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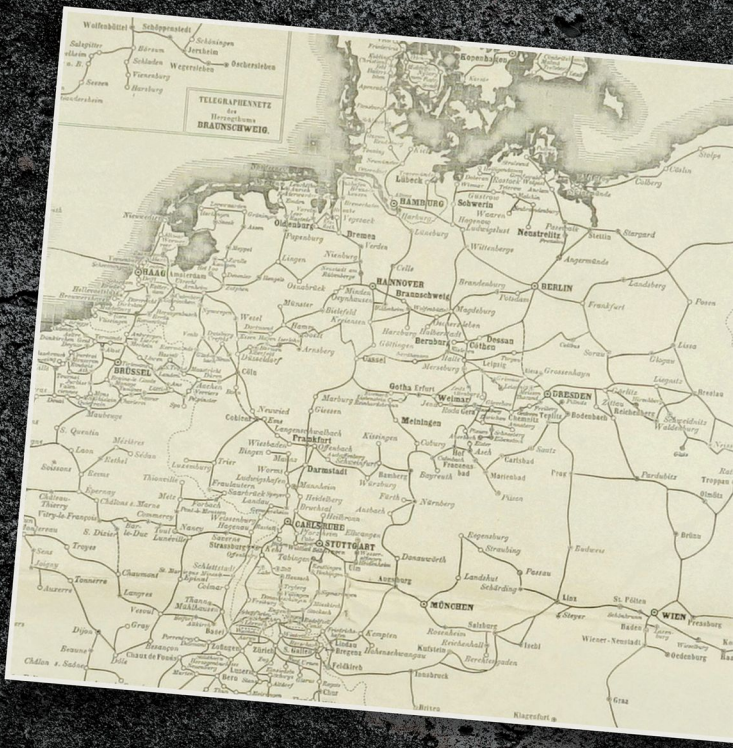

NETWORKS OF MODERNITY

Germany in the Age of the Telegraph, 1830–1880

JEAN-MICHEL JOHNSTON

STUDIES IN GERMAN HISTORY

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Contents

List of Figures

Figure 0.1 Map of Central Europe, 1815–66

Introduction

'Whoever seeks to detect the fundamental waves in the economic currents of our time', Karl Knies wrote in 1857, 'is repeatedly steered towards the world-historical revolution in the means of communication.'[1] A few years earlier, the man later considered a founding father of the German 'Historical School' of economics had published an analysis of *The Railways and their Effects*, and now he set out to consider the impact of an equally transformational technology—the electric telegraph.[2] Doing so, Knies recognized, meant investigating the countless facets of social, economic, cultural, and political life which had been altered by this new means of communication. Describing the endeavour, he wrote: 'Whoever seeks to register the achievements and effects of the telegraph soon witnesses a vision, like that of a tree which, from a trunk which is easily spanned, shoots out many branches and limbs, which themselves carry innumerable leaves and constantly swell with new sprouts and buds from the invisible passages and chambers of its lifeblood.'[3]

This book tackles the challenge which Karl Knies faced in 1857, drawing upon the additional benefit of hindsight to examine the role played by telegraphic communication in the transformation of Germany during the nineteenth century. It takes this challenge one step further, considering not only the impact but also the origins of this technological revolution—both the roots and the visible manifestation of Knies's metaphorical tree, as it were, situating them in the changing landscape of Central Europe between the *Vormärz* and the early years of the *Kaiserreich*. It investigates how the much-acclaimed 'communications revolution' both derived from and fuelled the broader, contested process of Germany's modernization.

As Knies's text suggests, developments in transport and communication have long been considered central to the momentous changes which shook Europe and North America during the nineteenth century. Trains, telegraphs, and steamships elicited both wonder and anxiety among contemporaries, of course, but they also quickly became the subject of scholarly attention. In the 1870s, the Austrian Emil Sax studied the economic impact of these innovations upon the national economy,

[1] K. Knies, *Der Telegraph als Verkehrsmittel, mit Erörterungen über den Nachrichtenverkehr überhaupt* (Tübingen, 1857), p. iii.
[2] K. Knies, *Die Eisenbahnen und ihre Wirkungen* (Braunschweig, 1853).
[3] Knies, *Der Telegraph*, p. 190.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0001

and by the early twentieth century the historian Karl Lamprecht emphasized the profound influence which they had exerted upon German culture.[4] In 1932, Roger Albion coined the expression 'communications revolution' to emphasize the distinctive impact of new means of travel and exchange within the broader 'industrial revolution' under which they were often subsumed.[5] Today, the communications revolution has become a compulsory chapter in master narratives of the nineteenth century, while attracting attention in its own right as an ongoing process often associated with the age of the Internet.[6]

Despite this long-standing consensus, the telegraph, whose leading role in the communications revolution is widely recognized, remains remarkably overlooked in the historiography of modern Germany.[7] Horst A. Wessel has provided an essential overview of the various lines which were established across different states during the nineteenth century, and Josef Reindl and Jan-Otmar Hesse have productively engaged with the question of how telegraph networks were administered across Central Europe and in the *Kaiserreich*.[8] The wider intellectual, political, or socio-economic implications of telegraphic communication, meanwhile, have been hinted at in a selection of thought-provoking but necessarily

[4] E. Sax, *Die Verkehrsmittel in Volks- und Staatswirthschaft*, 2 vols. (Vienna, 1878–9); K. Lamprecht, *Zur jüngsten deutschen Vergangenheit*, 2 vols. (Freiburg im Breisgau, 1903), ii/1.

[5] R. Albion, 'The "Communication Revolution"', *American Historical Review*, vol. 37, no. 4 (July 1932), pp. 718–20. The Canadian historians Harold Innis and Marshall McLuhan, who emphasized the transformative impact of media upon society, also helped to bring the communications revolution to the attention of historians. Cf., for example, H. A. Innis, *The Bias of Communication* (Toronto, 1951); H. M. McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (Toronto, 1962).

[6] See, for example, R. Evans, *The Pursuit of Power: Europe, 1815–1914* (London, 2016), pp. 147–58; J. Osterhammel, *The Transformation of the World: A Global History of the Nineteenth Century*, trans. P. Camiller (Princeton, 2014), esp. pp. 710–43. The literature on the 'communications revolution' per se is replete with narratives in which the telegraph features in a trajectory leading from 'Gutenberg to the Digital Age'. Cf. B. Kovarik, *Revolutions in Communication: Media History from Gutenberg to the Digital Age* (London, 2011), esp. pp. 255–74; Further examples include J. Bray, *Innovation and the Communications Revolution: From the Victorian Pioneers to Broadband Internet* (London, 2002); B. Winston, *Media, Technology and Society: A History: From the Telegraph to the Internet* (London, 1998). For a critical evaluation of the concept see Wolfgang Behringer, 'Communications Revolutions: A Historiographical Concept', *German History*, vol. 24, no. 3 (2006), pp. 333–74.

[7] On the telegraph in continental Europe, see: C. Bertho, *Télégraphes et téléphones: De Valmy au microprocesseur* (Paris, 1981); *Svenska Telegrafverket: en historisk framställning, utgiven enligt beslut av Kungl. Telegrafstyrelsen*, ed. Kungl. Telegrafstyrelsen (7 vols., Stockholm, 1931–97); U. Cavina, *La Telegrafia Elettrica e le Origini del Morse (Uffici e linee nell'Italia preunitaria)* (Albino, 2008); C. Colavito, *Telegrafi e Telegrafisti del Risorgimento: Storia delle Prime Comunicazioni Elettriche in Italia* (Rome, 2014); S. Fari, *Una Penisola in Comunicazione: Il Servizio Telegrafico Italiano dall'Unità alla Grande Guerra* (Bari, 2008); L. E. Otero Carvajal, 'La evolución del telégrafo en España', in A. Bahamonde Magro, G. Martinez Lorente and L. E. Otero Carvajal, *Las communicaciones en la construcción del Estado contemporáneo en España, 1700–1936* (Madrid, 1993), pp. 123–88.

[8] H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland und die rheinische Industrie: von den Anfängen bis zum Ausbruch des Ersten Weltkrieges* (Wiesbaden, 1983); J. Reindl, *Der Deutsch-Österreichische Telegraphenverein und die Entwicklung des deutschen Telegraphenwesens, 1850–1871* (Frankfurt am Main, 1993); J.-O. Hesse, *Im Netz der Kommunikation: Die Reichs-Post- und Telegraphenverwaltung, 1876–1914* (Munich, 2002).

limited articles or book chapters.[9] Often, however, the most up-to-date literature on the subject still remains the collection of somewhat dry and narrow-focused publications issued in the early twentieth century to celebrate the anniversaries of the postal and telegraph services in individual German states.[10] To this day, the technology remains in the shadow of its more boisterous partner in crime, the railway.[11]

Yet it would be difficult to overstate the telegraph's role in the transformation of the nineteenth-century world. Telegraph lines were first established in Europe and North America during the 1830s and 1840s, and within three decades they had evolved into fully fledged national and international networks of communication. From the 1850s, submarine cables began to adorn the ocean floor, connecting continents and launching a new phase of globalization. Information circulated faster and wider than ever before, binding industry, trade, and finance ever closer together, streamlining bureaucracy and diplomacy, energizing the press and the public sphere. For many contemporaries in the West, this growing worldwide web of cables and wires heralded the seemingly inevitable triumph of 'civilization'—both at home, where they drew rural villages out of the depths of ignorance and 'tradition', and abroad, where they brought 'progress' to imperial colonies.[12] From industrialization to capitalism, state-building, imperialism, and the belief in progress itself, the telegraph connected and stimulated many of the phenomena associated with the birth of the modern world.

By investigating the development of telegraphic communication, therefore, this book revisits Germany's encounter with modernity. To describe this process as modernization is perhaps contentious, as the term has become synonymous with the schematic models of socio-economic and political development drawn up in the aftermath of the Second World War. These models prescribed a path to 'modernity', based principally on the British and American experience, through

[9] M. Wobring, 'Telekommunikation und Nationsbildung. Die politischen Konzepte früher deutscher Telegraphenplanung vom ausgehenden 18. Jahrhundert bis zur Paulskirche', *Technikgeschichte*, vol. 71, no. 3 (2004), pp. 201–21; W. Löser, 'Die Rolle des Preußischen Staates bei der Ausrüstung der Eisenbahnen mit elektrischen Telegraphen in der Mitte des neunzehnten Jahrhunderts', *Jahrbuch für Wirtschaftsgeschichte*, 4 (1963), pp. 193–208; B. Siegert, *Relays: Literature as an Epoch of the Postal System* (Stanford, 1999), esp. pp. 165–85.

[10] See, for example, *Rückblick auf das erste Jahrhundert der K. Bayer. Staatspost* (1. März 1808 bis 31. Dezember 1908), ed. K. B. Staatsministerium für Verkehrsangelegenheiten (Munich, 1909); F. Weber, *Post und Telegraphie im Königreich Württemberg: Denkschrift aus Anlass des Ablaufs der fünfzigjährigen Verwaltung des württembergischen Post- und Telegraphenwesens durch den Staat* (Stuttgart, 1901); *Hundert Jahre Telegraphie in der Pfalz, 1853–1953*, ed. Oberpostdirektion (Neustadt, 1953).

[11] On the German railways, see L. Gall and M. Pohl (eds.), *Die Eisenbahn in Deutschland: Von den Anfängen bis zur Gegenwart* (Munich, 1999).

[12] D. J. Czitrom, *Media and the American Mind: From Morse to McLuhan* (Chapel Hill, 1982); On the telegraph in America more generally, see D. Hochfelder, *The Telegraph in America, 1832–1920* (Baltimore, 2012); D. R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford, 1981); T. Standage, *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century's Online Pioneers* (London, 1999).

which industrialization and democratization worked in tandem. According to the '*Sonderweg*' thesis developed in the 1960s, Germany's failure to follow this path had led to its twentieth-century 'catastrophe'.[13] Unlike in its Western neighbours, so the argument ran, industrialization in Germany had not led to the emergence of a robust and vocal middle class, allowing traditional agrarian elites to block political reform and preside over an economically powerful but illiberal and aggressively imperialistic state.[14] The German psyche, in George Mosse's interpretation, never came to terms with this schizophrenic reality, rejecting the technological apparel of modernity and seeking refuge in dreams of an imagined, bucolic, *völkisch* past.[15]

The limits of this deterministic model were highlighted in the 1980s, in a path-breaking work by David Blackbourn and Geoff Eley. The *Sonderweg* thesis, they pointed out, rested on a comparison with an arguably flawed representation of 'modernization' in Britain, where industrialization, middle-class hegemony, liberal politics, and parliamentary rule were assumed to have gone unproblematically hand in hand.[16] The fixation upon Germany's failure to fulfil these criteria had, in the words of Blackbourn, created 'a curiously static picture of imperial German politics and society', populated by immovable elites and a notoriously passive bourgeoisie.[17] Historians were invited to break free from the shackles of this prescriptive theory, and to consider the 'peculiarities', rather than the purported aberrations, of Germany's development.[18] Over the past three decades, the diversity and dynamism of German nineteenth-century history have been recovered, its social, religious, and political divisions, uneven industrialization, nation- and empire-building initiatives, and scientific culture being recast as expressions of a much more ambiguous, at times very dark, modernity that emerged at the turn of the twentieth century.[19]

A similar shift has taken place in the historiography of Europe as a whole. Like the *Sonderweg* thesis, the socio-economic determinism, abstraction, and

[13] F. Meinecke, *Die Deutsche Katastrophe: Betrachtungen und Erinnerungen* (Wiesbaden, 1946).

[14] The classic formulation of this thesis is H.-U. Wehler, *Das Deutsche Kaiserreich, 1871–1918* (Göttingen, 1973), which drew on the work of Eckart Kehr: *Der Primat der Innenpolitik*, ed. H.-U. Wehler (Berlin, 1965). See also B. Moore, *Social Origins of Democracy and Dictatorship* (Boston, 1966); R. Dahrendorf, *Gesellschaft und Demokratie in Deutschland* (Munich, 1965).

[15] G. Mosse, *The Crisis of German Ideology* (New York, 1964).

[16] D. Blackbourn and G. Eley, *The Peculiarities of German History: Bourgeois Society and Politics in Nineteenth-Century Germany* (Oxford, 1984).

[17] D. Blackbourn, *Class, Religion and Local Politics in Wilhelmine Germany* (London, 1980), p. 8. Cf. T. Nipperdey, 'Probleme der Modernisierung in Deutschland', in *Nachdenken über deutsche Geschichte* (Munich, 1985); H.-U. Wehler, *Modernisierungstheorie und Geschichte* (Göttingen, 1975).

[18] Blackbourn and Eley, *Peculiarities*.

[19] D. F. Crew, 'The Pathologies of Modernity: Detlev Peukert on Germany's Twentieth Century', *Social History*, vol. 17, no. 2 (May 1992), pp. 319–28; S. O. Müller and C. Torp (eds.), *Das Deutsche Kaiserreich in der Kontroverse* (Göttingen, 2009); Heinrich August Winkler's magisterial history of modern Germany, however, suggests that the *Sonderweg* thesis remains a powerful historiographical leitmotif: *Der lange Weg nach Westen*, (2 vols., Munich, 2000).

Eurocentrism of modernization theories had been criticized since the 1970s, some seeking more flexible models, others emphasizing the agency of individuals, of discourse, and of culture in explaining historical change.[20] Perhaps more significantly, however, the underlying faith in a normative concept of Western modernity has been shaken by scholars of postcolonial and global history. In recent years, the 'provincialization' of Europe within a global context has highlighted the exchanges and transfers through which 'its' vision of modernity, its very uniqueness, was constructed, contested, adopted, and adapted by different actors in different settings.[21] Here too, the straightjacket of a linear, purportedly universally applicable, modernization theory has been shed, scholars now preferring to describe the 'multiple' or 'alternative' modernities which coexisted during the nineteenth and twentieth centuries.[22]

These conceptual changes have brought about a welcome recognition of the diversity previously masked by efforts to make history fit the model. But in a strange reversal of fortunes, the past appears to have become static once again, full of contradictions but lacking direction, as the mechanism of modernization that held developments together has been jettisoned. The concept of modernity, as Frederick Cooper has pointed out, risks being dissolved into an effectively timeless diversity, devoid of analytical content.[23] At the very most, it seems, historians agree that modernity 'was' or 'is' at a particular moment, and often stands in as the container, rather than the product, of diverse historical forces.[24] In the German context, the beginning of that period is most commonly situated around 1890 and identified with the Wilhelmine Empire, a time when, as a recent collection has shown, visions of the future were contested—these were Germany's 'modernities'.[25] As Helmut Walser Smith highlighted a decade ago, ever since the path dependency of the *Sonderweg* model was discarded German historiography has been characterized by an uneasy attempt to balance this observed diversity of

[20] S. N. Eisenstadt, 'Studies of Modernization and Sociological Theory', *History and Theory*, vol. 13, no. 3 (1974), pp. 225–52. The validity of the critique was acknowledged by one of its earlier proponents, Alexander Gerschenkron: see 'Europecentrism and Other Horrors: A Review Article', *Comparative Studies in Society and History*, vol. 19, no. 1 (1974), pp. 108–23. See also the particularly trenchant critique of the model as 'ahistorical' by Immanuel Wallerstein: 'Modernization: Requiescat in Pace', in L. Coser and O. Larsen (eds.), *The Uses of Controversy in Sociology* (New York, 1976).

[21] D. Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton, 2000).

[22] S. N. Eisenstadt, 'Multiple Modernities', *Daedalus*, vol. 129, no. 1 (2000), pp. 1–29.

[23] F. Cooper, 'Modernity', in *Colonialism in Question: Theory, Knowledge, History* (Berkeley, 2005), pp. 113–49.

[24] As suggested by discussions in the round table on 'Historians and the Question of "Modernity"', *American Historical Review*, vol. 116, no. 3 (June 2011), pp. 631–751.

[25] G. Eley, J. Jenkins, and T. Matysik (eds.), *German Modernities from Wilhelm to Weimar: A Contest of Futures* (London, 2016).

contemporary experiences with the need to provide a meaningful, explanatory continuity to the past.[26]

This book argues that the very ambiguity of modernity—its contradictions, perhaps—can be traced, at least to a great extent, to the unprecedented expansion of networks of communication during the nineteenth century. For networks are themselves Janus-faced creatures; they not only create connections and relations of interdependence between people and places but by their very nature also include and exclude; they privilege the 'connected' to the detriment of those who remain 'disconnected'.[27] Indeed, recent studies in the field of global history have shown how telegraph networks fuelled both the growing interconnectedness and the social, political, and racial division of the nineteenth-century world.[28] These were the engines of a thoroughly ambiguous process of modernization.

Following the development of networked communication, therefore, this book reveals one of the mechanisms underpinning the social, economic, political, and cultural paradoxes of the nineteenth century. In doing so, it situates Germany within broader efforts to revisit the transformation of Europe as a connected, but uneven and uncertain, process. During this period, Europe was arguably not so much driven by a 'dual revolution' in politics and industry as enmeshed in its effects, caught 'between growth and equality', as Jörg Fisch puts it.[29] In a thought-provoking work, James Vernon has described the nineteenth century's oscillations as the 'dialectic' of modernity, a continuous synthesis of seemingly opposed forces which, this book argues, were in fact fundamentally connected.[30] It also suggests not simply the parallels but the continuities between the nineteenth century and

[26] H. W. Smith, 'When the *Sonderweg* Debate Left Us', *German Studies Review*, vol. 31, no. 2 (May 2008), pp. 225–40.

[27] M. Castells, 'Informationalism, Networks, and the Network Society: A Theoretical Blueprint', in Manuel Castells (ed.), *The Network Society: A Cross-Cultural Perspective* (Cheltenham, 2004), pp. 3–45. There is a wealth of literature taking various approaches to the use of networks in history and sociology. As early as 1939, Norbert Elias proposed to view society as a network out of which individuals emerge and to which they contribute: *Die Gesellschaft der Individuen*, ed. M. Schröter (Frankfurt am Main, 1987 [1939]). In the latter decades of the twentieth century, networks witnessed many reincarnations, ranging from studies on social networks often derived from the work of Mark Granovetter to the 'Actor-Network-Theory' proposed by Bruno Latour, which places humans, objects, and ideas on an even, interconnected plane: M. Granovetter, 'The Strength of Weak Ties', *American Journal of Sociology*, vol. 78, no. 6 (1973), pp. 1360–80; C. Kadushin, *Understanding Social Networks: Theories, Concepts, Findings* (New York, 2012); B. Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford, 2005). This book considers social networks and the material means of communication upon which they rely to be mutually constitutive.

[28] R. Wenzlhuemer, *Connecting the Nineteenth-Century World: The Telegraph and Globalization* (Cambridge, 2012). Wenzlhuemer's overview suggests a number of directions which the historiography might fruitfully follow and has spurred some very interesting studies: S. M. Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks* (New York, 2016); A. Bonea, *The News of Empire: Telegraphy, Journalism and the Politics of Reporting in Colonial India, c. 1830–1900* (Oxford, 2016). Cf., most recently, A. Asseraf, *Electric News in Colonial Algeria* (Oxford, 2019). Jürgen Osterhammel hints at these two dimensions of globalization in his chapter on 'Networks: Extension, Density, Holes', in *Transformation of the World*, pp. 710–43.

[29] J. Fisch, *Europa zwischen Wachstum und Gleichheit, 1850–1914* (Stuttgart, 2002).

[30] J. Vernon, *Distant Strangers: How Britain became Modern* (Berkeley, 2014).

the present day, now that the techno-optimism that accompanied the emergence of the Internet in the 1990s has been replaced by an awareness of the world's many digital inequalities, hinting at the existence of much more deeply entrenched mechanism of connection and division.[31]

To adopt this approach is to focus our attention on the half-century during which telegraphs and railways first transformed the European landscape—the decades immediately preceding the Wilhelmine Empire, which continues to occupy centre stage in Germany's dramatic encounter with modernity.[32] This period straddling the revolutions of 1848 and the early years of the *Kaiserreich* continues to be overlooked in the historiography, despite the emphasis which some historians have placed upon the considerable social upheaval and industrial 'take-off' which it witnessed.[33] Caught between an increasingly 'long' eighteenth century and a twentieth century whose roots reach ever further back, the years 1830–80 appear to be 'dangling in space', as David Blackbourn has recently stated.[34] Much of this impression is no doubt a question of changing historical perspective, but, as this book seeks to demonstrate, these were unquestionably decades of intense and important change. In approaching this period of transition, this book also constitutes a plea for the rehabilitation of 'modernization', not as a normative model of historical development but as an analytical concept to explain the *emergence* of a fundamentally ambiguous and diverse modernity by the late nineteenth century. It seeks to restore the utility of the term in defining a historically contingent process, while accounting for the ambivalence of its consequences.

* * *

Networks and modernization have long been intertwined in the historiography of nineteenth-century Europe. In the 1950s, Karl Deutsch famously placed infrastructures of communication at the heart of the emergence of national cultures, a thesis taken up twenty years later by Eugen Weber in his classic illustration of nation-building under the French Third Republic.[35] The linearity of these parallel processes of 'modernization' and 'nationalization', as then conceived, has since

[31] See, in particular, W. H. Dutton and M. Graham (eds.), *Society and the Internet* (Oxford, 2014).

[32] James Retallack has recently offered a much more nuanced view of the *Kaiserreich*'s place in the longer thread of German history: J. Retallack, *Germany's Second Reich: Portraits and Pathways* (Toronto, 2015).

[33] W. Siemann, *Gesellschaft im Aufbruch. Deutschland 1849–1871* (Frankfurt am Main, 1990); H.-U. Wehler, *Deutsche Gesellschaftsgeschichte* (5 vols., Munich, 1987–2008), iii, pp. 66–97; see also H. Böhme, *Deutschlands Weg zur Grossmacht: Studien zum Verhältnis von Staat und Wirtschaft während der Reichsgründungszeit, 1848–1881* (Cologne, 1968). More recently, Christopher Clark has called for more research on the post-revolutionary decade of 'reaction' in particular: 'After 1848: The European Revolution in Government', *Transactions of the Royal Historical Society*, vol. 22 (Dec. 2012), pp. 171–97.

[34] D. Blackbourn, 'Nineteenth-Century German History: Dangling in Space?', *Central European History*, vol. 51, no. 4 (2018), pp. 618–22.

[35] K. Deutsch, *Nationalism and Social Communication: An Inquiry into the Foundations of Nationality* (London, 1953); E. Weber, *Peasants into Frenchmen: The Modernization of Rural France, 1870–1914* (Stanford, 1976).

been successfully challenged.[36] Abigail Green and Siegfried Weichlein have demonstrated how the development of communications networks in Germany's federal context fostered a dual process of regional and national state-building, both before and after unification.[37] New means of transport and communication, these works suggest, not only tolerated but in fact supported the now well-documented persistence of local and regional identities in Germany.[38]

In this process, telegraph lines went one step further than the railways. In many ways, they were the latter's silent partner, often erected or buried alongside the heavy iron tracks that criss-crossed the countryside. But the relative ease and speed with which telegraph wires could be constructed, and the lower levels of investment which they required, meant that the technology reached both deeper into the countryside and further across state borders than the railways ever could. Not limited to the same extent by geographical and topographical constraints, telegraph lines and offices tied together villages, towns, and cities across Europe and beyond. They became, quite literally, the infrastructure connecting the local, national, and eventually global dimensions of the transformations which characterized the nineteenth century.

This book therefore investigates the wide variety of spatial frameworks in which telegraph networks were established, and which they came to sustain. Building upon the work of Green and Weichlein, it emphasizes the 'particularistic' origins of these networks, whose construction was part and parcel of the state-building policies pursued by the various governments of the German Confederation (*Deutscher Bund*) during the 1850s and 1860s. They contributed to the entrenchment of the federal German heritage with which the *Kaiserreich* of 1871 would have to contend when it, too, sought to turn the telegraph into a tool of nationalization.[39] But it also follows these lines of communication inwards and outwards. It spotlights, on the one hand, the expanding international networks in which the German states were repeatedly repositioned by the technology and, on the other hand, the local contexts through which telegraphic transmissions were channelled—the towns and villages where telegraph offices became a new focal point in the everyday life of the community.

[36] On the reception of Weber's work and the research which it stimulated, see: M. Cabo and F. Molina, 'The Long and Winding Road of Nationalization: Eugen Weber's *Peasants into Frenchmen* in Modern European History, 1976–2006', *European History Quarterly*, vol. 39, no. 2 (2009), pp. 264–86.

[37] A. Green, *Fatherlands: State-Building and Nationhood in Nineteenth-Century Germany* (Cambridge, 2001); S. Weichlein, *Nation und Region: Integrationsprozesse im Bismarckreich* (Düsseldorf, 2004).

[38] See, for example, C. Applegate, *A Nation of Provincials: The German Idea of Heimat* (Berkeley, 1990); A. Confino, *The Nation as a Local Metaphor: Württemberg, Imperial Germany, and National Memory, 1871–1918* (London, 1997); J. Retallack (ed.), *Saxony in German History: Culture, Society, and Politics, 1830–1918* (Ann Arbor, 2000).

[39] On the 'long' history of German federalism, see M. Umbach (ed.), *German Federalism: Past, Present, Future* (Basingstoke, 2002).

Telegraph networks thus provide an invaluable lens through which to investigate the '*jeu d'échelles*', the different levels at which the very idea of 'Germany' was simultaneously being constructed during the nineteenth century.[40] One need only look at the administrative organizations which regulated telegraphic communication to get a sense of how this game was played. The German-Austrian Telegraph Union (*Deutsch-Österreichischer Telegraphen-Verein*)—a 'großdeutsch' organization, as the name suggests—was established very early on in the 1850s, but its dissolution in 1871 triggered attempts by some states to secure their independence. This they could do, in part, through their participation in the broader International Telegraph Union (ITU) which had been established in 1865, and which limited the new Reich administration's freedom of action.

The same interplay of forces becomes apparent when we turn from the administration of telegraphy to its content and its users. From the outset, of course, the technology provided a new tool for the conduct of government, diplomacy, policing, and warfare.[41] The 'reaction' of the 1850s, the Crimean War, and the changing European balance of power during the 1860s and 1870s were all driven by the to and fro of urgent telegrams. In this regard, the telegraph alerted governments to the growing interdependence of domestic and international security. Across society, meanwhile, the technology altered the conduct of trade, finance, industry, agriculture, and news distribution. And here too, its impact was ambivalent—it fostered the integration of a German economic sphere while enabling individuals to develop independent relations within different regional, national, and international systems of exchange. It supported structures of decentralized production in some regions, but facilitated the concentration of modern industries in others; it made East Elbian landowners more sensitive to the influence of their American competitors, while encouraging 'cosmopolitan' Hanseatic merchants to shift their gaze away from the Atlantic and back to the domestic German market; it enabled private bankers to strengthen their networks of debtors and creditors while extending the practice of stock market speculation to a wider public; it spawned telegraphic news agencies who then fought for control of regional, national, and global control of the press.

Behind the scenes, the 'wiring of the world' had begun, tentatively at first, as connections were established across smaller stretches of water in the 1850s, then proceeding apace after the laying of the transatlantic cable in 1866.[42] Yet German states appeared to be sidelined in this incipient globalization of communication, driven as it was by the governments and funds of their Western

[40] D. Blackbourn, 'Das Kaiserreich transnational. Eine Skizze', in S. Conrad and J. Osterhammel (eds.), *Das Kaiserreich Transnational* (Göttingen, 2004), p. 303.

[41] See, for example, D. Headrick, *The Invisible Weapon: Telecommunications and International Politics, 1851–1945* (New York, 1991), pp. 73–5; D. P. Nickles, *Under the Wire: How the Telegraph Changed Diplomacy* (Cambridge, Mass., 2003).

[42] Müller, *Wiring the World*.

counterparts—they were close enough to feel the ripples of a changing world economy, but too far to make an impact of their own. German journals and newspapers celebrated the apparent shrinking of the globe, a select few businessmen even took part in its realization, and its economic repercussions were very real, as the crises of 1857 and 1873 demonstrated. In reality, however, a vanishingly small minority of Germans were communicating across the world's longest wires, the vast proportion of their exchanges taking place across Germany and Europe.

Here, again, was another paradox. A modest wood merchant in Bavaria was increasingly aware of the 'distant' causes of local price fluctuations, parliamentary deputies discovered that transatlantic connections benefited an infinitesimally small elite, and Bismarck well knew that news agencies now had global connections, but their ability, or willingness, to engage these channels were limited. The potential challenges of globalization, as Cornelius Torp has described them, were made apparent from an early stage and at particular times, and telegraph networks certainly helped to spread news from overseas, no doubt influencing political and cultural discourse at home.[43] As Mark Hewitson has argued, however, taking up the finer points of Karl Deutsch's model, networks had created a competitive system of interactions, one in which global, European, national, and local connections vied for attention. For the time being, more regional concerns tipped the balance.[44]

The crisis of the 1870s, therefore, unleashed tensions which had been building for the preceding two decades, as Germany was pulled in a variety of directions. During the 1850s and 1860s many liberal parliamentary deputies had pushed governments to accept the primacy of 'national' economic priorities when designing networks of communication. The favour shown to particular elites as a result, however, was widely recognised and later became the subject of intense discussion in the *Reichstag*. Governments, meanwhile, struggled to maintain their influence over a seemingly increasingly independent public sphere, shaped by the telegraphic news from agencies which were themselves bound by their dependency upon international agreements. And in towns and villages across the country, conflicts arose between the officials, bankers, and industrialists who all sought to resituate telegraph offices in locations suited to their needs. These offices had become their point of access to the regional, national, or global economy upon which they depended, and provided one of the 'modern' focal points around which, as Oliver Zimmer has shown, the rhythms and priorities of local communities were reorientated and reconfigured.[45] Viewed from this perspective, the

[43] C. Torp, *The Challenges of Globalization: Economy and Politics in Germany, 1860–1914*, trans. A. Skinner (New York, 2014), esp. pp. 13–88; S. Conrad, *Globalisation and the Nation in Imperial Germany*, trans. Sorcha O'Hagan (Cambridge, 2010).

[44] M. Hewitson, *Germany and the Modern World, 1880–1914* (Cambridge, 2018), pp. 25–8.

[45] O. Zimmer, *Remaking the Rhythms of Life: German Communities in the Age of the Nation-State* (Oxford, 2013). On the impact of broader socio-economic and political forces upon local communities,

'*zweite Reichsgründung*' (second founding of the Empire) and the 'conservative turn' of 1878 did not so much mark Germany's sudden entry into a globalized modernity as constitute an effort to manage the Manichaean forces by which it was already being shaped.

Within this complex web of relations there lay one particularly visible silken strand, one that tied German businessmen to their counterparts across Europe and, in some cases, the globe. This 'telegraphic elite' was composed of individuals from the higher echelons of trade, finance, and industry, who drew from, and often determined, the flow of information and capital across state borders. It cannot be claimed that they represented the contested category of a German 'bourgeoisie' as a whole, but they constituted a privileged section of the middle class, for whom the telegraph became a very real 'network of means' connecting them to a pan-European elite.[46] These were the men (most often) who expected daily updates on international stock market fluctuations and relied on the technology's punctuality to effect their business transactions at specific times. Their needs often determined the shape and management of telegraph networks, fuelling this 'silent bourgeois revolution' with what were in fact at times rather vocal demands.[47] As in any revolution, there were both winners and losers: the elation of the connected elite was often matched by the frustrations of those who remained disconnected or poorly served by the network. Nevertheless, the technology helped place the rising bourgeoisie centre stage in Germany, as elsewhere in Europe. After all, in the words of Eric Hobsbawm, '[f]or good or ill, it was their age . . . '.[48]

Across politics, society, and the economy this was also an age of speed, and the telegraph, like the railways, was one of its principal engines. The cognitive impact of this speed, however, the transformation of Europeans' perception of time and space, remains under-researched.[49] The key theoretical texts on the matter, from

see also W. Whyte and O. Zimmer (eds.), *Nationalism and the Reshaping of Urban Communities in Europe, 1848–1914* (Basingstoke, 2011).

[46] J. Seigel, *Modernity and Bourgeois Life: Society, Politics and Culture in England, France, and Germany since 1750* (Cambridge, 2012), esp. pp. 1–37. On the problematic definition of the bourgeoisie in the German context, see M. Hettling, 'Eine anstrengende Affäre: Die Sozialgeschichte und das Bürgertum', in S. O. Müller and C. Torp (eds.), *Das Deutsche Kaiserreich in der Kontroverse* (Göttingen, 2009), pp. 219–33; J. Sperber, 'Bürger, Bürgertum, Bürgerlichkeit, Bürgerliche Gesellschaft: Studies of the German (Upper) Middle Class and Its Sociocultural World', *Journal of Modern History*, vol. 69, no. 2 (June, 1997), pp. 271–97.

[47] D. Blackbourn and G. Eley, *The Peculiarities of German History: Bourgeois Society and Politics in Nineteenth-Century Germany* (Oxford, 1984), esp. pp. 176–205.

[48] E. Hobsbawm, *The Age of Capital, 1848–1875* (London, 1977), p. 11.

[49] Notable exceptions include R. Wenzlhuemer, '"Less Than No Time". Zum Verhältnis von Telegrafie und Zeit', *Geschichte und Gesellschaft*, vol. 37, no. 4 (Oct. 2011), pp. 592–613; I. R. Morus, '"The Nervous System of Britain": Space, Time and the Electric Telegraph in the Victorian Age', *British Journal for the History of Science*, vol. 33, no. 4 (Dec. 2000), pp. 455–75. The paradigmatic attempt to analyse this cognitive transformation is Wolfgang Schivelbusch's *The Railway Journey: The Industrialization of Time and Space in the 19th Century* (Berkeley, 1986). For a thought-provoking analysis, situated in the context of nineteenth-century Canada, see J. Stein, 'Reflections on Time, Time-

Anthony Giddens to David Harvey and Zygmunt Bauman, associate the onset of modernity with a linear process of 'time-space compression' or 'distantiation' stimulated by the communications revolution.[50] Distance, according to these texts, and as contemporaries asserted, was progressively 'annihilated' during the nineteenth century, and time was standardized into a universally measurable quantity. This, indeed, is the spatio-temporal counterpart to the classic narrative of modernization—a Weberian rationalization of time and space, through which the clock became the principal means of coordinating life across 'what we call modern civilization', signalling the triumph of abstract, linear, and measurable time over the cyclical rhythms of nature, of night and day, and of the human body.[51] The telegraph, by effectively dematerializing communication, appears to have accelerated the death of distance.

Once again, research on extra-European modernity has called this narrative into question. On Barak, for instance, has foregrounded the telegraph as one of the technologies which nominally imposed 'Western' time management in colonial Egypt. His research shows, however, that time was infused with different meanings, and that a variety of 'times' could coexist in such a setting.[52] Taking a global view of developments, Vanessa Ogle has similarly shown that, from the late nineteenth to the mid twentieth century, the effort to establish a Universal Standard Time across the world met a number of obstacles, and in fact provided a framework in which other conceptions of social, religious, and 'national' times could be defined.[53] Other works have highlighted the multiplicity of modes of reckoning and experiencing time in different contexts, a multiplicity which, it seems, was also reflected in the spatio-temporal confusion reigning in Europe at the turn of the twentieth century, as Stephen Kern has illustrated.[54]

Modern concepts of time and space were not merely multiple, however. As this book will demonstrate, the fragmentation of conceptions of time and space

Space Compression and Technology in the Nineteenth Century', in Thrift and May (eds.), *TimeSpace*, pp. 106–19.

[50] D. Harvey, *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change* (Cambridge, Mass., 1990); A. Giddens, *The Consequences of Modernity* (Cambridge, 1990), pp. 1–29; Zygmunt Bauman, *Liquid Modernity* (Cambridge, 2000).

[51] D. Landes, *Revolution in Time: Clocks and the Making of the Modern World* (Cambridge, Mass., 1983), p. xx. On the problematic situation of studies on time and acceleration within the framework of linear narratives of modernization, see H. Rosa, *Social Acceleration: A New Theory of Modernity*, trans. Jonathan Trejo-Mathys (New York, 2013). More generally, see B. Adam, *Time and Social Theory* (Cambridge, 1990); E. P. Thompson, 'Time, Work-Discipline, and Industrial Capitalism', *Past & Present*, 38 (Dec. 1967), pp. 56–97; G. Dohrn van Rossum, *History of the Hour: Clocks and Modern Temporal Orders* (Chicago, 1996).

[52] O. Barak, *On Time: Technology and Temporality in Modern Egypt* (Berkeley, 2013).

[53] V. Ogle, *The Global Transformation of Time: 1870–1950* (Cambridge, Mass., 2015).

[54] A. Wishnitzer, *Reading Clocks, Alla Turca: Time and Society in the Late Ottoman Empire* (Chicago, 2015); S. Kern, *The Culture of Time and Space, 1880–1918* (Cambridge, Mass., 2003). On the contact between 'Western' and other modes of time measurement, see also Y. Frumer, 'Translating Time: Habits of Western-Style Timekeeping in Late Edo Japan', *Technology and Culture*, vol. 55, no. 4 (2014), pp. 785–820.

derived directly from the development of new means of communication, which came to 'enframe' Germans' experience of modernity.[55] As the telegraph spread progressively and unevenly across the German landscape, space appeared to contract for those people and places included in the network of high-speed information circulation, but expanded for those who remained excluded. In a similar way, time might speed up for some users but appear to drag on for those suffering delays in transmission, its value fluctuating accordingly. The quality of an individual or a locality's access to telegraphic communication generally reflected their social, economic, or political status, such that the speed of finance and politics might contrast sharply with the rhythms of rural life—perceived fluctuations in time and space were the cognitive counterpart to the uneven modernization of Germany.

None of these geopolitical, social, economic, and cognitive changes escaped the attention of contemporaries. Historians have argued that the late nineteenth-century Wilhelmine Empire was dominated by a dangerous and ultimately destructive combination of economic strength and cultural self-doubt—it was a 'nervous Great Power' engulfed in an 'age of nervousness'.[56] By the early twentieth century, indeed, the sociologist Georg Simmel and the historian Karl Lamprecht denounced the excessive speed of modern life.[57] Society, Lamprecht believed, was subject to a growing 'excitability' (*Reizsamkeit*): 'forwards, without pausing, is the catchword of the present', he believed.[58] And '[t]here is no doubt', Lamprecht added, 'that this concern [*Betrachtung*] for every second is directly, and to a large extent, due to modern means of communication'.[59] Yet this phenomenon, as recent work has shown, was not unique to Germany—in Britain too, these were anxious times.[60]

The broad brushstrokes of this modern culture of speed, moreover, concealed the process through which new means of communication had penetrated society. The generalized alarm which historians have detected in the latter decade of the nineteenth century was the result of the progressive infiltration of technologies such as the telegraph into the habits of different strata of the population. The

[55] M. Heidegger, 'The Question Concerning Technology', in *The Question Concerning Technology and Other Essays*, trans. W. Lovitt (London, 1977), pp. 3–36.

[56] V. Ullrich, *Die nervöse Großmacht: Aufstieg und Untergang des deutschen Kaiserreichs, 1871–1918* (Frankfurt am Main, 1997); J. Radkau, *Das Zeitalter der Nervosität: Deutschland zwischen Bismarck und Hitler* (Munich, 1998); A. Killen, *Berlin Electropolis: Shock, Nerves, and German Modernity* (London, 2006). Michael Cowan has argued that the response to this nervousness was a widespread desire to recover the strength of the human will: M. Cowan, *Cult of the Will: Nervousness and German Modernity* (University Park, Pa., 2008).

[57] G. Simmel, 'Die Groβstädte und das Geistesleben', in Rüdiger Kramme, Angela Rammstedt, and Otthein Rammstedt (eds.), *Georg Simmel: Aufsätze und Abhandlungen, 1901–1908*, 2 vols. (Frankfurt am main, 1995), i.; K. Lamprecht, *Zur jüngsten deutschen Vergangenheit*, 2 vols. (Freiburg im Breisgau, 1903), ii/1.

[58] Lamprecht, *Zur jüngsten deutschen Vergangenheit*, ii/1, 262, 242. [59] Ibid., 159.

[60] A. Bonea, M. Dickson, S. Shuttleworth, and J. Wallis, *Anxious Times: Medicine & Modernity in Nineteenth-Century Britain* (Pittsburgh, 2019).

towering figures of the emerging realist literature during the period, from Gustav Freytag to Friedrich Spielhagen and Theodor Fontane, had already noted this transformation in the 1850s, 1860s, and 1870s. They themselves drew on a widespread perception of the effects of telegraphic communication which was expressed in newspapers and journals, from *Kladderadatsch* to *Die Gartenlaube*. As these novelists and publications show, the public had learned to marvel at, caricature, and ultimately internalize the individual stages of the technology's development as an accelerator of finance, business, geopolitics, and, eventually, social life. Along the way, Germans had experienced the same hopes and disappointments, expectations and frustrations, as their Western counterparts, to whom they were connected by the technology.[61]

In essence, this book investigates the emergence of one major new means of communication to reveal the ways in which it transformed Germany before it was—sometimes literally—sunk into the foundations of society. In doing so, it seeks to illuminate the process through which the networks created by the telegraph came to form the often invisible infrastructure of German modernity. This process was by no means linear; on the contrary, it proceeded by means of inclusion and exclusion, of connection and division, paving the way for the contests and challenges which the country, like many of its neighbours, faced at the turn of the century.

The Roots of Modernity

In 1850, the schoolteacher Heinrich Schellen produced a textbook on telegraphy aimed at 'friends of physics, telegraph personnel, engineers, technicians, and mechanics', the principle aim of which, he stated, was to 'bring a certain order to the great mass of electro-telegraphic experiments, and to the motley tangle of inventions, constructions, priority contests and the like' which they had engendered.[62] As Schellen's text implied, this revolutionary new technology had not emerged fully formed from the mind of a single inventor, nor was it simply a natural successor to earlier, inferior means of communication. The telegraph was the product of discussions and negotiations between numerous actors, at a time when the function and means of communication in society had become a subject of debate.

This book therefore begins by plunging into the world of *Vormärz* Germany to explore the social, economic, and cultural context from which the telegraph

[61] David Blackbourn has elegantly described this ambiguous culture of progress in *The Long Nineteenth Century: A History of Germany, 1780–1918* (New York, 1998), pp. 270–310.

[62] H. Schellen, *Der elektromagnetische Telegraph in den einzelnen Stadien seiner Entwicklung* (Brunswick, 1850), p. v.

emerged. It seeks both to highlight the little-known German 'contributions' to the narrative of this technology's development and to challenge its linearity.[63] For despite the now long-standing efforts of historians of science and technology to turn our attention to the environment in which scientific 'truths' and practical innovations are produced, the history of telegraphy remains dominated by an account which prioritizes the individual achievements of primarily Anglo-American protagonists.[64] Samuel Morse in the United States and Charles Wheatstone in Britain had their counterparts in Bavaria's Carl Steinheil and, later, Prussia's Werner Siemens. Neither Steinheil nor Siemens, however, could have brought their telegraphic apparatuses to life without government funding, private investment, and a widely disseminated stock of scientific and technical knowledge.

Indeed, the 'motley tangle' of individuals who, in one way or another, contributed to the development of the electric telegraph in Germany included scientists, technicians, entrepreneurs, political economists, and bureaucrats. Between *c.*1830 and *c.*1850, scientific knowledge on the subject was exchanged between academicians and university professors, but also amateur inventors and skilled technicians, who would later form the core of an engineering profession; investment in the technology was provided both by governments and the private railway companies interested in developing new signalling systems to help coordinate their trains; the strategic, political, and commercial utility of communications networks in general, meanwhile, was being re-evaluated by officials and writers who sought to understand the changing relationship between state and society.

To investigate the origins of the telegraph, then, is to explore the social, cultural, and economic history of the later *Sattelzeit*, when the concepts of 'science' and 'technology', 'state', 'society', and 'communication' itself were in flux. Doing so invites us to reconsider the origins and process of early industrialization in Germany, which has generally been associated primarily with Prussia and has tended to emphasize the state's role in providing the legal, administrative, educational, and entrepreneurial support for that process.[65] As some research has

[63] V. Aschoff, *Geschichte der Nachrichtentechnik* (2 vols., Berlin, 1995), p. ii. A much earlier work, E. Feyerabend, *Der Telegraph von Gauss und Weber im Werden der elekrischen Telegraphie* (Berlin, 1933), provides a very brief summary of early developments and reproduces a number of crucial documents which, it seems, have since been lost.

[64] A notable recent exception is B. S. M. Schwantes, *The Train and the Telegraph: A Revisionist History* (Baltimore, 2019). B. Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes, 1987), esp. pp. 1–17. J. Golinski, *Making Natural Knowledge: Constructivism and the History of Science* (Chicago, 2008), esp. pp. 13–46. W. E. Bijker, T. P. Hughes, and T. J. Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass., 1987). See, for instance, K. Beauchamp, *History of Telegraphy* (London, 2001); A. Huurdeman, *The Worldwide History of Telecommunications* (Hoboken, N.J., 2003).

[65] W. Fischer, 'Das Verhältnis von Staat und Wirtschaft in Deutschland am Beginn der Industrialisierung', *Kyklos*, vol. 14, no. 3 (1961), pp. 337–63; W. O. Henderson, *The State and the Industrial Revolution in Prussia, 1740–1870* (Liverpool, 1958); U. P. Ritter, *Die Rolle des Staats in den Frühstadien der Industrialisierung* (Berlin, 1961); I. Mieck, *Preussische Gewerbepolitik in Berlin*,

suggested, however, other states such as Baden were equally active in promoting industrialization, and even in Prussia the influence of private investment should not be underestimated.[66] As James Brophy and Eric Brose have shown, when it came to industrialization, technological development, and railway construction, there was considerable dialogue and a constant negotiation of interests between Prussian bureaucrats and businessmen, as well as among state officials themselves.[67]

Building upon these insights, this book highlights the interactions between individuals on either side of the fluid boundaries of 'state' and 'civil society' who brought together the logistical, financial, and technical resources necessary to the development of telegraphy. Borrowing from Joel Mokyr, it argues that a broadly conceived 'useful knowledge' circulated among the variety of people and institutions concerned, allowing them to collaborate, whether consciously or unwittingly, in developing a new technology.[68] Something akin to an 'industrial Enlightenment' was taking place in *Vormärz* Germany, a concept which Peter Jones has applied to late eighteenth- and early nineteenth-century Britain to challenge the primacy of either 'science' or technical 'know-how' in the process of industrialization.[69] It accompanied the 'agricultural Enlightenment' which, as Jones has also recently argued, was taking place across Europe between 1750 and 1850, as knowledge circulated increasingly broadly throughout society.[70]

Adopting this concept is not to dilute individual agency and causality in a broth of ideas. Knowledge circulated through a constellation of academies, universities, institutions, and associations which had emerged across Germany by the early nineteenth century. It was discussed by scientists, technicians, entrepreneurs, and bureaucrats in person or through letters, and disseminated to a wider audience in a growing variety of books and journals. As Denise Phillips has shown, the concept of science itself remained remarkably broad until the mid-1800s, progressively redefined by an intellectual culture shared across a broad social

1806–1844 (Berlin, 1965); H.-U. Wehler perceived the state's role as merely establishing a framework which did not hinder industrial development: *Deutsche Gesellschaftsgeschichte* (5 vols., Munich, 1987–2008), ii., pp. 64–94.

[66] R. Tilly, *Financial Institutions and Industrialization in the Rhineland, 1815–70* (London, 1966); W. Fischer, *Der Staat und die Anfänge der Industrialisierung in Baden, 1800–1850* (Berlin, 1962).

[67] J. M. Brophy, *Capitalism, Politics, and Railroads in Prussia, 1830–1870* (Columbus, 1998); E. D. Brose, *The Politics of Technological Change in Prussia: Out of the Shadow of Antiquity, 1809–1848* (Princeton, 1993).

[68] J. Mokyr, *The Gifts of Athena: Historical Origins of the Knowledge Economy* (Oxford, 2002), pp. 1–27.

[69] P. Jones, *Industrial Enlightenment: Science, Technology and Culture in Birmingham and the West Midlands, 1760–1820* (Manchester, 2009); on this persisting dichotomy in the German context, see U. Wengenroth, 'Science, Technology and Industry', in D. Cahan (ed.), *From Natural Philosophy to the Sciences: Writing the History of Nineteenth-Century Science* (Chicago, 2003), pp. 221–53.

[70] P. Jones, *Agricultural Enlightenment: Knowledge, Technology and Nature, 1750–1840* (Oxford, 2016).

spectrum.[71] People and places, as well as ideas, filled the German 'landscape of innovation'.

There was thus more at stake during the early nineteenth century than the first stages of industrialization. This was, indeed, the 'end of the economic old order', a period during which the relationship between state, society, and even nature, was redefined, requiring the many actors who feature in this book to find their place in a changing world.[72] The interactions between scientists, technicians, entrepreneurs, and bureaucrats engaged in developing the telegraph provide a glimpse into the ways in which they sought to manage this 'Great Transition', defining and defending their respective realms of expertise and authority.[73] The Prologue therefore turns to this period when the 'thick strands of continuity' in German history, the very fabric of state and society, were being unravelled and intertwined anew.[74] The networks of communication which emerged from this process of incipient modernization were to constitute the new seams of society.

* * *

This book cannot claim to be comprehensive, and the desire to include a diverse selection of protagonists, as well as to consider the many facets of the communications revolution, naturally imposed some limitations on the choice of source material. To claim exhaustiveness, however, would be to defy this book's premise: that the origins of the telegraph cannot be attributed to a single set of actors, and that the impact of telegraphic communication was not circumscribed by traditional borders. It is nonetheless based upon extensive research in archives throughout Germany, in addition to which a number of published newspapers, journals, textbooks, and novels from the period have been consulted.

Where the development of individual states is under consideration, the Kingdoms of Bavaria and Prussia feature most prominently, acknowledging the latter's undeniable predominance during the period while eschewing the tendency to make it the source of broader generalizations on German history. As a number of historians have now shown, Bavaria and the 'Third Germany' more generally were of considerable weight in defining the course of that history.[75] In order to account for regional and local differences in development, meanwhile, further

[71] D. Phillips, *Acolytes of Nature: Defining Natural Science in Germany, 1770–1850* (Chicago, 2012).

[72] J. M. Brophy, 'The End of the Economic Old Order: the Great Transition, 1750–1860', in H. Walser Smith (ed.), *The Oxford Handbook of Modern German History* (Oxford, 2011), pp. 169–94.

[73] Ibid.

[74] H. W. Smith, *The Continuities of German History: Nation, Religion, and Race Across the Long Nineteenth Century* (Cambridge, 2008), p. 12. Smith uses the expression to illuminate the different but related issue of historiographical debates on the German *Sonderweg*.

[75] For a critical analysis of this historiographical shift, see A. Green, 'The Federal Alternative? A New View of Modern German History', *Historical Journal*, vol. 46, no. 1 (Mar. 2003), pp. 187–202.

research was also conducted at state, municipal, and private archives in Berlin, Bremen, Nuremberg, Duisburg, Wuppertal, and Munich. Some additional primary material was also kindly provided by the *Institut für Stadtgeschichte* in Frankfurt am Main. Developments in Austria do not feature centrally, as the Habsburg Empire merits a study of its own, but they are described where information was readily accessible and insofar as they affected and tied into events and decisions in the region. It is hoped that the changes thereby depicted provide something of a representative picture of nineteenth-century Germany as a whole.

This book is structured chronologically and divided into two parts. After the Prologue, the first three chapters explore the 'landscape of innovation' across which the idea of telegraphy was discussed, applied, and developed into a useable technology, between 1830 and 1849. Chapter 1 traces the expectations which scientists, intellectuals, bureaucrats, and entrepreneurs placed in the possibility of instantaneous, long-distance communication. Chapter 2 highlights the negotiations which took place between these actors as they brought together the technical, logistical, and financial resources necessary to turn that possibility into a reality. Chapter 3 focuses upon the pivotal years which brought the *Vormärz* to a close, when the revolutionary upheavals of 1848/9 spurred governments to take a leading role in the construction of new networks of communication.

Chapters 4, 5, and 6 investigate the process through which telegraph networks were built and administered between 1850 and 1880, and their influence upon the development of the German economy, society, politics, and culture. Here, it is the 'consumers' of the technology who take centre stage, from state administrators, ministers, and members of parliament, to news agencies, bankers, merchants, and manufacturers. The technical development of the telegraph continued during this period, of course, and many actors—the state in particular—straddled the border between 'production' and 'consumption', but the focus here is upon the impact of the telegraph upon state and society. Throughout, an emphasis is placed upon the challenges which these many different applications of the technology created for users and administrators, the competition which it produced between them, and the many different local, regional, national, and eventually global contexts to which it connected them.

The development and implementation of telegraphic communication tied Germany into the Western experience of modernization, complete with its many ambiguities. Like its neighbours, Germany was subject both to the celebrated benefits of technological progress and to the disruptions caused by its onward march.[76] From the process of its development to its widespread

[76] G. Eley, J. L. Jenkins, and T. Matysik, 'Introduction: German Modernities and the Contest of Futures', in G. Eley, J. L. Jenkins, and T. Matysik (eds.), *German Modernities from Wilhelm to Weimar: A Contest of Futures* (London, 2016), pp. 1–30; Y.-S. Hong, 'Neither Singular nor Alternative: Narratives of Modernity and Welfare in Germany, 1870–1945', in ibid., pp. 31–58; G. Eley, 'What Was German Modernity and When?', in ibid., pp. 59–82.

integration, the telegraph was the product of, and a contributor to, the growing interdependence of people and places across Germany, Europe, and the globe. It lay at the heart of the connections and divisions, the excitement and frustrations, the hopes and disappointments that were to characterize modernity.

Prologue

'The value of an innovation', wrote Fernand Braudel, 'is only ever proportional to the social transformation which supports and imposes it.'[1] In many ways, indeed, the concepts and practices that came to underpin the idea of telegraphy, 'distant-writing', have their origins in the sixteenth century, when the relations between state and society in Europe were transformed and the role of exchange, communication, or the characteristically equivocal German '*Verkehr*' was re-evaluated. This was arguably the beginning of a much longer, ongoing 'communications revolution' which, as Wolfgang Behringer suggests, began with the establishment of the *Reichspost* in early modern Central Europe.[2] From that time, European society fell prey to a 'tempo virus' which encouraged the pursuit of ever more rapid forms of communication, and of which the media revolutions of the nineteenth and twentieth centuries are further symptoms.[3] It is this long-term change in the theory and reality of communication, this thick strand of continuity, that underpins the history of telegraphy.

The religious upheavals which shook Europe in the sixteenth and seventeenth centuries, and particularly the devastation inflicted upon the German-speaking lands during the Thirty Years War, altered the relationship between rulers and their subjects. With the rise of the territorial state, however contested both by contemporaries and historians, a new abstract source of power emerged whose authority was wielded over a distinct space and population. The efforts of Louis XIV in France, Elector Friedrich Wilhelm in Prussia, and Ferdinand III in Austria to subjugate the provincial sources of power which had underpinned the feudal order produced new attitudes to the management of the people and resources now under their direct authority. Where 'mercantilism' is commonly used to describe these practices in England and France, its counterpart in German-speaking Central Europe was 'cameralism'.

The coherence of cameralism in theory and practice is disputed, but its many variations during the seventeenth and eighteenth centuries reveal a widespread, underlying understanding of society and nature as distinct spheres of activity

[1] Quoted in P. Flichy, *Une histoire de la communication moderne: Espace public et vie privée* (Paris, 1991), p. 2, author's translation.

[2] W. Behringer, *Im Zeichen des Merkur: Reichspost und Kommunikationsrevolution in der Frühen Neuzeit* (Göttingen, 2003), pp. 643–88.

[3] P. Borscheid, *Das Tempo-Virus: eine Kulturgeschichte der Beschleunigung* (Frankfurt, 2004), pp. 149–79.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0002

which could be measured, regulated, and exploited by the state. From Veit von Seckendorff's *Teutscher Fürstenstaat* in 1656, to Johann Gottlob von Justi's *Staatswirthschaft* in 1758, individual writers advised rulers by describing 'ideal states' in which natural and human resources were rationally managed.[4] Their methods were increasingly taught at educational institutions, from the universities of Göttingen and Heidelberg to the mining academy in Saxon Freiberg, whence newly trained administrators were deployed to produce topographies, introduce principles of forestry, and build 'model' manufactures across Germany.[5] Landscapes, always modified to a degree by human activity, now became the object of rulers' planned attempts to colonize new spaces, supported by a burgeoning scientific knowledge that sought to uncover the mechanics of nature.[6] In short, territories and populations were rendered 'legible' for the purposes of economic exploitation.[7]

Many of Germany's principalities and cities, of course, remained immune to the encroachment of centralizing state power of the Prussian kind, protected as they were by the 'incubator' of the Holy Roman Empire.[8] Moreover, the quantity of ink spilt on the 'ordering' of states may well suggest just how disordered they were in reality.[9] Nonetheless, the wide distribution of cameralist literature, its progressive anchoring in the universities, and its implementation by numerous rulers highlight a developing ambition to describe and manage the relations between nature, society, and the state—to draw up and implement, in the words of Bruno Latour, our 'modern constitution'.[10]

Within this framework, the 'common good' or *'das allgemeine Wohl'* was used by theorists and administrators to describe the shared fate that united state and society. In the seventeenth century, Johann Joachim Becher's understanding that 'state and economy [*Wirtschaft*] constitute a single economic entity' still prevailed, but his expression also suggests that they denoted separate concepts. By the eighteenth century, the distinction between the state, as a source of power, and the set of social and economic interactions which it could seek to regulate had

[4] Cf. the discussions in P. R. Rössner (ed.), *Economic Growth and the Origins of Modern Political Economy: Economic Reasons of State, 1500–2000* (London, 2016).

[5] D. Lindenfeld, *The Practical Imagination: The German Sciences of State in the Nineteenth Century* (Chicago, 1997), pp. 11–45; G. Stavenhagen, *Geschichte der Wirtschaftstheorie* (Göttingen, 1969), pp. 15–35; P. R. Rössner, 'New Inroads into Well-Known Territory? On the Virtues of Re-Discovering Pre-Classical Political Economy', in Rössner (ed.), *Economic Growth*, pp. 3–25.

[6] D. Blackbourn, *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany* (New York, 2006), esp. pp. 21–76.

[7] J. Scott, *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, 1999), pp. 9–84.

[8] M. Walker, *German Hometowns: Community, State and General Estate, 1648–1871* (Ithaca, 1971), pp. 11–33.

[9] Andre Wakefield, *The Disordered Police State: German Cameralism as Science and Practice* (Chicago, 2009).

[10] B. Latour, *Nous n'avons jamais été modernes: essai d'anthropologie symétrique* (Paris, 1991).

become clearer.[11] *Verkehr*, or communication, meanwhile, was increasingly understood as the force behind those interactions, laying the foundations for the concept of the 'economy' as a dynamic, independent sphere of relations which would prevail in the nineteenth century.

Communication and transport, indeed, underpinned the development of the post-Westphalian territorial state, particularly in Central Europe.[12] Until the seventeenth century, the *Heerstraßen* and *Handelsstraßen* (military and trade routes) connecting the myriad cities and principalities in the region had been under the diffuse authority of the Holy Roman Empire, while smaller roads were managed by a mixture of territorial lords, communities, and private owners. The *Reichspost*, meanwhile, was run almost exclusively by the Thurn und Taxis family, to which Emperor Frederick III had granted a monopoly in 1443. After the Peace of Westphalia, however, the Elector of Brandenburg established his own *Landespost* in 1649, and others soon followed suit.[13] By the eighteenth century, a number of states had also taken on the responsibility of constructing new, paved roads.[14] Development was variegated, of course, but the principle of state involvement in the provision of communications infrastructure had been established.

For cameralist writers, roads and postal services were among the state monopolies, or *Staatsregalien*, which local princes should seek to wrest from the Holy Roman Emperor.[15] As Justi argued in the mid eighteenth century, however, roads were to be built 'not just for travellers' and their goods, but such that 'every man can enjoy sufficient security on them'.[16] The notion of communication as a general public good began to take hold, and a path-breaking '*Intention*' published in Baden declared roads to be of utility to all subjects.[17] With the post, Justi similarly argued, 'as with all monopolies', revenue was now to be only a 'secondary aim'.[18] The common weal was now placed conceptually above fiscal considerations, and '*Verkehr*' was at its heart, no longer simply understood as a set of commercial or face-to-face interactions.[19] In practice, of course, a mixture of local and central authority persisted, fees were still imposed on many roads, and the public nature

[11] Stavenhagen, *Geschichte der Wirtschaftstheorie*, pp. 15–35; Lindenfeld, *Practical Imagination,* pp. 11–45.
[12] T. Blanning, *The Pursuit of Glory: Europe, 1648–1815* (London, 2008).
[13] Behringer, *Im Zeichen des Merkur*, pp. 240–79, here p. 243.
[14] K. G. A. Jeserich, H. Pohl, and G.-C. von Unruh (eds.), *Deutsche Verwaltungsgeschichte* (5 vols., Stuttgart, 1983–8), ii., pp. 204–8.
[15] Behringer, *Im Zeichen des Merkur*, pp. 216–40.
[16] J. H. G. von Justi, *Staatswirthschaft, oder systematische Abhandlung aller Oeconomischen und Cameralwissenschaften* (2 vols., Leipzig, 1755), ii., pp. 131.
[17] Jeserich, Pohl, and von Unruh, *Deutsche Verwaltungsgeschichte*, ii., pp. 206–8.
[18] Justi, *Staatswirthschaft*, ii., p. 160.
[19] J. Ritter (ed.), *Historisches Wörterbuch der Philosophie* (13 vols., Darmstadt, 1971–2007), xi., pp. 703–4.

of roads would only be codified by the middle of the nineteenth century.[20] The relationship between state, society, '*das allgemeine Wohl*', and *Verkehr* was in flux.

The purpose of exchange and communication was being re-evaluated across Europe. In Britain, an intellectual undercurrent reaching back to Thomas Hobbes and John Locke led Adam Smith to place the individual, human propensity for exchange at the heart of his *Wealth of Nations*, published in 1774. In France, the physiocrats called for the removal of barriers to the exchange of goods within a territory—'laissez-faire' policies were increasingly seen as a source of wealth. In Germany, by the 1790s Johann Heinrich Jung-Stilling saw private economy as a sector independent of, and prior to, public policy, and thus worthy of independent study. The 'common good', he believed, derived from the needs of individuals.[21] As Armand Mattelart has argued, the modern meaning of 'communication' derived from these widespread efforts to conceptualize the relationship between individuals, societies, and exchange.[22]

By the late 1700s, *Verkehr* was thus widely viewed as a social and economic force, but one understood as maintaining stability and equilibrium. Adam Smith himself had believed in a 'balance' of trade between nations, and the French physiocrats asserted that an '*ordre naturel*' underpinned exchanges within society. In Germany, the great classifier Johann Beckmann still relied upon a mechanistic metaphor to describe the ideal state, a system regulated by the smooth dovetailing of its cogs, but which left little room for dynamism or growth.[23] Early modern science, too, had come to focus on the forces underpinning the mechanisms that hold the universe together and which, as Newton's work in particular had suggested, could be measured. The nature and number of those forces were contested, as the properties of light, heat, gravity, magnetism, electricity, and a putative 'ether' were progressively uncovered, but at the very least mathematical laws, rather than arbitrary divine providence, now appeared to guarantee a natural order.[24]

Indeed, the European 'landscape of innovation' was itself undergoing transformation. On the one hand, the cameralists' interest in manufacturing and agriculture had led to the collection, dissemination, and discussion of production techniques which Johann Beckmann proposed in 1777 to subsume under the umbrella term of '*Technologie*'.[25] The knowledge and methods identified by Beckmann, Justi, and others were taught as part of the *Cameralwissenschaften*, the means of managing the state, in universities such as Göttingen, whose example

[20] Jeserich, Pohl, and von Unruh, *Deutsche Verwaltungsgeschichte*, ii., pp. 218–19.
[21] Lindenfeld, *Practical Imagination*, pp. 34–6.
[22] A. Mattelart, *L'invention de la communication* (Paris, 2011).
[23] Lindenfeld, *Practical Imagination*, p. 28.
[24] J. Gascoigne, 'Ideas of Nature', in *The Cambridge History of Science: vol. 4, The Eighteenth Century*, ed. R. Porter (Cambridge, 2003), pp. 285–304; R. W. Home, 'Mechanics and Experimental Physics', in ibid., pp. 354–74.
[25] Lindenfeld, *Practical Imagination*, p. 32.

was followed in many other places into the early nineteenth century. During the early 1800s, for instance, the great Bavarian reformer Maximilian von Montgelas introduced the subject to the universities of Ingolstadt (later Landshut) and then Würzburg. *Technologie* had received institutional recognition.[26]

On the other hand, the practice of rational, empirical research upon which 'modern science' came to depend had become detached from its own institutional contexts. Eighteenth-century universities provided neither an expectation of, nor incentives for, research. The philosophical faculties in which mathematics and *Naturwissenschaften* were taught constituted a mere preparation for the higher faculties, particularly that of medicine. Instead, since the mid seventeenth century, empirical research and discussion had revolved around the numerous European academies or societies of science. In Germany, the academies in Berlin, Munich, and Göttingen featured prominently as forums for the 'Republic of Letters' in which science was often a central topic of exchange. By the latter decades of the eighteenth century, however, these academies were in decline and were dealt a harsh blow by the disruptions of the French Revolution.[27] Academies and researchers lived on in Germany, but the knowledge they produced was no longer anchored in their institutions.

From the late eighteenth century, therefore, both scientific knowledge and technical know-how began to circulate more freely across society, supported by a booming journal culture.[28] Government efforts to improve agriculture and manufacture were matched by the appearance of numerous 'patriotic' or 'economic' societies throughout Germany.[29] Reflecting trends in Enlightenment sociability, their members included nobles, merchants, tradesmen, and state officials who came together, often upon a private initiative, to discuss improvements to agriculture and manufacturing in their town or region. Following the example set in England, the *Gesellschaft zur Beförderung der Künste und nützlichen Gewerbe* was established in Hamburg in 1765, and similar societies emerged in Karlsruhe and Neuötting-Burghausen in provincial Bavaria in the 1760s, Lübeck in 1788–9, Nuremberg in 1792, and soon they could be found across Germany.

Across these old and new sites of knowledge production, there was growing interest in the little-understood force of 'electricity', whose effects were being publicly demonstrated in spectacular fashion to delighted crowds across

[26] Lindenfeld, *Practical Imagination*, p. 52.

[27] J. McClellan, *Science Reorganized: Scientific Societies in the Eighteenth Century* (New York, 1985), pp. 233–59.

[28] D. Phillips, *Acolytes of Nature: Defining Natural Science in Germany, 1770–1850* (Chicago, 2012).

[29] H. Lowood, *Patriotism, Profit and the Promotion of Science in the German Enlightenment: The Economic and Scientific Societies, 1760–1815* (New York, 1991); H. E. Bödeker, 'Economic Societies in Germany, 1760-1820: Organisation, Social Structures and Fields of Activities', in K. Stapelbroek and J. Marjanen (eds.), *The Rise of Economic Societies in the Eighteenth Century* (Basingstoke, 2012), pp. 182–211.

Europe.[30] The electrostatic phenomenon produced by friction had been observed for millennia, but only since the 1600s had natural philosophers distinguished its effects from those of magnetism and begun to unravel its various properties. By the eighteenth century, this 'imponderable fluid' appeared not only to emanate from objects but to be implicated in a variety of natural phenomena, suggesting potential applications. Its powers of attraction were known, but Benjamin Franklin also detected its operations in lightning, while 'conductors' and 'insulators' were identified, its connection to heat was established, and Luigi Galvani suggested that its presence in animals was the source of nervous activity; even the mathematical laws describing the effects of this force had been established, based on their analogy with Newton's laws. Indeed, the ubiquity of electricity led some German proponents of *Naturphilosophie* to suggest that it manifested the intrinsic, vital link between force and matter.[31] Alessandro Volta's construction of a 'pile' in 1799, eagerly discussed in academies and journals across Europe, then finally provided a reliable, constant source of electricity that could be isolated, used, and investigated, in what emerged as the discipline of physics.[32]

* * *

The upheavals of the early nineteenth century shook, but did not disrupt, this line of continuity. The Napoleonic Wars and the collapse of the Holy Roman Empire in 1803 produced new states and stimulated reforms across Germany, as ruling dynasties sought to unify their territories under the increasingly politically salient idea of 'the nation'. The importance of communication, or *Verkehr*, remained central to the perceived relationship between state and society, and pre-existing policies were pursued with a view to aligning and reconciling the two. In Prussia, the construction of roads, which had been somewhat neglected by Frederick the Great, was re-launched.[33] The monopoly of states such as Bavaria over postal services was officially sanctioned, and these became a major source of revenue.[34] The road- and canal-building projects to link the Rhine, Main, and Danube in Bavaria became a symbol of the Wittelsbach dynasty's benevolence towards all its subjects, new and old.[35] The 'taming of the Rhine' by Johann Gottfried Tulla,

[30] P. Bertucci, 'Domestic Spectacles: Electrical Instruments between Business and Conversation', in B. Bensaude-Vincent and C. Blondel (eds.), *Science and Spectacle in the European Enlightenment* (Burlington, 2008), pp. 75–88; O. Hochadel, 'The Sale of Shocks and Sparks: Itinerant Electricians in the German Enlightenment', in Ibid., pp. 89–102.

[31] Cf. R. Richards, *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe* (Chicago, 2002).

[32] J. Heilbron, *Elements of Early Modern Physics* (Berkeley, 1982), pp. 159–240; G. Pancaldi, *Volta: Science and Culture in the Age of the Enlightenment* (Princeton, 2003).

[33] Jeserich, Pohl, and von Unruh, *Deutsche Verwaltungsgeschichte*, ii., pp. 206.

[34] K. Amtmann, *Post und Politik in Bayern von 1808 bis 1850: Der Weg der königlich-bayerischen Staatspost in den Deutsch-Österreichischen Postverein* (Munich, 2006), pp. 230–44.

[35] N. Mayr, 'Particularism in Bavaria: State Policy and Public Sentiment, 1806–1906' (PhD Thesis, University of North Carolina, 1988), p. 85.

begun in the cameralist spirit, now became an instrument of state-building for the newly formed Grand Duchy of Baden.[36]

In conceptual terms, the role of *Verkehr* as an economic force in society began its emancipation from the state-centred theories of the cameralist era. On the one hand, the fundamental principles of a 'classical' economics derived from Adam Smith's work were slowly incorporated by German writers. Supported by the diffusion of natural law theory and Kantian philosophy, the individual was increasingly placed at the heart of economic thought. Works such as J. F. E. Lotz's *Der Verkehrende Mensch* (1821) and Heinrich Rau's *Lehrbuch der politischen Ökonomie* placed the satisfaction of human needs and desires at the core of a new German style of *Nationalökonomie,* and *Verkehr* between individuals became the principle means by which this was achieved.[37]

On the other hand, the universalism associated with natural law and Smithian economics, and the emphasis which these placed upon the autonomous realm of social interaction, clashed with prevailing notions regarding the primacy of the state. The most radical rejection of these theories came from Adam Müller, who believed that 'Man is inconceivable outside the state', and laid the foundations for a historical, organic conception of state and society which has come to be seen as characteristically German.[38] Müller's ideas were only truly influential much later in the century, however, and for the most part a tension prevailed into the 1840s between free economic interaction among individuals and the higher purposes of the state. As David Lindenfeld has argued, the works of Hegel, Friedrich List, and Robert von Mohl display a tension in their efforts to merge the desire for order inherited from their cameralist predecessors, on the one hand, and their acknowledgment of the self-propelling dynamism of society on the other.[39]

This heritage of ideas concerning the function of communication and exchange substantially informed the intellectuals, parliamentary deputies, and state officials who began to consider the possibility of telegraphy in the early nineteenth century. In some respects, the technology could be considered analogous to the roads, railways, and waterways that had long been under development, but it also differed from them in important ways. Once telegraph networks came into operation across Germany, revealing its technological peculiarities and limitations, it would change their understanding of communication itself.

Scientific and technical knowledge, meanwhile, continued to circulate increasingly broadly during these decades. Reforms intended to introduce more rigorous research practices to universities were implemented by Wilhelm von Humboldt in the early nineteenth century, but their effects were slow to spread to the natural

[36] Blackbourn, *Conquest of Nature*, p. 94.
[37] K. Tribe, *Governing Economy: The Reformation of German Economic Discourse, 1750–1840* (Cambridge, 1988), pp. 149–201.
[38] Tribe, *Governing Economy*, p. 175. [39] Lindenfeld, *Practical imagination*, p. 93.

sciences. Only by the 1840s would the discipline of physics gain a firm foothold in universities. And so, discussions of electricity, or 'galvanism', continued to take place in a variety of settings, as the focus shifted to understanding the interconvertibility of the many different forces identified in the eighteenth century, a process that would culminate in the 1850s in the elaboration of 'energy' as a unifying concept.[40]

Of crucial importance, in this regard, were the connections which Hans Christian Oersted and Michael Faraday established between electricity and magnetism, in the 1820s and 1830s. Their work by no means resolved the question of the nature of electricity, but it enabled the production of electricity by induction and the closer observation and manipulation of electrical phenomena. By the 1830s, indeed, their theories were primarily being applied to the transmission of signals through soon-to-be 'telegraphic' wires, the results then feeding back into understandings of electricity throughout the century, establishing a mutually sustaining alliance between science and technology that would characterize the nineteenth century.[41]

Related investigations were taking place both within and outside academies and universities. Georg Ohm, for instance, published a groundbreaking theory in 1827 establishing the role of resistance in electrical circuits that was to be essential in the transmission of signals over long distances. Yet Ohm was unable to find permanent employment at a research institution. After leaving Cologne, he taught at the *Vereinigte Artillerie- und Ingenieur-Schule* in Berlin, and unsuccessfully applied for a position at the Bavarian *Akademie der Wissenschaften*, whose director, Friedrich Wilhelm Joseph Schelling, was a key proponent of *Naturphilosophie* and little inclined to appreciate the kind of mathematical 'abstractions' proposed by Ohm. Instead, the physicist found himself teaching at the Nuremberg *Polytechnische Schule* during the 1830s.[42] Academies, societies, and peripatetic professors were thus just as crucial as Germany's decentralized university system in disseminating ideas.[43] Key figures in this book, such as Wilhelm Weber and Carl Steinheil, taught and researched in a variety of institutions, from the military schools of Berlin to the *Gymnasien*, *Polytechnische Schulen*, universities, and academies spread out across Germany.

Alongside the natural sciences, *Technologie* was now disseminated through a widening array of institutions. Drawing on the example of the French *Ecole des Ponts et Chaussées*, the *General-Wegbau-Intendance* established in Hanover in

[40] P. Harman, *The Conceptual Development of Nineteenth-Century Physics* (Cambridge, 1982).

[41] B. Hunt, *Pursuing Power and Light: Technology and Physics from James Watt to Albert Einstein* (Baltimore, 2010).

[42] C. Jungnickel and R. McCormmach, *Intellectual Mastery of Nature: Theoretical Physics from Ohm to Einstein* (2 vols., Chicago, 1986), i., pp. 52–8.

[43] J. Ben-David, *The Scientist's Role in Society: A Comparative Study* (Englewood Cliffs, 1971), pp. 108–38.

1764 and the *Bauakademie* founded in Berlin in 1799 had begun to train state engineers.[44] Beginning in 1821, Christian Peter Wilhelm Beuth then established twenty new *Gewerbeschulen* in Prussia, whose students were trained in a number of trades, and some of whom then attended the *Gewerbe-Institut* established in Berlin.[45] Outside Prussia too, similar considerations led to the establishment of *Polytechnische Schulen* in Karlsruhe (1825) and Hanover (1831), for instance.[46] Even 'backward' Bavaria sought to stimulate new methods of production, and the *Polytechnische Centralschule* founded in Munich in 1827 spawned similar institutions in Augsburg and Nuremberg.[47]

In parallel, the heritage of Enlightenment economic and patriotic societies fed into the 'polytechnical societies' created in the nineteenth century. These societies varied from state to state but all brought together individuals from a broad cross section of society to share their interest in science and technology. The most famous was the *Verein zur Förderung des Gewerbfleißes in Preußen*, established under the aegis of Beuth in Berlin, but other, more independent associations existed there too, such as the *Polytechnische Gesellschaft* established by J. C. Freund and Nathan Mendelssohn, a lesser-known son of the great German Jewish philosopher Moses Mendelssohn.[48] Similar associations were to be found across Germany, even in the Bavarian '*Agriculturstaat*', where a private initiative led to the founding of the *Polytechnische Gesellschaft* in Würzburg and an *Industrie- und Kulturverein* in Nuremberg, a burgeoning manufacturing centre.[49] The Munich *Polytechnischer Verein* was established in 1816, and its journal advertised literature on a variety of subjects including, of course, 'electromagnetism, electricity, galvanism'.[50] The association also effectively acted as a patent office, assessing the utility of new inventions on behalf of the government—a reminder that the state too participated in this circulation of knowledge.[51]

The term 'polytechnic' itself highlights the importance placed on the broad scope of issues discussed in these societies. They often brought together craftsmen and manufacturers, with chemists (*Apotheker*) and even some professors, and provided social connections and training for the many tradesmen, or *Handwerker*, suffering from the competitive labour market that resulted from the progressive removal of guild regulations—they laid the groundwork for the professional associations which proliferated from mid-century. The societies also fuelled the

[44] L. U. Scholl, *Ingenieure in der Frühindustrialisierung: staatliche und private Techniker im Königreich Hannover und an der Ruhr (1815–1873)* (Göttingen, 1978), pp. 55–64; P. Lundgreen, *Techniker in Preussen während der frühen Industrialisierung: Ausbildung und Berufsfeld einer entstehenden sozialen Gruppe* (Berlin, 1975), p. 12.

[45] Lundgreen, *Techniker in Preussen*, pp. 45–54.

[46] Scholl, *Ingenieure*, pp. 245–6.

[47] Boehm, 'Das akademische Bildungswesen', p. 1025.

[48] I. Mieck, *Preussische Gewerbepolitik in Berlin, 1806–1844* (Berlin, 1965), pp. 36, 162.

[49] S. Fisch, 'Polytechnische Vereine im "Agriculturstaat" Bayern bis 1850', *ZBLG*, 49 (1986), pp. 539–78.

[50] *KGB* (1829), p. 236.

[51] D. E. Thomas, 'Der Polytechnische Verein in Bayern (1816–1933)', *ZBLG*, 64 (2001), pp. 431–60.

emerging culture of industrial exhibitions through which ideas about technology were diffused. In 1809, the Würzburg *Polytechnische Gesellschaft* held what was quite possibly the first German '*Kunst- und Industrie-Ausstellung*', which was followed by many more across Germany—most notably that organized by Beuth's *Verein* in Berlin in 1822.[52]

While exhibitions only slowly took on supralocal dimensions, new publications simultaneously emerged which circulated ideas and innovations throughout Germany and beyond. *Dinglers Polytechnisches Journal* was founded in 1820 in Augsburg for this very purpose and became a key channel for British and French ideas to enter the German states. From the outset it reported, among other things, on developments in the 'theory of galvanism'.[53] Journals were simultaneously replacing textbooks as the principal means of communicating research among academics, and *Poggendorffs Annalen der Physik und Chemie*, for instance, developed into the principal organ for the discussion of physics and electricity.[54] There was considerable crossover between the two forms of journal too. *Dinglers*, for instance, regularly translated and published material from academic publications, while an entrepreneur such as Werner Siemens, though trained as an artilleryman, was no stranger to the *Annalen der Physik*.[55] Scientific research and practical know-how frequently overlapped.

The actors who feature most prominently in the first three chapters of this book were all located at different sites in this broad landscape of innovation during the 1830s and 1840s. From Carl Friedrich Gauβ in Göttingen to Carl Steinheil in Munich or Johan Schmidt in Bremen, from Werner Siemens in Berlin to Rhenish railway companies and Bavarian state bureaucrats, all approached telegraphy from different angles but came to depend upon the resources which each could provide and a common fund of knowledge circulating between them. The new connections which could be forged between such diverse institutions and social actors reflected the dynamism of a world in transition. Their interactions and exchanges enabled new combinations of forces which produced the achievements and disappointments, the hopes and frustrations of the incipient modern age.

[52] Fisch, 'Polytechnische Vereine', p. 543; Mieck, *Preussische Gewerbepolitik*, pp. 141–9.
[53] 'Theorie des Galvanismus', *DPJ*, vol. 34, no. 59 (1829), p. 232.
[54] Jungnickel and McCormmach, *Intellectual Mastery*, p. 37.
[55] H. Pieper, 'Werner von Siemens und die elektrotechnische Fachliteratur bis 1872', *Technikgeschichte*, 34 (1967), pp. 323–49.

PART I

1830–1849

1
Expectations

'The speed at which the telegraph transmits information borders on the incredible,' the political scientist Robert von Mohl remarked in 1832.[1] His colleague, Johann Heinrich Moritz Poppe, a professor of *Technologie* at the University of Tübingen, agreed: 'foremost among the many subjects which presently excite the public's interest to a high degree', he wrote in 1834, 'are the railways and the telegraph, which one can also indisputably count among the most remarkable inventions of recent times.'[2] Three years later, in an essay submitted for a competition at the French Academy of Sciences, Friedrich List similarly described the telegraph as 'one of the most important discoveries of the human genius. It proves how much nature strives to unite and to bring humanity closer together, and the degree to which it is possible for man to overcome the obstacle which distances pose to nature's aims.'[3] Speed, human ingenuity, public interest, excitement, and the conquest of distance—these were the terms of a now familiar nineteenth-century discourse of technological progress celebrating the steam engines, railways, and telegraphs that launched the communications revolution.

Yet Mohl, Poppe, and List were not referring to the electric telegraph but rather to its more modest predecessor, the optical, or signal, telegraph.[4] Their enthusiasm towards what was soon to be considered an obsolete technology testifies to a much deeper and long-standing social interest in different means of communication, and the relativity of speed and progress as concepts. In the sixteenth and seventeenth centuries, for instance, contemporaries had already marvelled at the speed of the 'flying courier' and postriders of Kurbrandenburg.[5] The novelty of inventions, indeed, all too often obscures the profound and enduring influence of earlier

[1] R. v. Mohl, *Die Polizei-Wissenschaft nach den Grundsätzen des Rechtsstaates* (2 vols., Tübingen, 1832–3), ii., p. 395.

[2] J. H. M. Poppe, *Die Telegraphen und Eisenbahnen* (Stuttgart, 1834).

[3] F. List, *Die Welt bewegt sich. Über die Auswirkungen der Dampfkraft und der neuen Transportmittel*…, ed. Eugen Wendler (Göttingen, 1985), p. 156.

[4] There is some uncertainty as to whether or not Friedrich List may indeed have known about or foreseen the development of the electric telegraph: Cf. E. Wendler, *Friedrich List (1789–1846): A Visionary with Social Responsibility* (Berlin, 2015), p. 194. Given his interest in the construction of the Leipzig–Dresden railway, whose board of directors briefly considered trialling the new technology in the 1830s, it is possible that he had this in mind. As the text in question was addressed to the French Academy, however, it is likely that he was describing the optical telegraph which was best known in Europe at the time. See below.

[5] W. Behringer, *Im Zeichen des Merkur: Reichspost und Kommunikationsrevolution in der Frühen Neuzeit* (Göttingen, 2003), pp. 644–5.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0003

technologies, and while the optical telegraph was soon to disappear from the European landscape, in its time it had stimulated and enriched discussions on the implications of long-distance communication for the state and society.[6]

As historians of technology and scholars of media studies now emphasize, modern innovations do not spring fully formed from the mind of a few pioneers. They are shaped by the culture in which they emerge, they are 'co-constructed' by myriad actors, including their users.[7] By the 1830s, the idea of 'telegraphy' had stimulated widespread expectations regarding the future of long-distance communication. Reading from the broadly circulating literature on the topic, intellectuals, scientists, technicians, bureaucrats, and businessmen alike discovered a horizon of possibilities for developing and applying the technology, encouraging them to contribute the knowledge, logistical support, and financial investment upon which it would depend. Expectations thus attracted all manner of 'producers' and, later, consumers to the electric telegraph; they fostered the characteristic blend of rational and irrational motivations which led individuals to take a leap of faith and devote their intellectual energy, administrative resources, and of course their money, to its development.[8]

The terms in which the promise of telegraphic communication was couched were sufficiently broad and ambitious as to draw together a large cast of actors. It was a belief in the possibilities rather than the realities of instantaneous long-distance communication which thereby enrolled the people and resources necessary to its materialization. Each one of the actors in question then drew upon the fluid concept of 'telegraphy' and gave it new qualities, envisioned its different purposes, and proposed ways of bringing it to life. This malleable concept, or 'boundary object', provided a common focal point around which the actors could negotiate their interest in the matter.[9]

For while the ultimate objective of instant interpersonal communication lay distant on the horizon, the path that led there meandered through stages of technological experimentation and logistical planning. It is precisely this growing

[6] D. Edgerton, *The Shock of the Old: Technology and Global History Since 1900* (Oxford, 2007).

[7] See, for example, M. Sturken, D. Thomas, and S. Ball-Rokeach (eds.), *Technological Visions: The Hopes and Fears That Shape Technologies* (Philadelphia, 2004); N. Oudshoorn and T. Pinch (eds.), *How Users Matter: The Co-Construction of Users and Technology* (Cambridge, Mass., 2005).

[8] The power of expectation as a socio-economic force was recognized in the 1960s by the proponents of an emerging field of behavioural economics. In the 1970s, Nathan Rosenberg applied the idea to the study of technological innovations, to help explain irregularities in schematic models of their adoption and diffusion, of the kind proposed by Everett Rogers: N. Rosenberg, *Inside the Black Box: Technology and Economics* (Cambridge, 1982); E. Rogers, *Diffusion of Innovations* (New York, 1962). The function of 'irrational' motivations in attracting contributors to the production process itself has since come under closer scrutiny. See, for example, M. Borup, N. Brown, K. Konrad, and H. van Lente, 'The Sociology of Expectations in Science and Technology', *Technology Analysis and Strategic Management*, 18, nos. 3 and 4 (July-Sept. 2006), pp. 285–98.

[9] S. L. Star and J. R. Griesemer, 'Institutional Ecology, "Translations", and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39', *Social Studies of Science*, vol. 19, no. 3 (Aug. 1989), pp. 387–420.

gulf between individuals' immediate 'space of experience' and the horizon of rapidly advancing expectations that has made modern scientific and technological progress an increasingly large-scale collaborative enterprise.[10] As the 1830s wore on, scientists, technicians, bureaucrats, and businessmen were forced to shift their focus away from their long-term ambitions, recognizing their dependence upon the material or intellectual resources of others. Confronting the different interests which coalesced around the telegraph, their expectations often turned into frustration.

1.1 The Horizon of Telegraphic Communication

In line with a persisting trend in the historiography of Germany, we might expect to place the state at the heart of the electric telegraph's development.[11] While railway networks were characterized by a complex mixture of private and public ownership across Europe throughout the nineteenth century, from the 1830s to the 1860s telegraph lines were almost universally state-owned, with the exception of the haven of private enterprise that was the United Kingdom.[12] In France, the state's monopoly over the construction and—initially—use of telegraph networks was enshrined in a law of 1837, and a similar stance was eventually adopted throughout most of Germany. The state, therefore, was undeniably to loom large in the technology's history. But it should not overshadow the broader context in which ministers and bureaucrats operated, dependent as they were upon the knowledge and resources of an international array of scientists, entrepreneurs, and intellectuals.[13]

By the 1830s, a variety of optical telegraph systems had been established across Europe, fuelling ongoing discussions on the function and means of communication in state and society. Semaphores and signalling systems of various kinds have been recorded throughout history, but it was in the 1790s that the Frenchman Claude Chappe developed the simple mechanical contraption that would be adapted and implemented in a number of countries. His optical telegraph consisted of three connected slats of wood, mounted atop any small building or

[10] R. Koselleck, '"Erfahrungsraum" und "Erwartungshorizont" – zwei historische Kategorien', in R. Koselleck, *Vergangene Zukunft. Zur Semantik geschichtlicher Zeiten*, 4th edn. (Frankfurt am Main, 2000), pp. 349–75.

[11] J. Reindl, *Der Deutsch-Österreichische Telegraphenverein und die Entwicklung des deutschen Telegraphenwesens, 1850–1871* (Frankfurt am Main, 1993); H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland und die rheinische Industrie: von den Anfängen bis zum Ausbruch des Ersten Weltkrieges* (Wiesbaden, 1983), pp. 15–244.

[12] R. Millward, *Private and Public Enterprise in Europe: Energy, Telecommunications and Transport, 1830–1990* (Cambridge, 2005).

[13] Horst A. Wessel does, however, consider the different companies involved in the production of the materials for the states' telegraph lines: see Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens*, esp. pp. 207–44.

structure at an elevated point in the landscape, which could be articulated from within an office established beneath it. Telegraphists operated the machine to form certain prescribed symbols, which were observed by telescope at the next station, then relayed onwards to the message's destination.

Chappe was by no means the first to propose such a system, but in 1793 the French *Convention nationale* granted him 6,000 francs to establish an experimental line in the Île-de-France region. The following year, the foundations were laid for an extensive national network of optical telegraph stations centred on Paris, which was to be expanded during the revolutionary and Napoleonic wars, and eventually reached as far as Venice and the Spanish border.[14] This period of international turmoil also prompted a number of other European governments to follow the French example. In Sweden, a first line had been constructed as early as 1794, and the threat of war with Russia in 1808 led the government to develop its own network. From 1797 to 1808, the Admiralty in Britain established telegraphic connections between London and the country's principal ports.[15] In Spain, a line was established between Madrid and Aranjuez in 1800, and a small military network centred on Cadiz was in operation until 1820.[16]

Across much of Europe, however, the optical telegraph fell into disuse upon the return of peace, and only in France was a large functional network maintained throughout the early nineteenth century. Efforts were being made in parallel to exploit electricity as a means of transmission, though few proved viable. Some, such as Francis Ronalds's in Britain, still used electrostatics, but many now exploited the various interactions of electricity with other forces. In Bavaria, possibly at the request of the military authorities that had witnessed the efficiency of Napoleon's optical network, in 1809 Samuel Thomas Sömmerring designed an apparatus using a voltaic pile to produce bubbles in a liquid by electrolysis. Paul Schilling, an attaché at the Russian embassy in Munich who had assisted Sömmerring in his work, turned instead to Oersted's work on the relationship between electricity and magnetism, and by the early 1830s had designed an apparatus which produced signals by deflecting a needle. Others across Europe and North America were playing with the same ideas, but few were immediately practicable.[17] When merchants in British and American coastal towns implemented telegraph lines to obtain timely updates on the incomings and outgoings

[14] C. Bertho, *Télégraphes et téléphones: De Valmy au microprocesseur* (Paris, 1981), pp. 10–23; on the optical telegraph in northern Italy during this period, see C. Fedele, 'Il telegrafo ottico alla sua prima apparizione in Italia', *Memorie dell'Accademia Italiana di Studi Filatelici e Numismatici*, vol. 5, no. 3 (1994), pp. 7–14.

[15] Bertho, *Télégraphes et téléphones*, pp. 55–8; On the optical telegraph in Sweden, see *Svenska Telegrafverket: en historisk framställning, utgiven enligt beslut av Kungl. Telegrafstyrelsen*, vol. 3, *Den optiska telegrafens historia i Sverige, 1794–1881*, ed. N. J. A. Risberg (7 vols., Stockholm, 1931–97); cf. also K. V. Tahvanainen, *Ord i Sikte: Den optiska telegrafen i Sverige, 1794–1881* (Stockholm, 1994).

[16] L. E. Otero Carvajal, 'La evolución del telégrafo en España', in *Las communicaciones en la construcción del Estado contemporáneo en España, 1700–1936* (Madrid, 1993), pp. 123–88.

[17] Beauchamp, *History of Telegraphy*, pp. 20–47.

of ships, it was to the tried and tested optical system that they turned. The 1830s, in fact, witnessed a new impulse to build a number of semaphoric telegraphs, including in Spain, Sweden, and Russia, as well as a particularly ambitious line in Prussia between Berlin, Koblenz, and Cologne in 1832.[18]

There is no doubt that military and political motivations lay behind the Prussian initiative. The line had clear strategic implications, serving to connect the state's heartland in Brandenburg to its discontiguous Westphalian provinces.[19] And it has been argued that similar state interests shaped attitudes to both optical and electrical telegraphy across Germany through to the mid nineteenth century. According to Michael Wobring, despite the numerous economic motivations for improving telecommunications, these played no determining role in their development.[20] A number of texts written between 1790 and 1840 certainly confirm that one of the principal motivations in developing telegraph networks was to promote territorial integration, but these tend to concern Prussia, and the picture is more complex once the lens is retracted to consider a much larger section of Germany and a wider array of sources.[21]

The potential utility of optical-telegraph networks was discussed well beyond the confines of military and ministerial quarters. As early as 1794, an 'eyewitness account' published in Germany had reported on the new Chappe telegraph system introduced in France: 'One is so convinced of the multifaceted utility of the telegraphs for the government and for commerce here, and so convinced of its almost instantaneous dissemination of information, that the Convention nationale has decided to construct telegraphs to all areas of the empire (*Reich*) [*sic*].'[22] Shortly thereafter, a review of this book published in *Minerva*, in Hamburg, bemoaned the fact that, while 'the now so famous machine, . . . is being used by the French, other nations investigate whether the invention is new or old'.[23] In Hamburg itself, the long-established *Gesellschaft zur Beförderung der Künste und nützlichen Gewerbe* received a request that such a line be built to provide local businessmen with news from the city's port in Cuxhaven.[24]

[18] V. Aschoff, *Geschichte der Nachrichtentechnik*, p. 81.

[19] K. Beyrer, 'Die optischen Telegraphie als Beginn der modernen Telekommunikation', in C. Neutsch and H.-J. Teuteberg (eds.), *Vom Flügeltelegraphen zum Internet: Geschichte der modernen Telekommunikation* (Stuttgart, 1998), esp. pp. 19–26; cf. also K. Beyrer and B.-S. Mathis (eds.), *So weit das Auge reicht: Die Geschichte der optischen Telegraphie* (Karlsruhe, 1995).

[20] M. Wobring, *Die Globalisierung der Telekommunikation im 19. Jahrhundert: Pläne, Projekte und Kapazitätsausbauten zwischen Wirtschaft und Politik* (Frankfurt am Main, 2005), pp. 93–140.

[21] M. Wobring, 'Telekommunikation und Nationsbildung: Die politischen Konzepte früher Deutscher Telegrafenplanung vom Ausgehenden 18. Jahrhundert bis zur Paulskirche', *Technikgeschichte*, 71 (2004), pp. 201–22.

[22] *Beschreibung und Abbildung des Telegraphen oder der neuerfundenen Fernschreibemaschine zu Paris* (Leipzig, 1794), pp. 13–14.

[23] *Minerva: Ein Journal historischen und politischen Inhalts*, 4, no. 4 (1794), p. 383.

[24] *Hanseatisches Magazin*, 2 (1799), p. 299.

From the outset, the telegraph was thus geared to commercial, as well as state, interests. In 1810, Heinrich von Kleist published a short satirical piece in the *Berliner Abendblätter*, entitled '*Entwurf einer Bombenpost*'. As useful as the recent proposals for an electric telegraph might seem, he wrote, they would not allow individuals to transmit messages of considerable length, making them 'little suited to the interests of the merchant'. To that particular end, therefore, he suggested that an artillery-powered message delivery system might be introduced, firing cannonballs filled with 'letters, reports, attachments and packages' to the desired correspondent.[25] 'A short mathematical calculation', he added sarcastically, would demonstrate that the proposed 'cannonball-post' could facilitate communication between Berlin and Stettin or Breslau. As such, it was 'an invention of the greatest and most decisive weight' in equal measure for 'the bourgeois (*das bürgerliche*) as well as commercial public'.[26]

Whether or not the telegraph was indeed, as Johann Poppe claimed, 'foremost among the many subjects which presently excite the public's interest to a high degree', by the 1830s it had certainly become embedded in different spheres of intellectual and cultural life. The market for 'popular science' textbooks was only beginning to emerge at the time, but there was space to subtly captivate people's imagination in other ways.[27] Kleist's early interest in the technology, for instance, was matched in later years by Goethe's, who evoked in *Wilhelm Meisters Wanderjahre* the capacity for 'the telegraphs constructed in our country, when they are not otherwise damaged, [to] mark the passage of the hours by day and by night, by a very ingenious construction'.[28] Newspapers, meanwhile, were peppered with references to the fact that 'one often sees the telegraph in movement' at times of political instability, or that a published report was incomplete because 'at this point, the telegraph was interrupted by the [fall of] night'.[29] The notion that the optical network was circulating information across Germany was thus by no means alien to the reading population. In 1823 the Bavarian *Kunst- und Gewerbe-Blatt* listed the French telegraph network's average transmission times, and by 1831 the performance of a new steam engine was being measured against the ideal of 'telegraphic speed'.[30]

[25] Heinrich v. Kleist, 'Entwurf einer Bombenpost', *Berliner Abendblätter*, 12 Oct. 1810.

[26] Ibid.

[27] A. Daum, *Wissenschaftspopularisierung im 19. Jahrhundert: Bürgerliche Kultur, naturwissenschaftliche Bildung, und die deutsche Öffentlichkeit, 1848–1914* (Munich, 1998), pp. 236–79; on some of the means of diffusing popular science beyond privileged circles, see J. M. Brophy, *Popular Culture and the Public Sphere in the Rhineland, 1800–1850* (Cambridge, 2007), pp. 18–53.

[28] *Goethes Sämmtliche Werke*, ed. K. Goedeke (36 vols., Stuttgart, 1893–6) xviii, 404; Cf. also F. Haase, *Kleists Nachrichtentechnik: Eine diskursanalytische Untersuchung* (Opladen, 1986), pp. 162–74.

[29] *Allgemeine Zeitung München*, 22 May 1836, 27 Aug. 1837.

[30] 'Schnelligkeit der Mittheilungen durch Telegraph', *KGB*, 9 (1823), p. 116; J. Baader, 'Anzeige einer neuerfundenen Bauart von Eisenbahnen', *D[inglers] P[olytechnisches] J[ournal]*, vol. 41, no. 1 (1831), p. 19.

This widespread awareness of the possibilities and applications of telegraphy formed the context in which writers such as Johann Poppe, Robert von Mohl, and Friedrich List set out their expectations for the technology. In his *Polizei-Wissenschaft* (1833), Mohl placed considerable weight upon the development of trade, which he believed depended upon 'the rapid transmission of information'.[31] The state, he wrote, had already contributed significantly to the provision of such preconditions by developing roads and a postal service—these were the means of communication which had fallen within its purview over the course of the seventeenth and eighteenth centuries. '[B]ut there is yet another means', he continued, 'which is in a position to transmit information at a much greater speed, namely the telegraph.'[32]

Governments, Mohl recognized, had expressed their misgivings towards the erection of private telegraph lines. To allow these, they feared, would threaten the 'head start' (*Vorsprung*) which the organs of the state should possess over society. In other words, by granting individuals the right to build and use telegraph lines governments would lose their advantage in the dissemination of information. 'Yet why should the speed of the spread of news be feared for its impact on the peace of the state?' Mohl asked.[33] States which introduced a telegraph network, he pointed out, would be in no worse a position than those which possessed none at all.

Mohl's work reflected the ongoing shift in conceptions of the relationship between state and society. His text, as its title indicated, addressed issues which fell within the conventional remit of the *Staatswissenschaften*, or sciences of the state. The book's very first chapter dealt with the 'Concept and Purpose of the State in General'—these were the focus of his attention.[34] As he recognized, however, administering the state now involved accounting for the force of communication between its subjects or citizens, for the relatively self-driven nature of the economy.[35] He noted, for instance, that the speed of existing postal services and of news distribution had already limited any 'advance' which the state might possess over the public sphere. He conceded that certain restrictions might justifiably be imposed upon telegraphic communication, where it threatened to interfere with the government's own activities. '[U]ntil now only governments have established such institutions for their own purposes . . . ', he concluded on this subject, but 'the use of the telegraph by private persons, namely by merchants . . . seems as permissible as it is desirable'.[36]

An anonymous publication of the same year further emphasized the tension between the interests of the state and those of society as a whole. The author's

[31] Mohl, *Polizei-Wissenschaft*, ii, p. 395. [32] Ibid., ii, p. 395. [33] Ibid., ii, p. 395.
[34] Ibid., i, p. 3.
[35] On the efforts of German intellectuals to reconcile the dynamism of a self-driven economy with the administration of the state in the early nineteenth century, see K. Tribe, *Strategies of Economic Order: German Economic Discourse, 1750–1950* (Cambridge, 1995), pp. 183–201.
[36] Mohl, *Polizei-Wissenschaft*, ii, p. 395.

intention was to praise the Prussian government's decision to construct an optical telegraph line between Berlin and Cologne. On one hand, the line was seen as a means by which the government intended to reconnect the disparate regions of the body politic: 'the utility of the state-maintained telegraph for the state itself is not insignificant . . . the telegraph in a sense makes the ruler omnipresent in his kingdom'.[37] On the other hand, while ensuring the unity of the state as a whole, the author also believed that 'such constructions . . . are among the necessary conditions under which the industry and trade of a people can attain a desirable recovery'.[38] The concluding remarks went on to opine that, '[w]ere it feasible also to send private information from one commercial town to another, to bankers, merchants and factory owners, then much would be won for the blossoming of trade and industry, as well as for the success of judicious speculation'.[39]

This conceptual tension also underpinned the essay presented by Friedrich List to the French Academy of Sciences in 1837. The text as a whole considered the influence of new means of transport upon the 'material economy, civil life, and the social status and power of nations', and he devoted a section to the telegraph in particular. The technology, he argued, was destined to 'enable nations and governments to correspond and to conduct their affairs as though they were separated by only a few leagues'.[40] It had, he implied, proven its great service to the state, but he also believed that it 'could be of immense utility if it were applied to the interests of science, of the arts, of industry, of amicable relationships . . . '.[41]

List's essay, however, marked a transition towards an understanding of state and society as interdependent but no longer consubstantial. Telegraph lines, he believed, more than the railways, could be interfered with and used to attack both governments and individuals. This was no reason to forbid the technology's use, he emphasized, 'considering that the advantages which would result from it for the public good (*la chose publique*) and the general interest (*intérêt général*) would be greater than the potential inconveniences . . . '.[42] Instead, no doubt influenced by contemporary debates over the French law of 1837, he suggested that telegraphy be placed under police surveillance and that the use of cyphered messaging be banned. This was not intended simply to defend the interests of the state, however. State control, he believed, could prevent the new technology from becoming 'the instrument of illicit profits for those who might gain access to it by their fortune, or a right of precedence, or by any other privilege'. By centralizing the administration of the telegraph network, then, the state could act as a guarantor of equal and secure access to information.

[37] *Beschreibung der vorhandenen Telegraphen: mit besonderer Berücksichtigung des preußischen, nebst einem Vorschlage zur Verbesserung derselben* (Haunwald, 1833), p. 44.
[38] Ibid., p. 6. [39] Ibid., p. 45. [40] List, *Die Welt*, p. 156. [41] Ibid., pp. 154–5.
[42] Ibid., p. 155.

List thereby laid the groundwork for the economically liberal moment that would surface in the 1850s and 1860s.[43] Preserving the '*chose publique*' or '*das allgemeine Wohl*', he implied, was a matter not simply of protecting the state's fiscal and strategic interests to the benefit of society as a whole but also of ensuring fair and free access to the tools which allowed the economy to develop. With the technology to hand, for example, the government could provide for the 'general interest' by ensuring that 'general news, of interest both to all of commerce and all of industry would be immediately rendered public'.[44] The belief was gaining ground that the state's primary function was to establish the framework and infrastructure for the unhindered pursuit of economic activities by all its inhabitants.

List and his contemporaries were hereby expressing a rather broad and diffuse expectation in the potential of telegraphic communication within the framework of existing political and economic thought. Its ultimate goal was not described in any detail but rested upon assumptions as to the technology's speed and the distances which it could cover. Their horizon of expectation lay far beyond their own experience and knowledge of the topic, consisting of possibilities rather than realities, and leaving little sense as to how the gap between the two might be bridged.

Even the technical literature on the topic reflected the many different ideas contained within the concept of 'telegraphy'. The *Technische Deputation* in Prussia and the *Gewerbeverein* in Bavaria, both established in the 1810s, dealt with proposals and patent applications for such inventions sent in by scientists, technicians, and ordinary members of the public, while new polytechnical journals offered a new means of sharing their ideas. *Dinglers Polytechnisches Journal*, launched in 1820, had become and would remain a mainstay of this periodical literature, even after the advent of more specialized organizations and journals from the 1840s.[45] From its very beginning, therefore, *Dinglers* published a number of articles related to 'telegraphy' which give a sense of the principal preoccupations of the time.

Between 1830 and 1838, around eighteen articles made their way into the journal which concerned non-electrical forms of telegraphy or signalling. Initially, the journal's articles were mainly drawn from foreign publications, but over time an increasing proportion were either original contributions or taken from other German specialist sources. The articles published in the 1830s reveal that there was no consensus on the basic principles of telegraphy. While clearly sharing an understanding of the objective of long-distance communication, the

[43] See below, Chapters 5 and 6. [44] List, *Die Welt*, p. 156.
[45] F. Fischer, 'Dinglers Polytechnisches Journal bis zum Tode seines Begründers (1820–1855)', *Archiv für Geschichte des Buchwesens*, vol. 15 (2007), pp. 1027–142.

variety of proposals published in *Dinglers* and the diversity of deficiencies which they identified and sought to resolve are remarkable.

Some efforts were directed towards improving existing optical-telegraph mechanisms, particularly their use at night. Various proposals for 'day-and-night telegraphs' were put forward, such as that from Le Coat de Kveguen in 1830, or from the Frenchman Ferrier in 1833.[46] A report translated from the *Liverpool Times* in 1835 described a 'night-telegraph' fuelled by the interaction of oxygen and hydrogen, while another, also developed in England, was effectively a form of pneumatic post.[47] Even adopting a very loose definition of 'optical telegraphy', however, only around four of the eighteen articles evoked dealt with this particular type of communication.

Other articles instead reported on possible applications of electricity or hydraulics to the task of long-distance transmission, and a number focused upon potential means of channelling human speech. 'Curtis' acoustic apparatuses', for example, consisted of a so-called 'logophor' which aimed to transmit vocal messages via extended tubes, and a certain Mr Sudre had even developed a 'Telephonium'. Innovation was thus a combination of existing ideas and speculation as to the future of long-distance communication. Over the following decades similarly ambitious proposals were regularly put forward, but as the first electric telegraph trials were conducted in the late 1830s and early 1840s, the field began to narrow and to revolve around the more immediate objective of improving this specific application.

Where potential customers for these innovations were evoked, business and trade once again featured prominently. In 1832, for instance, a contributor to *Dinglers Polytechnisches Journal* stressed that it had 'always communicated all new improvements to the telegraph in our journal, and also often expressed our astonishment that one still had not thought of constructing them in our German states. A commercial telegraph line is currently being erected between Paris and Havre [*sic*], and we dare to think that our bankers and merchants should imitate this example, if they understand its benefits.'[48] The idea of electrical telegraphy was the product of many different conceptions and proposed applications of long-distance communication, and its materialization was to be the achievement of equally diverse actors.

1.2 Managing Expectations

While the Prussian state constructed its optical telegraph line from Berlin to Cologne and the public followed the technology's evolution in newspapers and

[46] Anonymous, 'Ueber einen Tag- und Nacht-Telegraphen, von Le Coat de Kveguen', *DPJ*, 35 (1830), pp. 63–4; Anonymous, 'Ferrier's Tag- und Nacht-Telegraph', *DPJ*, 50 (1833), pp. 393–4.

[47] Anonymous, 'Eisenbahnen in Verbindung mit Telegraphen', *DPJ*, 56 (1835), p. 74.

[48] Anonymous, 'Einiges über die Geschichte der Telegraphen', *DPJ*, vol. 43 (1832), pp. 153–4.

journals, and while writers opined on the future of long-distance communication, in the early 1830s in Göttingen the mathematician Carl Friedrich Gauβ and his collaborator, the physicist Wilhelm Weber, were busy conducting seemingly unrelated experiments to measure the earth's magnetic field. Their efforts were part of a project initiated in 1828 by Alexander von Humboldt to collect magnetic recordings across a range of countries, inspired by his travels to South America and informed, not least, by his training in cameralist methods of resource exploitation.[49] By the early 1830s, the undertaking was being coordinated by Gauβ and Weber in Göttingen, who received measurements from a number of the German states' generally well-funded observatories—in Berlin, Königsberg, Göttingen, and Munich in particular.[50]

In the context of their experiments in this field, Weber extended a wire from the Göttingen observatory, across the town, to the physics cabinet. A voltaic pile was used to send electrical impulses across the wire, which was wrapped around a large magnet at one end, and caused a needle to move, allowing the scientists to transmit coded messages to one another. Eventually, they claimed, they were exchanging 'whole words and short phrases'.[51] Immediately considering the possible ramifications of this experiment, the two scientists reported their findings in the *Göttingische Gelehrte Anzeigen*, stating: 'There is no doubt that it would be possible to install a direct telegraphic connection in a similar way between two places separated by a considerable number of miles [*Meilen*].'[52]

That Gauß should apply his investigations and instruments to telegraphy was no surprise. During the 1820s, when carrying out a geodetic survey of the Kingdom of Hanover ordered by George III of England, he had famously developed his sextant-heliotrope. The purpose of the instrument was to concentrate the sun's rays in one place and direct them towards a surveyor located a considerable distance away, thus making various points in the landscape visible to the naked eye, even during the day. Noting that the intense flashes of light produced by the instrument could be used as signals at a distance, in 1821 Gauß had explained to the astronomer Heinrich Christian Schumacher that he was sending 'telegraphic symbols' with his apparatus.[53] Soon, he had been using the heliotrope to send

[49] On the neglected cameralist origins of 'Humboldtian science', see P. Anthony, 'Mining as the Working World of Alexander von Humboldt's Plant Geography and Vertical Cartography', *Isis*, vol. 109, no. 1 (2018), pp. 28–55.

[50] C. Jungnickel and R. McCormmach, *Intellectual Mastery of Nature: Theoretical Physics from Ohm to Einstein* (2 vols., Chicago, 1986), i, pp. 63–77; G. A. Good, 'Between Data, Mathematical Analysis and Physical Theory: Research on Earth's Magnetism in the 19th Century', *Centaurus*, vol. 50 (2008), pp. 290–304.

[51] *Göttingische Gelehrte Anzeigen* (3 vols., Göttingen, 1834), ii, 1274. One key witness to these experiments was a young Julius Reuter: see L. Guggenbuhl, 'Reuter, Gauss and Göttingen', *Mathematics Teacher*, vol. 51, no. 8 (Dec. 1958), pp. 603–6.

[52] *Göttingische Gelehrte Anzeigen*, ii, p. 1274.

[53] AWG: Gauß Briefwechsel, Gauß to Schumacher, 24 Oct. 1821 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/1123).

orders to his assistants, and even once to announce to a counterpart that he was departing for their meeting.[54] Telegraphy had always been on the mathematician's horizon.

Gauß and Weber therefore recognized the potential ramifications of their experiment.[55] The description of their electromagnetic telegraph which they published in the *Göttingische Gelehrte Anzeigen* was taken up by other journals, and the two men pursued their experiments over the following years, the results of which Gauß discussed with colleagues across Germany. Alexander von Humboldt was perhaps the first to whom he described his innovation. On 13 June 1833 he wrote to Humboldt explaining Weber's wire installation and that 'I wish, in particular, to try and use it to make telegraphic symbols'. The apparatus he had in mind would be able to transmit one letter in less than a minute, but he believed that with more apparatuses and circuits one could, 'by dividing the labour, attain any desired speed'. Unlike his heliotrope, which relied upon sunlight, he admitted, 'electrogalvanism' was entirely independent of the weather and time of day. 'I am inclined to believe that [it] could cover enormous distances at one stroke . . . one could correspond directly between Göttingen and Hanover.' Taking the project further, he wrote that he had 'wondered whether in future, once railways are more widespread, the tracks themselves . . . might be used instead of wires'. Costs would be an issue, but he promised to carry out experiments to that end.[56]

'Quaint digressions' was Humboldt's assessment of the two scientists' work, in a letter to the astronomer Friedrich Bessel in Königsberg.[57] As he pointed out to Heinrich Christian Schumacher, there had been a number of previous attempts to construct similar contraptions: '[a]lready 20 years ago old Sömmerring sent his electric telegraph to Paris; Baron Schilling von Cannstadt is hopeful of introducing his in Russia, and when I was in Spain in 1799, Bétancourt had already worked on such a telegraph . . . from Madrid to Aranjuez.'[58] The project clearly had a long pedigree among scientists, and while they shared an expectation in the potential of telegraphy, more impressive results and contributions had to be presented to stimulate interest. On the other hand, his reaction also indicates how keenly such developments were noted, conveyed, and discussed across an international network of intellectuals and scientists.

[54] AWG: Gauß Briefwechsel, Gauß to Schumacher, 10 Nov. 1822 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/1143); AWG: Gauß Briefwechsel, Gauß to Schumacher, 7 Jan. 1825 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/1180).

[55] Contrary to the narrative which has been put forward, among others, by K. Beauchamp, *History of Telegraphy* (London, 2001), p. 25.

[56] AWG: Gauß Briefwechsel, Gauß to Alexander von Humboldt, 13 June 1833 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/616).

[57] Ibid., no. 6, citing K.-R. Biermann, 'Aus der Vorgeschichte der Aufforderung Alexander von Humboldts von 1836 an den Präsidenten der Royal Society zur Errichtung geomagnetischer Stationen', *Wissenschaftliche Zeitschrift der Humboldt-Universität*, 12 (1963), pp. 211, 218.

[58] Ibid.

For his part, Gauß remained optimistic, writing to the Bremen-based astronomer Heinrich Wilhelm Olbers of his discovery: 'I am convinced that, using strong enough wires, it would be possible to telegraph in this way at one stroke from Göttingen to Hanover or from Hanover to Bremen.'[59] Olbers himself had heard of this 'amazing application of Galvanism' through 'public rumours, which included some incomprehensible things'.[60] Clearly, the academic grapevine had been rustling with news of the Göttingen pair's ideas, and over the next few years Gauß and Weber explored different means of developing their telegraph. One crucial adaptation, for instance, was the use of an inductor, based on Faraday's ideas, to produce a more reliable flow of electricity than the voltaic pile. Gauβ was evidently deriving much enjoyment from his explorations: 'might I tell you in confidence', he wrote to Schumacher, 'what gives me the most satisfaction in my work, is by far the theoretical conquests in the field of electromagnetism, rather than those in that of pure magnetism.'[61]

Pursuing the ongoing widespread interest in the connections between electricity and the nervous system, in 1835 Gauβ and Weber even began to explore the effects of electricity upon the human body. The current was too weak to be felt by the hands, Gauβ explained to Schumacher, but the lips and the tongue were far more sensitive. 'Once again, a new field of most interesting experiments is opening up here,' he asserted.[62] The two men amused themselves with these trials, and Gauβ reported to Olbers that 'one can clearly distinguish the sense [*Sinn*] (whether + or −) of a galvanic impulse with one's lips, so that we have already had fun telegraphing in such a way that the despatch [*Depesche*] was tasted [*aufgeschmeckt*].[63] The whole range of human senses was being considered in relation to telegraphy. 'I believe smell is just as sensitive,' Schumacher replied to Gauβ, 'but I don't see a means of introducing it here.'[64]

On the one hand, therefore, Gauβ's imagination was given free rein at this stage. He envisioned a future where 'the despatch that his majesty of all the Russians might like to have played out from St Petersburg could be tasted in Odessa at the very same moment'.[65] On the other hand, he was also aware of the steps which had

[59] AWG: Gauß Briefwechsel, Gauß to Olbers, 20 Nov. 1833 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/993).
[60] AWG: Gauß Briefwechsel, Olbers to Gauß, 3 Dec. 1833 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/4656).
[61] AWG: Gauß Briefwechsel, Gauβ to Schumacher, 6 Aug. 1835 (accessed 20 Mar. 2017, at https://gauss.adw-goe.de/handle/gauss/1294).
[62] AWG: Gauß Briefwechsel, Gauβ to Schumacher, 13 Sept. 1835 (accessed 20 Mar. 2017, at https://gauss.adw-goe.de/handle/gauss/1296).
[63] AWG: Gauß Briefwechsel, Gauβ to Olbers, 11 Nov. 1835 (accessed 20 Mar. 2017, at https://gauss.adw-goe.de/handle/gauss/999).
[64] AWG: Gauß Briefwechsel Schumacher to Gauβ, 18 Sept. 1835 (accessed 20 Mar. 2017, at https://gauss.adw-goe.de/handle/gauss/5708).
[65] AWG: Gauß Briefwechsel, Gauβ to Schumacher, 13 Sept. 1835 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/1296).

to be taken to bring these expectations closer to reality. Tests 'on a greater scale' must first be conducted with his apparatus, he admitted, in order to assess how easily it could be handled. 'In other circumstances than mine', he felt that the theory of electromagnetism 'would allow for many applications of importance for the Society, and of glittering practicality in the eyes of the great masses . . . If one could spend thousands of Thaler on the matter, I believe, for example, that electromagnetic telegraphy could be brought to a level of perfection and on a scale which would frighten fantasy itself.'[66]

The contrast between the 'fantasy' and the financial costs of telegraphic communication in Gauß's statement highlight the scientist's ability to mediate between expectations and reality. It is often forgotten, for instance, that in 1835 the academic entered into confidential negotiations with the new Leipzig–Dresden railway company, with a view to equipping their projected line with a telegraph wire.[67] It is unclear how this project unravelled—it probably foundered as a result of the mounting costs—but it was certainly among the first such attempts to combine the two technologies.[68]

It was also in 1835 that Carl August Steinheil of the Bavarian *Akademie der Wissenschaften* travelled through Göttingen. The young scientist was participating in the collaborative magnetism project from his base in Munich, and visited Gauß in order to collect the instruments necessary to take readings according to the mathematician's precise methods.[69] Steinheil had studied astronomy and physics at Göttingen—though during Gauβ's leave of absence—and under Friedrich Wilhelm Bessel at Königsberg. Since 1833 he held the position of *Zweiter Conservator der mathematisch-physikalischen Sammlung* at the Bavarian academy, with responsibility for the region's main collection of research equipment, and it was in this capacity that he sent his own magnetic readings to Gauβ in December 1835.[70]

From the great polymath Alexander von Humboldt to Gauß the mathematician, the astronomers Bessel, Olbers, and Schumacher, the physicist Weber, and the ambassadorial attaché Paul Schilling, the range of individuals involved in the discussion of electromagnetism illustrates the breadth and openness of empirical scientific research, which was still struggling to drop an institutional anchor. Around the same time, for instance, Schilling's apparatus was being demonstrated

[66] AWG: Gauß Briefwechsel, Gauβ to Schumacher, 6 Aug. 1835 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/1294).

[67] AWG: Gauß Briefwechsel, Gauβ to Olbers, 11 Nov. 1835 (accessed 17 Dec. 2016, at https://gauss.adw-goe.de/handle/gauss/999).

[68] G. Waldo Dunnington, *Carl Friedrich Gauss: Titan of Science* (New York, 1955).

[69] H. Marggraf, *Carl August Steinheil und sein Wirken auf telegraphischem Gebiete* (Munich, 1888), p. 14.

[70] J. A. Repsold, 'Carl August Steinheil', *Astronomische Nachrichten*, 203, nos. 11–12 (1916), pp. 165–92; cf. also AWG: Gauß Briefwechsel, Steinheil to Gauβ, 3 Dec. 1835 (accessed 20 Mar. 2017, at https://gauss.adw-goe.de/handle/gauss/5122).

across Germany, including at a meeting of the *Gesellschaft Deutscher Naturforscher und Aerzte* in 1835, where Georg Wilhelm Muncke, a professor of Physics in Heidelberg, decided to acquire a copy to use in his lectures. One of these lectures, in 1836, was attended by the Englishman William Fothergill Cooke, who shared his observations with Charles Wheatstone, Chair of Experimental Physics at King's College London. Together, they too were soon to make their contributions to the field.[71]

Meanwhile, Gauβ encouraged Steinheil to take up their trials in the use of electricity and magnetism to transmit messages, and by 1836, having studied the question of galvanic telegraphy for himself, Steinheil believed that more extensive trials were needed. '[T]he problem has come as far as science may drive it,' he stated; 'what must now happen is of a technical nature, and must be carried out by the technical domain.'[72] Much like Weber in 1833, he planned to span a wire across Munich, between the physics cabinet in the Bavarian *Akademie* and the observatory in Bogenhausen—a distance of roughly 5 kilometres.[73]

Like Gauß, Steinheil knew that his undertaking required external financial and logistical support, for which he would have to stimulate interest in the matter. He first turned to the Bavarian *Akademie* for help in securing 800 gulden, and technical support in carrying out the proposed trial.[74] As Friedrich Wilhelm Joseph Schelling, the Chairman of the *General-Conservatorium*, wrote to the king, 'in so far as a new scientific [underlined in the original] result is not hereby to be expected..., without which the funds of the *Akademie der Wissenschaften*... is not in a position to cover the costs of the proposed trial, any further appraisal lies beyond the competence of the *Conservatorium*'.[75] According to its regulations, the academy itself could not therefore provide the funds for Steinheil's experiment—it had now become a technical, rather than a scientific, experiment, and the matter was turned over to the *Oberste Baubehörde*.

No doubt aware of these technicalities, Steinheil's address to the *General-Conservatorium* was framed in terms which evoked the great possibilities of modern science. 'More than any other science, in recent times, physics has

[71] Aschoff, *Geschichte der Nachrichtentechnik*, p. 83.

[72] BHStA, MInn 45175/1, Steinheil to General-Conservatorium, 19 Apr. 1836.

[73] Ibid.; Carl August Steinheil, *Ueber Telegraphie, insbesondere durch galvanische Kräfte: Eine öffentliche Vorlesung gehalten in der festlichen Sitzung der Königl. Bayerischen Akademie der Wissenschaften am 25. August 1838* (Munich, 1838), p. 22. The total length of the wire, to the observatory and back, was 30,500 Paris feet (roughly 10 km).

[74] BHStA, MInn 45175/1, Steinheil to General-Conservatorium, 19 Apr. 1836.

[75] BHStA, MInn 45175/1, Schelling to Ludwig I, 29 Apr. 1836. This passage has been misunderstood as demonstrating a certain scepticism towards Steinheil's inventions, which is clearly not Schelling's intention—the point is to distinguish between scientific and technical matters, principally for the purposes of financing the project: see H. Pieper, 'Carl August Steinheil, der vergessene Begründer der wissenschaftlichen Nachrichtentechnik', *Technikgeschichte*, vol. 37, no. 4 (1970), p. 334, whose interpretation has been taken up in R. Seidel, 'Verkehrsmittel Telegraph: Zur Geschichte der Telegraphie im 19. Jahrhundert bis 1866 unter besonderer Berücksichtigung des Raumes Hannover–Bremen' (PhD Thesis, University of Hanover, 1980), pp. 80–1).

come closer to life itself. The application of its findings has contributed significantly to extending the realm of that which Man can achieve. We witness seas being traversed in the face of violent storms by the power of steam, the greatest distances on land being crossed at a soaring speed . . . These great transformations of the conditions of life have resulted from the materialization [*Verwirklichung*] of a few fundamentals [*Sätze*] of the physical sciences.' Turning to the advantages of his proposed experiment, he emphasized the speed and versatility of the galvanic force: 'The time necessary to transmit this force is immeasurably small. In a second, it would circle the world a number of times. By day and by night, by all temperatures, under all atmospheric circumstances, over all distances – it always remains instantaneous [*momentan*] and equally effective [*gleich wirksam,* underlined in the original].'[76]

The ultimate aim of his project seemed clear: 'The application of galvanic currents to telegraphing'. The risks involved were minimal, he assured the authorities, because the trial rested upon 'an idea which has already been researched theoretically, has been trialled experimentally, promises a certain success, and only requires implementation on a larger scale in order to come to life in all its importance'.[77] The support of the authorities was sought, in particular, in finding a future means of hiding the electric telegraph wires from plain sight, as such a means of communication, it was underlined, could only remain in the hands of the state. Playing on his addressees' patriotic heartstrings, Steinheil ended by emphasizing '[t]he importance of the matter, the renown accruing to Bavaria for being the first to carry out an idea which is incontrovertibly one of the greatest of our times, and will very soon be taken up in the entire learned world'.[78]

Steinheil's rhetorical investment earned its dividends. His address and Schelling's endorsement were sent on to the *Oberste Baubehörde* with the note that 'such an experiment, in general, both from a technical perspective and in relation to the general purposes of the state [*Staatszwecke*] is of great interest'.[79] In approving the requested grant, the government's chief architect, Leo von Klenze, immediately raised the question of whether His Majesty should maintain telegraphy as a monopoly [*Regal*] or allow private concessions to be made upon particular conditions. In any case, however, he underscored 'the great benefit which would accrue to the nation through the use of this means of messaging is clear'.[80] What this oft-repeated and appealing but vaguely defined 'great benefit' might consist of in practice still remained unclear.

Steinheil's own declared visions for the future of telegraphy, meanwhile, reflected the broad horizon of expectations which he sought to evoke among his interlocutors. Like Gauβ, and foreshadowing the varied connections which would

[76] BHStA, MInn 45175/1, Steinheil to General-Conservatorium, 19 Apr. 1836.
[77] Ibid.
[78] Ibid.
[79] BHStA, MInn 45175/1, Note to Oberste Baubehörde, 4 May 1836.
[80] BHStA, MInn 45175/1, L. v. Klenze to MInn, 20 May 1836.

later be established between the body and electricity, he saw in the mysterious galvanic force a means of exciting the human senses. His aim, he told the *General-Conservatorium*, was to 'introduce a telegraphic language'. 'In doing so, one is not limited to the realm of feelings [*Gefühlssein*], like the current telegraphs [presumably a reference to sympathetic needles]. The force can thus be expressed, across a number of leagues, so as to be perceived by anybody. By means of sparks of a particular colour, by causing a platinum wire to glow, or by causing a magnet to rotate out of position, one can act upon the sense of sight; by striking bells, upon that of hearing; by touching the wire, give the senses unmistakeable signals . . . .'[81]

Having obtained the required support and carried out his trial, in 1838 Steinheil presented his findings to the *Akademie* in similar terms. He began by stating the aims of science in general: 'We must listen in on nature's forces and phenomena', he wrote, 'in order to conquer them and to make them carriers of our thoughts, and this is the task of telegraphy in its common sense.' This time, he focused upon human speech as the most advanced means of transmitting thought, implicitly evoking the deficiencies of optical telegraphs: 'We can clearly see that it is a digression when telegraphy strives to imitate an incomplete means of communicating, sign language, as used by disabled people, the deaf-mutes.' Instead, he insisted, telegraphy should 'imitate communication [*Mittheilung*] in its most complete form, as speech [*Rede*], whereby the sounds which strike our hearing instinctively catch our attention and lead to comprehension'. Steinheil's telegraph apparatus was therefore primarily designed to use electrical impulses to ring two bells, using which a 'spoken' language could be reproduced, though a writing implement was also included so as to print incoming signals.[82] Like Gauß, Steinheil had drawn inspiration from the many visions of long-distance communication which were circulating at the time, manipulating those expectations to enrol support for his own project.

1.3 Circulating Knowledge, Enrolling Support

As time wore on, the dissemination of Steinheil's ideas and his quest for financial and logistical support began to reveal the difficulty of reconciling the different interests involved in the development of the technology. His presentation to the *Akademie der Wissenschaften* in 1838 was duly published, and reproduced and summarized in a number of journals, from *Dinglers* to the French *Annales de chimie et de physique*, and Charles and John Watt's *The Chemist*.[83] Curiously,

[81] BHStA, MInn 45175/1, Steinheil to General-Conservatorium, 19 Apr. 1836.
[82] Steinheil, *Ueber Telegraphie*, pp. 4–5.
[83] Anonymous, 'Über Steinheil's elektro-magnetischen Telegraphen mit betreffenden historischen Notizen', *DPJ*, 67 (1838), pp. 388–400; 'Notice sur le télégraphe galvanique de M. Steinheil', *Annales de*

however, Steinheil published little if anything more concerning his own telegraph system and apparatus. Even the *Kunst- und Gewerbe-Blatt*, published by the Bavarian *Polytechnischer Verein*, which was often called upon to assess patent applications, and of which Steinheil was a member, limited itself to reproducing an article from the Leipzig-based *Polytechnisches Centralblatt*.[84]

It was in fact Wilhelm Weber in Göttingen who encouraged Steinheil to publish his findings as soon as possible, in an effort to pre-empt the actions of his competitors—primarily in England. 'Gauβ was wondering', Weber wrote in 1838, 'if you might not be inclined to produce a detailed account of your telegraph.' 'You know that Wheatstone in London is causing quite a stir with such a telegraph,' he explained, pointing out that the English professor was preparing an article on the topic. 'It is clear that, especially if this [Wheatstone's publication] is the first essay to appear on the matter and, as will undoubtedly be the case, it is circulated widely and quickly, the whole matter will appear before the world in a false light for a long time.' Weber even suggested that he might publish in his and Gauβ's journal dedicated to their magnetism project the *Resultate aus den Beobachtungen des Magnetischen Vereins*. 'That way, it would soon make its way to England, and especially into the hands of the people there who have the most authority—Herschel, Babbage, Airy, Miller, etc.—and the society in which your account appeared would prevent any misuse in England.'[85]

What Weber understood, which Steinheil seemed reluctant to acknowledge, was that publication was increasingly the means of securing one's intellectual property, not simply at home but on the international knowledge market. Referring once again to the matter in December 1838, Weber insisted that Steinheil at the very least share his work with Wheatstone and Michael Faraday: 'Wheatstone, though he is of a superficial nature, will not fail to act respectfully, and in this matter it is certainly important to circulate in many directions.'[86]

It is unclear why Steinheil was reluctant to follow Weber's advice, but he was also evidently acutely aware of the stakes involved in addressing different audiences. To the *General-Conservatorium* and the Bavarian government he had emphasized his 'scientific duty' to make his correspondents aware of a development which could be of such importance for mankind.[87] He had depicted his experiment in the grandest possible terms, as a contribution to the onward march

chimie et de physique, 71 (1839), pp. 347–51; 'Notice on the Galvanic Telegraph of M. Steinheil', *The Chemist, or Reporter of Chemical Discoveries and Improvements*, 1 (1840), pp. 33–4.

[84] D. E. Thomas, 'Der Polytechnische Verein in Bayern (1816–1933)', *ZBLG*, 64 (2001), pp. 431–60; J. Hülsse, 'Anwendung des Elektromagnetismus auf Telegraphie', *KGB,* vol. 16, no. 7 (1838), pp. 412–38. In 1834, Steinheil had even replaced the former editor of the *Gewerbe-Blatt* on the Verein's central administrative committee—see 'Gutachten einer Commission des polytechnischen Vereins', *KGB,* 12, no. 4 (1834), p. 1.

[85] DMM FA005/0614, Weber to Steinheil, 10 Sept. 1838.

[86] DMM FA005/0614, Weber to Steinheil, 18 Nov. 1838.

[87] BHStA, MInn 45175/1, Steinheil to General-Conservatorium, 19 Apr. 1836.

of 'physics' and to the reproduction of human speech. But in his notes for an article which appears to have been published, in edited form, in Schumacher's *Jahrbuch für Astronomie* for 1839, Steinheil also expressed his regret that readers were often interested in 'specific ideas' rather than their practical development. 'As long as [these ideas] exist only in the imagination, the wish cannot be expressed often enough that it would be possible to realize them, and men dream of the advantages which might be obtained from the diffusion of that which is being prepared. Once this has happened, one takes the matter for granted and the interest disappears.'[88] Selling a project in appealing, ambitious terms, as Steinheil had done to the *Akademie* and the government, was one thing; obtaining concrete support for further, perhaps less inspiring but necessary, trials and experiments was another. Indeed, the second part of his statement may perhaps suggest that the Bavarian state's interest in his telegraph had dwindled at this point.

There was a type of 'art' (*Kunst*), Steinheil believed, which sought to maintain an interest in big ideas by preserving the 'veil which contains temptation', in order to 'maintain fantasy in tension'. This art, however, stood in 'stark contrast with the tendency of the researcher, who sees in wingèd fantasy rather an enemy'. Here was a clear indication, therefore, that there were limits to Steinheil's willingness to fuel unrealistic expectations. A researcher, he believed, prefers to 'present the naked truth, whether or not it is as pleasing as the earlier fantasy . . . the researcher thus proceeds to disappoint'.[89] Echoing Gauβ's comments on the 'fantasy' involved in his project, this statement hints at the direction of developments in telegraphy at the time. Lofty visions as to the nature and purpose of the technology provided a leitmotif throughout its development. Expectations had to be raised to stimulate interest and involvement, but these would necessarily have to be tempered as experimentation and trials were undertaken.

With regard to telegraphy, 'whose feasibility is now proven', Steinheil wrote, it was time 'to approach the sober question, . . . whether the cost which it demands can be outweighed by the advantages obtained'. This practical reasoning, in Steinheil's mind, no longer fell within the purview of the scientist.[90] Having successfully pitched his contribution to science and the art of communication, Steinheil was practically calling for others to engage in the more mundane aspects of the work ahead, recognizing a boundary between his competency and that of others. Immediate expectations had to be brought closer to reality if the telegraphic project was to be realized. The state collaborators whom Steinheil desperately needed were struggling to make this shift, however.

[88] DMM FA005/0399, Notes, 'Noch eine Mittheilung über den viel besprochenen Telegraphen', undated (probably 1838/9).
[89] DMM FA005/0399, Notes, 'Noch eine Mittheilung'. [90] Ibid.

1.4 Confronting Reality

In March 1838, while preparing to present his findings to the *Akademie* in Munich, Steinheil had also proposed to pursue his trials along the very first Bavarian—and German—railway line between Nuremberg and Fürth. As Gauß had suggested before him, he hoped in particular to determine whether the metal tracks themselves might be used to conduct electric current and serve as a telegraphic circuit.[91] Bavarian Interior Minister Karl von Abel supported the idea, emphasizing to King Ludwig I 'the important role which it is probable that this new means of communication will play in the near future'.[92] As the stakes involved were raised, however, such broad statements of support and enthusiasm called for more justification.

Back in 1836, Leo von Klenze had heard rumours that the Saxon government had allowed a telegraph line to be erected alongside the new railway between Dresden and Leipzig—no doubt related to Gauβ's negotiations with the company. At the time, Klenze had already begun to consider how the government might respond if similar requests were put forward by railway companies in Bavaria, and what the state's attitude to this new means of communication should be.[93] By 1838, when King Ludwig I approved the request for an extra 500 gulden to complete Steinheil's trials, he too expressly requested that the question be addressed as to 'how [the telegraph] is to be used to the advantage of the state'.[94] If the state was to engage in the development of this technology, its concrete interest in the matter was to be identified.

The response, however, was uncertain. Even two years later, in 1840, Interior Minister Abel stated that it was not yet possible to evaluate whether the advantages of the telegraph for the purposes of the state and the public administration would outweigh its costs, as not all results had yet been collected. Crucially, he also believed that the telegraph 'could interfere all too deeply with the administrative organism and the correspondence methods of the public authorities'. Furthermore, any income which might be generated by the public use of a telegraph service would have to cover the losses incurred by the state postal service.[95]

Abel did believe that Steinheil's trials should be pursued along the Nuremberg–Fürth railway line, but he admitted the unpredictability of its future utility. In Bavaria, the general public was clearly understood as the most likely primary user of the new technology, which would thereby constitute a source of income for the

[91] BHStA, MInn 45175/1, Steinheil to Ludwig I, 16 Mar. 1838.
[92] BHStA, MInn 45175/1, Abel to Ludwig I, 10 May 1838.
[93] BHStA, MInn 45175/1, L. v. Klenze to Ludwig I, 20 May 1836.
[94] BHStA, MInn 45175/1, Abel to Ludwig I, 10 May 1838, approval from King Ludwig I on 12 May 1838.
[95] BHStA, MInn 45175/1, Abel to Ludwig I, 13 Apr. 1840.

state. However, 'as with every invention which can be of general use', Abel reported to the king, it was impossible to tell 'if there is a need for such a product before its diffusion' [underlined in the original]. Furthermore, he believed, 'nobody can predict to what extent it will become viable and stimulate a usage which might little by little become a general need'.[96] Informing Steinheil that further trials would be conducted along the new Munich–Augsburg railway instead, Abel explicitly stated that their purpose was 'to discover whether the public will use this new means of communication to an extent which will make its construction significantly profitable on a long-term basis . . . '.[97] To the king, on the other hand, Abel emphasized that 'the object is nonetheless so important and designed in such a way' as to justify support for future experimentation.[98]

This continuous oscillation between rather vacuous statements concerning the importance, utility, and 'benefit' of the technology on the one hand, and the impossibility of assessing these qualities on the other, reflects the authorities' repeatedly changing field of vision as they sought to identify their immediate interests while keeping the ultimate, distant objective in their sights. It testifies to the enduring power of the original expectations associated with the technology, just as these were confronted with reality.

Bavaria was not peculiar in this regard. In Prussia, news of Steinheil's experiments and the same rumours of a trial along the Saxon railway had stimulated interest in electrical telegraphy, but opinions remained divided.[99] Of course, since the establishment of the Berlin–Cologne optical telegraph line in 1832, there existed a Prussian department dedicated to the technology, led by Major Franz August O'Etzel and under the authority of the Ministry of War. But it was very much O'Etzel's personal enthusiasm which had led to its introduction and development.[100] The military arm of the Prussian state, in fact, had been reluctant to abandon its ideal of quasi-medieval warfare, and was only slowly becoming more receptive to the utility of 'modern' technology in general.[101]

In any case, the process stalled when the minister of the interior reported that the minister of war was rather sceptical as to the use of the telegraph for policing purposes: '[I]t does not seem to him to be the time to establish general measures for the aforementioned purposes, because the invention has not yet reached a stage at which it may be possible to make a definitive decision relating to its utility

[96] BHStA, MInn 45175/1, Abel to Ludwig I, 13 Apr. 1840.
[97] DMM FA005/0582, Abel to Steinheil, 13 Apr. 1840.
[98] BHStA, MInn 45175/1, Abel to Ludwig I, 13 Apr. 1840.
[99] E. Feyerabend, *Der Telegraph von Gauss und Weber im Werden der elekrischen Telegraphie* (Berlin, 1933), pp. 182, 187.
[100] Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland*, p. 146.
[101] E. D. Brose, *The Politics of Technological Change in Prussia: Out of the Shadow of Antiquity, 1809–1848* (Princeton, 1993), pp. 164–89; D. Showalter, *Railroads and Rifles: Soldiers, Technology and the Unification of Germany*, (Hamden, Conn., 1975), pp. 143–60.

and suitability for these purposes.'[102] Uncertainty was still preventing state authorities from making the leap of faith required to invest in the technology.

Where support was forthcoming, moreover, interests did not always align. As will be explored in Chapter 2, the main initial source of investment in telegraphy would come from another newly emerging sector—railway construction. Britain had led the way when Charles Wheatstone and William Cooke installed their electrical telegraph system along a segment of the Great Western Railway in 1838. The apparatus was used for the purposes of signalling, and similar applications of the technology were to help regulate railway traffic throughout German states and in France from the early to mid 1840s. For railway companies, the more immediate utility of the technology perhaps required a smaller leap of faith.

In Bavaria, the railway-based trials proposed by Steinheil in 1838, which had been relocated from Nuremberg to Munich, had called for collaboration with the *München-Augsburger Eisenbahn-Gesellschaft*. By the end of October 1840, the company informed Steinheil that they were prepared to begin the trials at his convenience. Having then installed his telegraph system along the railway track between the towns of Maisach and Olching, Steinheil seems to have left the installation to the supervision of the railway company's own staff, but technical issues arose when the line was left unattended.[103] Writing angrily to the board of directors, Steinheil asked, 'why should it be that the galvanic telegraph is only advantageous where there are railways? Purely and solely because of the supervision of the wires and its reparation . . . by the personnel which is already assigned to the supervision of the tracks . . . This supervision and preservation of the line is thus the only thing which materially links railways and galvanic telegraphs.'[104]

Steinheil, it seems, had not understood the logistical utility of the telegraph to the railway company itself. Around the same time, Steinheil made a note of the questions which he would have to put to the Railway Committee, among which he asked, 'what use would the committee make of such a telegraph for its own purposes?'[105] Yet the negotiations between the state and the company, and the earlier example of the Dresden–Leipzig line, had suggested that railways had their own reasons to employ the telegraph. The partnership between science and enterprise was put at risk by what appeared to be a clash of individual interests.

Steinheil's unaccommodating attitude was also reflected in his disagreement with the state over the patent, or *Privilegium*, for which he had applied in August 1838. Although south German states were relatively liberal in their attitude to patenting, Steinheil had sought particularly wide-ranging intellectual property

[102] Feyerabend, *Der Telegraph*, p. 191.
[103] DMM FA005/0582, Directorium der M-A Eisenbahn-Gesellschaft to Steinheil, 22 Feb. 1841.
[104] DMM FA005/0582, Steinheil to Directorium der M-A Eisenbahn-Gesellschaft, 8 Mar. 1841.
[105] DMM FA005/0582, Notes, undated.

rights over his telegraph system.[106] As Interior Minister Abel explained to him, his request had been denied because he had asked for a *Privilegium* encompassing 'exclusive execution (*alleinige Ausführung*)' of the project. The minister informed him that he was welcome to reapply for a patent, as long as he did not claim exclusive rights of usage.[107] Although the government was yet to be convinced of the technology's utility to the state, it was clearly not prepared to relinquish control over its future implementation. The friction which had emerged between the scientist, the railway company, and the authorities threatened to grind the process of technological development to a halt.

1.5 The Hanseatic Exception

Often overlooked, the north-western coast of Germany offers an informative contrast to the changes taking place in Prussia and Bavaria. In 1838, the merchant and vinegar manufacturer Johann Ludwig Schmidt obtained a concession from the Hamburg *Senat* to construct an optical telegraph line linking the town to its port in Cuxhaven at the mouth of the River Elbe. The installation served principally to facilitate communication between merchants and shipowners based in Hamburg, and the vessels entering or leaving the waterway to and from the North Sea.[108] In effect, Schmidt's project was to fulfil the wish expressed in 1799 to the *Gesellschaft zur Beförderung der Künste und nützlichen Gewerbe*, and replicated similar installations in other coastal towns such as between Holyhead and Liverpool in Britain.[109]

Drawing on the success of his initiative, in November 1838 Schmidt turned his attention westwards. In Bremen he found a situation analogous to that in Hamburg, as the city state was heavily dependent upon its ties to the harbour in Bremerhaven, at the mouth of the Weser. Schmidt therefore proposed to connect the two sites with an optical telegraph line, and as the project was beneficial to merchants and shipowners, his idea was pitched as a private enterprise. The aim was to establish a public limited company, whose shareholders would also receive dividends issuing from profitable use of the service.

Schmidt's project could be expected to find support in Bremen because it presented a solution to a very real problem which local merchants had faced since the early decades of the century. Over hundreds of years, an accumulation of

[106] M. Seckelmann, *Industrialisierung, Internationalisierung und Patentrecht im Deutschen Reich, 1871–1914* (Frankfurt am Main, 2006), pp. 100–2.

[107] DMM FA005/0582, Abel to Steinheil, 3 May 1839.

[108] Seidel, *Verkehrsmittel Telegraph*, pp. 197–200.

[109] See above, p. 37 G. J. Holzmann, 'Die optische Telegraphie in England und anderen Ländern', in K. Beyrer and B.-S. Mathis (eds.), *So weit das Auge reicht: Die Geschichte der optischen Telegraphie* (Karlsruhe, 1995), pp. 116–30.

sand had rendered the Weser inaccessible to ships at the level of Bremen itself, such that this 'port' town's very existence was under threat by the 1820s. A partial solution to this issue had been found in 1827, when Bremen's renowned *Bürgermeister* Johann Smidt had negotiated the acquisition of a portion of coastal territory from the neighbouring Duchy of Oldenburg. There, around 60 kilometres further downstream on the Weser, Bremen had established its new port: Bremerhaven.[110] The optical telegraph proposed by Schmidt now offered shipowners and merchants the possibility of remaining in Bremen and communicating with their ships in Bremerhaven via semaphore, enhancing their ability to coordinate the loading and unloading of their imports and exports.

In proposing the project, moreover, Schmidt could point to his success in Hamburg, another Hanseatic city state with a remarkably similar geographical and socio-economic layout. 'The results which have issued from that [Hamburg-Cuxhaven] line', it was asserted, 'enable us to conclude that, just as the enterprise there is profitable to the shareholders, so might adequate dividends be expected for the signatories here too, given the known communications relations between Bremen and Bremerhaven.' His more ambitious project eventually to connect the Hamburg–Cuxhaven and Bremen–Bremerhaven lines was similarly based upon the 'known' potential benefits of tying these sister towns.[111]

The Bremen *Senat* approved Schmidt's request for a concession, recognizing the very concrete benefits which his telegraph promised. The commission for Bremerhaven recognized the 'general considerations which render the multiplication and improvement of communications desirable for a trading post'. It also highlighted the 'local conditions' which supported the establishment of a Bremen–Bremerhaven connection, namely 'the significant distance of the central point of our trading life from the harbour and moorings of our ships'.[112] In contrast with the consideration of proposals in Bavaria and Prussia, the language used by both Schmidt and the *Senat* reflected the precise ways in which the telegraph might improve existing conditions.

In Bremen, the mouth of the Weser River was the lifeline of both the elite merchant community and the city state as a whole, which depended upon maritime trade. Notwithstanding a long history of disagreements and constitutional settlements, both the *Handelskammer* (Chamber of Commerce), representing the merchant community's interest, and the *Senat*, the state's government, often cooperated, recognizing that politics and trade went hand in hand. Bremen thus lacked the cameralist heritage which elsewhere in Germany had created

[110] H. Schwarzwälder, *Geschichte der Freien Hansestadt Bremen* (4 vols., Bremen, 1975–85), ii, 121–34.

[111] StAB 2-R.15.b.2, J. L. Schmidt, 'Einladung zur Unterzeichnung von Actien für den bremischen Telegraphen-Verein', 8 Nov. 1838.

[112] StAB 2-R.15.b.2, 'Bericht ad Supplikat Joh. Ludw. Schmidt pro Anlage einer Telegraphenlinie', 16 Jan. 1839.

tensions between a bureaucracy pursuing the higher objective of a well-ordered state and the materialist pursuits of an emerging commercial class, or *Wirtschaftsbürgertum*. In sharp contrast to Prussia, for instance, the commission for Bremerhaven considered it an undeniable advantage that Schmidt's project was to be carried out by private industry, and therefore at 'private risk'.[113] This economic liberalism was tied to a particular brand of social conservatism, based on the notion that the city state was an organic whole—a blend which Lars Maischak has termed 'cosmopolitan conservatism'.[114]

Like the railway companies elsewhere in Germany, merchants and shipowners saw the immediate utility of the telegraph to their existing operations. But the commission examining the project also suggested extending the service beyond the merchant community itself. It was proposed that the service be opened to all, in exchange for a fee, and that the *Senat* might itself make use of the telegraph when communicating with the relevant governmental bodies.[115] In Bremen, the organic—rather than holistic—conception of state and economy ensured that all shared similar interests: the growth of the latter supported the former. Only later would other German states resort to a similar understanding of the dynamic relationship between economic growth and state interests.

In the end, despite the proven success of the telegraph line between Hamburg and Cuxhaven, as well as the *Senat*'s support, Johann Ludwig Schmidt's project was not to come to fruition for a number of years, by which stage the electric telegraph had made its appearance on the technological and commercial scene. Part of the issue lay in the difficulty Schmidt experienced in obtaining the necessary concession from the Hanoverian government, on whose territory the connection between Bremen and Bremerhaven was to run.[116] In addition, however, the entrepreneur failed to attract the investment he had hoped for, and was never able to establish his projected '*Telegraphen-Verein*'.[117] Indeed, even in Hamburg, the demonstrated utility of the telegraphic connection to Cuxhaven belied the little support which Schmidt had received from individual investors—even after establishing an *Aktiengesellschaft* there, the entrepreneur was forced to buy the majority of the shares.[118]

The German 'norm' had thus been reversed in the Hanseatic city states, where there was a fertile ground of common interests between state and economic actors, but the lack of long-term ambitions, a narrow horizon of expectation, had failed to provide the required incentive to invest. The issue was compounded by the

[113] StAB 2-R.15.b.2, 'Bericht ad Supplikat Joh. Ludw. Schmidt pro Anlage einer Telegraphenlinie', 16 Jan. 1839.
[114] L. Maischak, *German Merchants in the Atlantic* (Cambridge, 2013), pp. 82–107.
[115] StAB 2-R.15.b.2, 'Bericht ad Supplikat', 16 Jan. 1839.
[116] StAB 2-R.15.b.2, J. L. Schmidt to Senat, 12 Dec. 1843.
[117] StAB 2-R.15.b.1, 'Extract aus dem Senatsprotocolle', 29 Oct. 1845; cf. also Seidel, *Verkehrsmittel Telegraph*, p. 204.
[118] Seidel, 'Verkehrsmittel Telegraph', p. 198.

mechanical, visible, and somewhat cumbersome nature of optical telegraph installations which did not evoke the kind of multi-sensory, telegraphic speech evoked by Steinheil and Gauß. Once such promises began to circulate, however, this fertile ground would bear its fruit, and Bremen was to be one of the first states in Germany to introduce the electric telegraph.

* * *

By the late 1830s, widespread expectations as to the possibility of telegraphic communication had begun to draw together the diverse intellectual, scientific, and entrepreneurial forces which were necessary to its materialization. In doing so, however, this possibility had also forced the actors concerned to narrow their horizons, temper their hopes, and consider the practicalities of the technology's development as well as their concrete interests in the project. Drawing upon a common fund of ideas and information regarding the technology and communication in general, writers, scientists, and bureaucrats had initially defined their vision in similarly evocative and ambitious terms. Now that various trials, improvements, and applications of the technology were under consideration, however, these actors had come to depend upon one another for financial, technical, and logistical support, and to voice their more immediate concerns.

For the time being, the horizon of expectation associated with telegraphy shifted out of focus. Across Germany and Europe, some scientists turned to the state for support in their trials, others to private enterprise; railway companies began to consult with ministers and academics for help in developing new signalling technologies; budding entrepreneurs such as Werner Siemens in Berlin discovered the networks of information exchange which bureaucrats themselves were drawing up to inform their decisions regarding the technology. Like delegates arriving at a conference of allied powers, these actors had initially gathered around a common purpose, but as immediate circumstances required them to prepare for extended deliberations, new hopes and frustrations began to emerge.

2
Realities

In October 1840, Carl Steinheil discovered that the telegraph line he had been trialling along the Munich–Augsburg railway had been damaged as a result of being left unsupervised. Furious, he complained to the regional government, demanding that the railway company in charge be mandated to conduct the trial according to his precise instructions.[1] This angered the company's board of directors: why, they asked, had he turned to the government instead of addressing them directly?[2] By 1842, the Bavarian state railway commission had been tasked with overseeing the line, but when the king asked for an update on Steinheil's experiments, the scientist refused to cooperate.[3] Tired of the incessant trials ordered by the state, Steinheil wrote that '[t]hese experiments—which I did not conduct upon the request of the government—are my private property'. 'If the government wishes to make use of my invention,' he continued, 'then I would humbly ask that the Royal Ministry address itself to me as a private person, and take into account further conditions on my part . . . .'[4]

Such conflicts and frustrations were a natural by-product of the interactions between scientists, technicians, railway companies, and state officials during the 1840s, as their elevated expectations were confronted with the reality of collaboration. During the 1830s, as we have seen, Carl Gauβ and Carl Steinheil had both considered whether railway tracks might not serve as an electrical circuit. Their hopes were dashed, but railway companies realized that telegraph wires could be used to transmit short signals along their lines, enabling them to manage the passage of trains and schedule their services. Britain set the example in this regard, when William Cooke and Charles Wheatstone trialled their telegraph along a number of lines, particularly the Great Western Railway in 1839—a simple system of needles which, when deflected by the electric current, pointed to letters on a display.[5] No doubt aware of this experiment, the *München-Augsburger Eisenbahn-Gesellschaft* had then agreed to Steinheil's trials along their line in 1840, and others soon followed suit.

[1] BHStA, MInn 45175/1, Steinheil to Regierung Oberbayern, 24 Oct. 1840.
[2] DMM, FA 005/0582, Directorium to Steinheil, 28 Oct. 1840.
[3] BHStA, MInn 45175/1, Präsidium Regierung Oberbayern to MInn, 7 Aug. 1842.
[4] DMM, FA 005/0582, Response to the commission established on 18 July, 28 July 1842.
[5] Fari, *Victorian Telegraphy before Nationalization*; K. Beauchamp, *A History of Telegraphy* (London, 2001), pp. 31–2; Aschoff, *Geschichte der Nachrichtentechnik*, pp. 85–6.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0004

The railway companies' experiments with the new technology were followed closely by state authorities, who pursued their own inquiries into its development, increasingly aware that their control over a potentially revolutionary means of long-distance communication was at stake. In Bavaria, as mentioned above, Carl Steinheil's telegraph was eventually placed within the technical jurisdiction of the *Eisenbahnbau-Kommission zu Nürnberg* (Railway Construction Commission), established in 1841 to pave the way for state ownership of the railways.[6] In Prussia, a *Telegraphen-Kommission* (Telegraph Commission) was assembled in 1844 to investigate the technology, under the authority of Major O'Etzel, director of the state's optical telegraph line, and the Ministry of War.[7] A similar pattern emerged in Austria, where a state commission was established in 1845.[8]

The development of the telegraph thus inevitably became caught up in the negotiations between the state and the private sector which shaped the emerging German railway industry during the 1840s.[9] In technical, logistical, and financial terms, however, the aims of the state and of the railway industry were in many ways complementary. Telegraph lines did not require the same scale of investment as railways—the kind of sums that led to constitutional crisis in 1847 when the Prussian government's request for a loan to build the *Ostbahn* was made conditional upon parliamentary reform.[10] Instead, governments often hoped to use the channels already opened up by railway lines to lay their own telegraph wires, thereby avoiding the need for expropriations. The results of the trials undertaken by private companies, moreover, substantially informed the decisions made by state commissions investigating the technology.

In many respects, therefore, the development of telegraphy relied upon much the same cooperation of state officials, businessmen, and industry experts which, as James Brophy has demonstrated, was necessary to the construction of railways in Prussia during the period.[11] Even outside Prussia, where state ownership of the railways was more pronounced, it was the utility of the technology to this sector that encouraged its development. The cast of characters involved was so broad, in fact, as to blur the very distinction between 'state' and 'civil society'. Ministers, bureaucrats, chief engineers, scientists, and individual entrepreneurs were all drawing upon a common, growing fund of 'useful knowledge' circulating across

[6] D. Götschmann, *Wirtschaftsgeschichte Bayerns: 19. und 20. Jahrhundert* (Regensburg, 2010), p. 59.

[7] H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland und die rheinische Industrie: von den Anfängen bis zum Ausbruch des Ersten Weltkrieges* (Wiesbaden, 1983), p. 150.

[8] G. Lobentanz, 'Zur Geschichte der Telegraphie in Österreich: Von den Anfängen bis ca. 1850' (PhD Thesis, University of Vienna, 1967), pp. 21–7.

[9] L. Gall and M. Pohl (eds.), *Die Eisenbahn in Deutschland: Von den Anfängen bis zur Gegenwart* (Munich, 1999), pp. 13–27.

[10] Ibid., pp. 21–4.

[11] J. M. Brophy, *Capitalism, Politics, and Railroads in Prussia, 1830–1870* (Columbus, 1998), esp. pp. 22–52.

a broad landscape of innovation through social networks, newspapers, and journals throughout Germany and beyond. The industrialization of Germany may have been regionally inflected and owed much to individual entrepreneurs, government departments, and educational establishments, but it is often the connections between them that are most striking.[12]

Tension was nevertheless the inevitable corollary to the cooperation between these diverse social and institutional actors. As state representatives, scientists, entrepreneurs, and technicians interacted to gain the resources they needed from one another, they also discovered their differences. 'The state' sought to establish its control over a technology which, as Robert von Mohl and Friedrich List had anticipated, seemed designed to emancipate society and the economy. Railway companies were eager to ensure they obtained favourable terms in their pursuit of technological innovation and, of course, profit. Carl Steinheil and his counterparts in other German states, meanwhile, defended their intellectual property in an increasingly competitive knowledge market. All of this took place in an international context of technological innovation which stimulated competition between and within states. Until 1847, the fruits of collective labour outweighed the frustrations which it produced, and a productive tension reigned. But the friction between them eventually threatened to grind the process to a halt.

2.1 Between Interests, Expertise, and Authority

Steinheil's proposal in 1838 to trial the use of railway tracks as telegraphic conductors on the Nuremberg–Fürth railway line had been both pragmatic and scientific, but its implications had been wider-reaching. Given the state's demonstrated interest in the technology, and its support for Steinheil's work, the proposal required the government to engage with the relevant railway company, whose statutes had been granted by the king. In Steinheil's view, the possibility of employing tracks instead of wires to transmit electric signals could potentially simplify the construction of telegraph networks, but for the state it raised the prospect of negotiations with the railway companies involved.

As Steinheil began his trials, the minister of the interior wrote to the *Regierungspräsidien* of Oberbayern, Mittelfranken, and the Pfalz. These were the regions which were to host the construction of Bavaria's first railway branches, and the local governments were therefore asked to approach the companies concerned. In particular, the Minister wished to know the conditions under

[12] On the regional dimensions of German industrialization, see G. Herrigel, *Industrial Constructions: The Sources of German Industrial Power* (Cambridge, 1996); on individual regions see, for example, I. Burkhardt, *Das Verhältnis von Wirtschaft und Verwaltung in Bayern während der Anfänge der Industrialisierung (1834–1868)* (Berlin, 2001); on Saxony see H. Kiesewetter, *Die Industrialisierung Sachsens: Ein regional-vergleichendes Erklärungsmodell* (Stuttgart, 2007).

which they would allow for 'the government—and it alone—to be entitled to use the railway in question . . . for the conduction of electrogalvanic telegraphy, free of charge, and for the costs arising in constructing the railway for this purpose to be carried by their shareholders'.[13] Anticipating elevated costs, and in the hope of establishing its authority over any future network, the state thus put forward ambitious terms of negotiation.

Unsurprisingly, the response was not especially accommodating. To begin with, the managing committee for the railway from Nuremberg to the northern border explained that such a decision could not be made without the assent of a general assembly. In addition, it complained that, given the conditions already imposed on companies like theirs, it was 'alarming to burden these further with the construction costs for an object of benefit to the state; for in this way . . . the already reduced willingness to undertake such enterprises would continue to sink ever deeper, and eventually render their fulfilment unadvisable'.[14]

Nor were these businessmen the only obstacle to the project. The Nuremberg–Fürth segment had initially been chosen as the site for Steinheil's experiment partly in order to evaluate potential public uptake of the service. This particular line had been chosen because of the 'industrious' nature of the two towns concerned, which would provide a good sense of the future market for the telegraph.[15] In 1840, however, the postal officials in Nuremberg, as well as the municipal councillors and representatives of the *Handelsstand* (commercial estate) in Fürth, refused to allow the trial to go ahead, on the grounds that no new means of communication besides the railway was necessary.[16] The rifts between central and local government, private sector interests, and local businessmen had begun to emerge.

It was as a result of the two northern towns' objections that Steinheil's trials had been relocated in 1840 to the new railway under construction between Munich and Augsburg. From Interior Minister Karl von Abel's perspective, the shift was all the more advisable given that these 'two principal towns of the Kingdom promise more significant results and a more decisive and profitable success of the trial to be undertaken'.[17] This time, moreover, the *München-Augsburger Eisenbahn-Gesellschaft*'s enthusiastic commitment to the project exceeded the state's hopes. By now, it had been recognized that even specially modified tracks could not serve as conductors, and that telegraphy would have to rely upon wires. But these required much lower levels of investment, and so not only did the

[13] BHStA, MInn 45175/1, Abel to Präsidien of Oberbayern, Mittelfranken and the Pfalz, 13 June 1838.
[14] BHStA, MInn 45175/1, Provisorisch dirigierender Ausschuβ to Regierungspräsident Mittelfranken, 19 June 1838.
[15] BHStA, MInn 45175/1, 'Registratur abgehalten den 19 Nov. 1838', 19 Nov. 1838.
[16] BHStA, MInn 45175/1, Abel to Ludwig I, 13 Apr. 1840.
[17] BHStA, MInn 45175/1, Abel to Ludwig I, 13 Apr. 1840.

company allow the trial to go ahead, it even offered to pay for the whole affair, so long as it was granted use of the telegraph line when it was not needed by the state.[18] It was this request which appeared to puzzle Carl Steinheil: 'what use would the committee make of such a telegraph for its own purposes?' he had jotted down in his notes.[19] Soon, indeed, Steinheil was plunged into the conflict with the *Gesellschaft* evoked at the beginning of this chapter.

Even before the trials were carried out, Interior Minister Abel recognized that, although the state administration itself would make little use of the technology, its potential utility to the public raised the question of the government's attitude to communications networks. The telegraph was considered to be of 'analogous nature to the royal postal institution', and should therefore be placed within the latter's jurisdiction. In legal terms, to do so would empower the king to fund telegraphy with the state's revenue, particularly profits from the postal service. The king would thereby be acting constitutionally, as the undertaking was 'aimed at the common good (*das allgemeine Wohl*)', as a means 'of the greatest importance for the acceleration and facilitation of exchanges over great distances'. Steinheil's trial, meanwhile, would ensure that this initiative was not introduced 'and money spent, without first having experience of its utility and practicability'.[20] The government had thereby sought to establish its legal authority over the future institution and to defend as far as possible its financial interest in the matter.

With the creation of the *Königliche Eisenbahnbau-Kommission zu Nürnberg* in 1841, moreover, the state prepared the ground for its ownership of the railways. Together, it seemed, railways, telegraphs, and the postal service would promote institutional integration across the state, thereby supplementing King Ludwig I's policy of cultural assimilation which sought to unite the kingdom's disparate regions around a common sense of Bavarian identity.[21] But the establishment of the commission also made the state responsible for overseeing the trials and experiments necessary to develop a working telegraph installation. The government had thereby staked a claim to its competence in technical, as well as financial and logistical, matters.

Interior Minister Abel now began to question the viability of telegraph networks as a whole. 'The construction of telegraphs', he explained, 'is only of benefit when they extend over a significant distance, and leave other means of communications far behind in their speed of transmission.' The planned railway between

[18] BHStA, MInn 45175/1, Steinheil to Ludwig I, 23 July 1840.
[19] DMM, FA005/0582, Notes, undated.
[20] BHStA, MInn 45175/1, Abel to Ludwig I, 25 Apr. 1840.
[21] Z. Segal, 'Communication and State Construction: The Postal Service in German States, 1815–1866', *Journal of Interdisciplinary History*, vol. 44, no. 4 (Spring 2014), pp. 453–73; K. Amtmann, *Post und Politik in Bayern von 1808 bis 1850: Der Weg der königlich-bayerischen Staatspost in den Deutsch-Österreichischen Postverein* (Munich, 2006), pp. 136–245; N. Mayr, 'Particularism in Bavaria: State Policy and Public Sentiment, 1806–1906' (PhD Thesis, University of North Carolina, 1988), pp. 96–187.

Munich and Augsburg would already allow for messages to be sent and received in around two hours, and faster if necessary, and in his view 'the exchanges between the [two towns] are not of such significance that a faster means of communication should be necessary'. No advantage would be gained, nor the invested capital recuperated, before the line in question was extended at least to Nuremberg, if not beyond. The minister believed that it would be most advisable for the government, business, and private individuals to wait until such time as the railway had connected important, particularly commercial, towns.[22]

King Ludwig I's personal interest in the project appears to have kept it afloat, but by 1842 the government was met with Steinheil's refusal to cooperate further in the trials. Steinheil's frustration, noted earlier, was also tied to the government's earlier attempts to limit his rights to intellectual property protection. In 1838, the scientist had been denied a wide-reaching *Privilegium* which would have secured his technical competence and financial interest in the matter. Steinheil's trials had continued to help answer the questions posed by the *Eisenbahnbau-Kommission*, but by 1842 he was no longer willing to allow the state to draw benefits from his ideas without due compensation.[23] The scientist's personal interests and sphere of expertise had collided with the government's.

The conflict ultimately turned to Steinheil's advantage. As a member of the *Polytechnischer Verein*'s *Centralverwaltungsausschuß* (central administration committee), and by virtue of his position in the Academy of Sciences, he was well acquainted with the officials who made key decisions on the introduction and patenting of new technologies.[24] In the early 1840s, for instance, his colleagues on the *Centralverwaltungsausschuß* included the head of the *Eisenbahnbau-Kommission*, Friedrich August Pauli, and *Generalzolladministrator* Karl von Bever.[25] The society itself was a central point of convergence in Bavaria for officials as well as private entrepreneurs who shared an interest in innovation. Aware of his bargaining power, therefore, in July 1844 Steinheil defended his application for a *Privilegium* on the telegraph to his colleague Pauli, on the grounds that his invention was increasingly endangered 'from abroad', and that he deserved remuneration for his efforts.[26] Pauli and his commission had since examined other proposals for telegraph installations, but before long the absence of Steinheil's expertise was felt, and in 1844 Pauli recommended that his advice be sought on methods of telegraphic signalling.[27] The cost, it seems, was the granting

[22] BHStA, MInn 45175/1, Abel to Ludwig I, 12 May 1841.
[23] BHStA, MInn 45175/1, Regierung Oberbayern to MInn, 7 Aug. 1842.
[24] Donald E. Thomas, 'Der Polytechnische Verein in Bayern (1815-1933)', *ZBLG*, vol. 64 (2001), p. 440.
[25] 'Verzeichnis der Mitglieder des Polytechnischen Vereins', *KGB*, 19 (1841), Beilage, pp. 35–6.
[26] BHStA, MHI 16863, Steinheil to Pauli, 3 July 1844.
[27] For example, BHStA, MInn 45175/1, Regierung Schwaben und Neuburg to MInn, 14 Dec. 1843; BHStA, MHI 16863, 'Bericht der Eisenbahnbau-Kommission', 25 Apr. 1844.

of a five-year *Privilegium* on the invention, which was finally handed over on 30 August 1844.[28]

Across Germany, meanwhile, other telegraph apparatuses and systems were now being trialled along a number of railways. At the time of Steinheil's stand-off with the state, the Mannheim-based Anglo-German engineer William Fardely wrote to King Ludwig I with a proposal. Raising the monarch's expectations with the now standard promise that his apparatus would transmit entire words 'at the speed of thought, through space and time', he then proceeded to describe the far more mundane, rather less romantic, applications of the technology which he had in mind. Put simply, his telegraph would enable railway personnel constantly to be informed as to the whereabouts of trains along their single-track lines. Thus able to coordinate the passage of different trains, the state would be spared the need to construct double sections of track along the entirety of its railway lines, except in those places where two trains might be required to meet.[29]

Fardely's offer appears not to have been taken up in Bavaria, but his installation was soon being trialled near neighbouring Frankfurt am Main, along the private *Taunus-Eisenbahn*.[30] And it was around this time that the banker and entrepreneur David Hansemann insisted that a telegraph system be introduced along a section of his railway line, between Aachen and Ronheide.[31] By 1845, trials were taking place along the two first railway lines in Württemberg, a first trial was underway along the *Kaiser Ferdinands-Nordbahn* near Vienna, and soon private railway companies throughout Prussia were requesting permission to construct their own telegraph lines.[32]

As in Bavaria, across Germany state commissions were established in parallel to these private initiatives. In 1844, Major O'Etzel's *Telegraphen-Kommission* had been established in Prussia under the auspices of the Ministry of War, and it had begun conducting trials between Berlin and Potsdam in collaboration with a clockmaker, Ferdinand Leonhardt.[33] In Austria, Major von Mayern, head of the state's optical telegraph line, was charged with inquiring into the trials which had been undertaken along the *Kaiser Ferdinands-Nordbahn*. The operating company's adviser, Andreas Baumgartner, was then chosen to head the state's own telegraph department.[34] In Baden, the physics teacher and *Hofrat* Wilhelm Eisenlohr proposed similar trials along the state railway.[35] In the search for expertise, the boundary between state and civil society was thus more porous than one might expect.

[28] 'Bekanntmachung von Gewerbs-Privilegien', *KGB*, 23 (1844), p. 791.
[29] BHStA, MInn 45175/1, William Fardely to Ludwig I, 30 June 1843.
[30] Wessel, *Die Entwicklung*, p. 133. [31] Ibid., 149.
[32] Ibid., 45; Lobentanz, 'Zur Geschichte', p. 15; W. Löser, 'Die Rolle des preußischen Staates bei der Ausrüstung der Eisenbahnen mit elektrischen Telegraphen in der Mitte des 19. Jahrhunderts', *Jahrbuch für Wirtschaftsgeschichte*, vol. 4 (1963), p. 198.
[33] Wessel, *Die Entwicklung*, p. 150. [34] Lobentanz, 'Zur Geschichte', pp. 16–27.
[35] Wessel, *Die Entwicklung*, p. 58.

In Bavaria, the government's decision to take ownership of the railways removed a source of friction with the private sector but left it at the mercy of Steinheil, whose expertise was required. In Prussia and Austria, meanwhile, tensions continued to surface between the public and private actors involved in the railway industry. 'It has already become urgent to consider this matter seriously,' the Austrian Major von Mayern asserted, referring to the technology's inexorable onward march. 'Certain things which are to be [*die einmal sein müssen*], will be. If one does not take care of them, they will crop up like weeds. Such is the case of telegraphy for us.'[36]

The governments of both Prussia and Austria had experience in the field of optical telegraphy, which had been placed firmly under the authority of the state. For Mayern, this monopoly over the circulation of information was now in jeopardy. 'The *Akziengesellschaft* of the *Nordbahn* has decided to erect a galvano-magnetic line alongside the railway. It has already begun,' he wrote. 'Certainly we cannot believe that we will let things go along as they please, and that the state will forego its prerogative as though nothing were thereby lost, in favour of the plutocrats.'[37] 'It is claimed', he continued, 'that "this telegraph is only for the purposes of the railway service". But it can speak as it chooses, and so, were there a disturbance in Prussia or an uprising in Bohemia, Your Excellency would have to turn to Baron Rothschild [a key investor in the company] in order to find out how things stand out there.'[38] While the state and the railway sector depended upon one another in technical matters, indeed, they held diverging visions of the telegraph's future applications.

Similar misgivings were expressed within the Prussian government. In June 1846, in view of the growing number of railway companies conducting telegraph trials, Friedrich Wilhelm IV had already informed his finance minister, Eduard Heinrich Flottwell, that 'this cyphered language (*Zeichensprache*) appears just as important for the government as it is dangerous in the hands of private individuals, and must not therefore be left over to private industry'.[39]

In both Prussia and Austria, the solution appeared to be a system of concessions, whereby telegraph wires were to be built along private railway lines under certain conditions, which ensured the state's ability to control their usage. From January 1847, it was announced that in Austria, 'given the importance which telegraphic connections have for the public administration . . . from now on no private individual nor any association will be given authorisation to construct telegraphs without first obtaining permission from the Kaiser himself'.[40] The parallel discussions which took place in Prussia have been interpreted as a

[36] Lobentanz, 'Zur Geschichte', p. 16. [37] Ibid., p. 17.
[38] Ibid., p. 17. On the Rothschilds' involvement in the Austrian railway industry, see N. Ferguson, *The World's Banker: The History of the House of Rothschild* (London, 1998).
[39] Löser, 'Die Rolle des preußischen Staates', p. 194. GSTA Document. [40] *EBZ*, 21 Feb. 1847.

demonstration of a conservative-aristocratic regime's fear of rising bourgeois forces.[41]

But the authoritativeness of statements such as Prussian Finance Minister Flottwell's belied the state's ultimate dependency upon the private sector. In Prussia, for instance, an initial decision to oblige companies to employ civil servants in the running of their telegraph lines was overturned. Early in 1847, the *Telegraphen-Kommission* came to the conclusion that, not only would this condition be a considerable burden for the railway companies, the state could then also be held responsible for any railway accidents which were linked to signalling errors.[42] Having considered the matter further, the commission then added that the obligation to employ civil servants would result in companies refusing to build any telegraph lines at all. And yet, as it explained, 'if they are not built by the companies, then it is unlikely that any will be built for state or public correspondence either'. The commission thereby recognized the limits to the government's power, and the need to cooperate with the private sector: 'for the companies have no obligation to allow the state to build telegraphs along their lines, and they would therefore only permit such construction upon onerous conditions', which would make the undertaking unprofitable and undesirable.[43]

The companies, for their part, needed to gain permission for their projects from a government as yet uncertain of its attitude to industrial capital. The conditions which the commission proposed to attach to the government's concessions were a considerable compromise and allowed railway companies to use their own employees to operate the telegraph installations. The decision met opposition from within the government, however. For Minister Graf zu Stolberg, these relaxed conditions relinquished security and authority to particularly bourgeois forces: 'the distinct composition of the railway managements, upon which the government has little influence, and in which one finds many men from the commercial estate (*Handelsstand*) cannot go unnoticed . . . .'[44]

Pressure was being exerted on both parties. The state, whatever its misgivings, could not expect telegraph lines to be built if it set excessively stringent conditions. For a number of railway companies, on the other hand, the safety and profitability of their enterprise now depended upon this new means of communication. As the finance minister's commissioner explained in July 1847, 'The decision as to the organization of the state telegraphs could go on for some time yet . . . But for now it is above all a question of establishing the conditions of the concessions as quickly as possible, so that the railway companies might carry out this installation for the improvement of safety of their service before the beginning of winter, as requested by a number of them.'[45]

[41] Löser, 'Die Rolle des preußischen Staates'. [42] Ibid., p. 196. [43] Ibid., p. 197.
[44] Ibid., p. 199. [45] Löser, 'Die Rolle des preußischen Staates', p. 201.

Across Germany, by 1847 the development of telegraphy had enrolled many different actors, encouraging them to cooperate in the financial, logistical, and technical management of the process. As they had done so, however, they had also sketched out the boundaries separating their respective spheres of interest, authority, and expertise, causing friction between them. The problem was widespread in Europe: in Britain, the relationship between Cooke and Wheatstone was famously fraught, both claiming priority in inventing the telegraph and negotiating deals with railway companies; in France, attempts by the existing telegraph administration to introduce the electric system in 1842, supported by the scientist François Arago, were thwarted by parliament's fear that it would threaten national security.[46] In Germany, the rubbing of interests and personalities was soon to become problematic.

2.2 The Landscape of Innovation

It was through the major German newspaper, the *Allgemeine Zeitung*, that Bavarian Interior Minister Abel had heard of Cooke and Wheatstone's telegraph installation on the Great Western Railway in Britain. Noting the similarities in both construction and purpose between the British invention and Carl Steinheil's, he had asked the Foreign Minister to obtain as much information as possible on the topic from the Consul in London.[47] A few years later, in 1845, the king himself read in the *Allgemeine Zeitung* of a trial carried out in Paris and ordered his ambassador in France to gather reports on the details of its construction.[48] Indeed, the French parliament had by now been convinced of the technology's utility by an expert commission and allowed a line to be built along the Paris–Rouen railway line.[49] This time, chief engineer Pauli of the state's *Eisenbahnbau-Kommission* was charged with investigating the trials in question.

As he explained to Abel, the purpose of the French telegraph was still primarily railway signalling—though ordinary correspondence might, in theory, be possible in future. For now, he recommended pursuing the tests underway along the Munich–Augsburg line, with the help of 'expert physicists'—Steinheil in particular—'so that Bavaria may not lag behind other countries in the practical implementation of this important achievement of science'.[50] Forwarding Pauli's report, the minister in turn called for haste: the telegraph was well and truly established in England, and it was now also in operation between Paris and

[46] Fari, *Victorian Telegraphy before Nationalization*; Bertho, *Télégraphes & téléphones*, pp. 70–3.
[47] BHStA, MInn 45175/1, Abel to Gise, 14 Dec. 1839.
[48] BHStA, MH 16863, MA to Gesandschaft Paris, 7 June 1845.
[49] Bertho, *Télégraphes & téléphones*, pp. 72–3.
[50] BHStA, MH 16863, Pauli to Abel, 17 Oct. 1845.

Versailles, as well as Saint-Germain. Even the Austrian government was planning a number of railway telegraph connections, he explained.[51]

Public and private channels thus intersected in stimulating the telegraph's development across Europe during the 1830s and 1840s. Through newspapers, journals, letters, and face-to-face interactions, information was being exchanged between monarchs and ministers, engineers and entrepreneurs, scientists and civil servants, connecting numerous hubs of knowledge production and consumption scattered across a broad landscape of innovation. As this 'useful knowledge' was shared, discussed, and modified, the contours of a new field of expertise began to emerge.

The Prussian state's efforts to remedy its industrial 'backwardness' in relation to Western Europe are well documented. Whether by means of espionage and official visits, or by subsidizing apprenticeships abroad for students of state institutions such as the *Gewerbe-Institut*, various strategies of 'technology transfer' had been employed to import the requisite knowledge and materials.[52] The practice continued in the 1840s, and both the Prussian and the Bavarian embassies implanted across Western Europe were repeatedly called upon to obtain information locally on the development of the telegraph.[53] Despite the considerable amount of home-grown talent in this field, England, in particular, shone like a beacon of progress in the landscape and was the prime destination for technological pilgrimages.

Notwithstanding Steinheil's own work, for instance, and no doubt due to his strained relations with the Bavarian government, Friedrich August Pauli travelled to England in 1843/4 and reported back that Wheatstone's invention there had been 'brought to a level of perfection, which leaves little more to be desired'.[54] In the summer of 1845, Johann Wilhelm Wendt, the captain, entrepreneur, and engineer behind Bremen's trials in electrical telegraphy made his second journey to England for the same purpose.[55] A few years later, *Hofrat* Wilhelm Eisenlohr was sent from Baden to discuss telegraphy with Charles Wheatstone himself.[56] Not all pilgrims travelled with the support, or on behalf, of state institutions, however: the Anglo-German engineer William Fardely, for his part, had moved to England in 1840 specifically for the purpose of training as a 'telegraph engineer',

[51] BHStA, MH 16863, Abel to Ludwig I, 13 Jan. 1846.

[52] W. Weber, 'Preussische Transferpolitik 1780 bis 1820', *Technikgeschichte*, vol. 50 (1983), pp.181–96; W. Weber, 'Industriespionage als Technologie Transfer in der Frühindustrialisierung Deutschlands', *Technikgeschichte*, vol. 42 (1975), pp. 287–305.

[53] The Prussian reports, for instance, are collected in GStA I.HA Rep.120 HA Handelsamt, Nr.179.

[54] BHStA, MH1 16863, Abel to Ludwig I, 13 Jan. 1846.

[55] StAB, 2-R.15.b.1, Petition to Senat, 28 Oct. 1845.

[56] R. Seidel, 'Verkehrsmittel Telegraph: Zur Geschichte der Telegraphie im 19. Jahrhundert bis 1866 unter besonderer Berücksichtigung des Raumes Hannover–Bremen' (PhD Thesis, University of Hanover, 1980), pp. 142–4.

and he published a translation of some of Wheatstone's work upon his return in 1844.[57]

The flow of information from abroad was also supported by a growing literature on the topic. The role of the *Allgemeine Zeitung* in spurring the Bavarian authorities to emulate developments abroad, for instance, hints at the increasingly open market on which ideas were now exchanged. The point was expressed to the Bavarian king by his envoy Graf von Luxburg, when he expressed his admiration for the new technology: 'These new telegraphic means of connection transmit messages to and from the furthest points with the speed of a lightning bolt.' He assumed that the king had already ordered his administrators to collect information on all new inventions and discoveries in the field of railway construction, as well as to submit all relevant literature and newspaper articles to expert examination, adding: 'In this regard, secrecy rules nowhere, everything is accessible to everyone [!]'[58]

The information they sought was certainly out there, as a periodical culture strengthened its hold on practices of scientific communication.[59] *Dinglers Polytechnisches Journal*, in particular, was a crucial vehicle for foreign knowledge into the German-speaking world. Of the sixty-four articles on telegraphy which it published between 1840 and 1847, just over half (thirty-three) were drawn from British journals, especially the *Mechanics' Magazine*. A further eighteen were taken from French journals, among them the *Echos du monde savant,* the *Comptes rendus*, and the *Moniteur industriel*. As far as can be ascertained, only nine articles were either purpose-written or drawn from another German-language source. All nine articles in question dealt with developments occurring in Germany itself or with German individuals' contributions to the technology.[60]

Of course, this bias was partly a result of the editor's strategy of providing access to those sources most difficult for his readers to obtain, and only since the late 1830s had *Dinglers* begun to rely on German sources for its articles.[61] On the other hand, the disproportion also supports the argument that by the early 1840s German technical literature lacked not so much in variety as in the quantity of original contributions.[62] The journal also served more practical purposes, in that it regularly recorded patents which were issued on inventions abroad. In its early

[57] V. Aschoff, *Geschichte der Nachrichtentechnik*, vol. 2, *Nachrichtentechnische Entwicklungen in der ersten Hälfte des 19. Jahrhunderts*, 2nd edn. (2 vols., Berlin, 1995), ii, pp. 173–80.

[58] BHStA, MHI 16863, Graf von Luxburg to Ludwig I, 16 June 1845.

[59] Christina Jungnickel and Russell McCormmach, *Intellectual Mastery of Nature: Theoretical Physics from Ohm to Einstein* (2 vols., Chicago, 1986), i, pp. 34–9, 114–28; L. U. Scholl, *Ingenieure in der Frühindustrialisierung: staatl. u. private Techniker im Königreich Hannover u. an d. Ruhr (1815–1873)* (Göttingen, 1978), p. 274; F. Fischer, 'Dinglers Polytechnisches Journal bis zum Tode seines Begründers (1820–55)', *Archiv für Geschichte des Buchwesens*, vol. 15 (2007), pp. 1027–142, here pp. 1029–36.

[60] These figures were established on the basis of the contents listings and an overview of each volume of *DPJ* between 1830 and 1880 (vols. 35–238).

[61] Fischer, 'Dinglers Polytechnisches Journal', pp. 1040–3, 1080–2, 1092.

[62] Ibid., p. 1095.

years, these had constituted its main source of information on technological developments outside Germany.[63] Over time, however, they also enabled keen German innovators to evaluate their potential market—it was widely held, for instance, that England liberally granted patents to foreign as well as native inventors.[64]

The information contained in periodicals such as *Dinglers* was also collected in particular sites. The Prussian *Technische Deputation*, for instance, bore responsibility for the evaluation of patent applications sent from any private citizen. In the early 1840s, the *Deputation* received applications from foreign agents requesting permission to import telegraph apparatuses, but also proposals for innovations in telegraphy from merchants and even high-school teachers such as August Kramer in Nordhausen.[65] When evaluating these applications, officials could turn to an extensive literature contained in its library, of which a catalogue published in 1853 gives an outline. The '*Repertorium der technischen Literatur*' lists 113 journals published between 1823 and 1853, containing articles on an enormous variety of topics.[66] The *Deputation* had become a crucial hub in the Prussian and German landscape of innovation, a repository of knowledge and a nexus between the state and amateur or professional inventors within society.

Of the journals recorded in the *Repertorium*, around forty-nine were German-language publications (including Austria–Hungary and Switzerland), and sixty-four were published both abroad and in a foreign language.[67] Britain and France loomed large, with twenty-seven and twenty-five publications respectively, followed far behind by francophone Switzerland (five) and the USA (four).[68] Over the period 1823–53 covered by the catalogue, a total of 190 articles were recorded under the heading '*Telegraphie*'. Of these, as far as can be ascertained, eighty-five were published exclusively in foreign-language journals. A further sixty-seven were published in both German-language and foreign journals, primarily British and French publications. *Dinglers* had published fifty-four of these, further confirming its importance in the transmission of news from abroad. Thus, 152 of a total of 190 articles were almost certainly of foreign origin.[69]

Only thirty-eight articles appear to have been drawn exclusively from German sources, usually other journals or newspapers, or purpose-written pieces. Narrowing down the interval to the period 1823–47, however, we find that only nine articles were of exclusively German origin, the remainder published between 1847 and 1853.[70] Despite the various trials taking place in Germany at the time, therefore, publications on the topic appear to have been more widespread in Britain and France at an earlier date.

[63] Ibid., p. 1089. [64] ibid., p. 1089.
[65] See the reports in GStA, I.HA Rep.120 MfHuG, D XIV 2, Nr.16, Bd.1–9.
[66] E. L. Schubarth (ed.), *Repertorium der technischen Literatur, die Jahre 1823 bis 1853 einschl. umfassend* (Berlin, 1853), pp. iii–xvi.
[67] Ibid. [68] Ibid. [69] Schubarth, *Repertorium*, pp. 874–8. [70] Ibid.

Overall, the bias in the literature in favour of foreign knowledge was contributing to a perception of backwardness, whatever its basis in reality. In 1847, *Dinglers* reproduced an article which had been published in a supplement to the *Allgemeine Zeitung*, and which expressed this ambiguity, both evoking the region's potential head start in telegraphy and the implicit anxiety that this advance may be lost: 'It is to be hoped that in our time of newly blossoming German national sentiment there will be enough participation in the German spirit of invention and German industriousness in affairs in which our fatherland not only does not lag behind the best of that abroad, but is everywhere well ahead.'[71]

In Bavaria too, innovation was supported by a nexus of people and institutions. The *Polytechnischer Verein*, as evoked earlier, was composed of both state officials and private citizens, and was charged with the assessment of patent applications. The society's *Kunst- und Gewerbe-Blatt* served to diffuse knowledge of these patents, as well as other developments which its members found noteworthy. The journal testifies in particular to Carl Steinheil's active participation in other fields of engineering, and records at least one of the *Privilegien* which he received on optical instruments.[72] But advice was also sought elsewhere in the government's efforts to keep up with developments. After reading reports of the Englishman Mr Highton's improvements to the technology in the *Allgemeine Zeitung*, for instance, King Ludwig I asked the *Akademie der Wissenschaften* to inquire into the matter.[73]

The articles published in *Dinglers*, meanwhile, also point to the changing contours of the field of telegraphy. As before, some contributors proposed particularly ambitious innovations. In 1841, for instance, the Swiss physicist Jean-Daniel Colladon was exploring the possibility of transmitting sound through water.[74] In 1846, a certain Romershausen suggested that his 'telephone'—a system based on the transmission of speech through underground tubes—was more secure than electric telegraphs, whose wires could easily be damaged, and that it would be of particular use 'to public and commercial exchanges' [*für den bürgerlichen und commerciellen Verkehr*].[75] Compared with the 1830s, however, the majority of articles had come to focus more specifically on the concrete developments and trials which were taking place in the field of electrical telegraphy throughout Europe and the USA.

In 1838, *Dinglers* thus informed its readers of both Steinheil's experiments and Charles Wheatstone's planned trial along the Great Western Railway in London.[76]

[71] Anonymous, 'Telegraphie in Deutschland', *DPJ*, vol. 105 (1847), pp. 457–9.

[72] 'Gemeinnützige Mittheilungen und Bekanntmachungen', *KGB*, vol. 14 (1836), p. 340.

[73] BHStA, MH 16863, Vorstand der Akademie der Wissenschaften to Ludwig I, 4 Feb. 1847.

[74] D. Calladon, 'Ueber den Schall im Wasser; Ein Schreiben des Hrn. Daniel Calladon an Hrn. Arago', *DPJ*, vol. 82 (1841), pp. 226–30.

[75] E. Romershausen, 'Über das Telephon', *DPJ*, vol. 99 (1846), pp. 413–15.

[76] Anonymous, 'Elektrischer Telegraph an der Great-Western-Eisenbahn', *DPJ*, vol. 70 (1838), p. 235; Anonymous, 'Über Steinheil's elektro-magnetischen Telegraphen mit betreffenden historischen Notizen', *DPJ*, vol. 67 (1838), pp. 388–400.

Between 1838 and 1845, this was followed up by a further five articles tracing the improvements which Wheatstone and his collaborator Cooke later made to their system. Further reports included descriptions of the American Samuel Morse's telegraph in 1839 and 1846, of the trials conducted on David Hansemann's railway between Aachen and the Belgian border in 1843, of those taking place in France on the Paris–Rouen railway line in 1845, of the experiments taking place in Bavaria, as well as of those carried out by William Fardely along the *Taunus-Eisenbahn* in 1846.[77] These experiments were more than local affairs, therefore, their results being communicated to the broader interested public.

Both in Germany and abroad, the vast majority of articles on telegraphy were still published in relatively wide-ranging, 'polytechnical' journals. This reflected the fluidity of the engineering community that was only then emerging throughout Europe and America, and the slow onset of professionalization around mid-century.[78] It also demonstrates that the field of 'telegraphy' remained considerably broad. There was no dedicated German-language journal for specialists in the technology until 1854, when the *Zeitschrift des Deutsch-Österreichischen Telegraphen-Vereins* was first printed. The only two articles published in *Dinglers* between 1840 and 1847 which were drawn from specialist journals—whether German or foreign—came from the *Archiv für Eisenbahnen*, a field which had already received much greater attention and investment from both the state and the private sector.[79]

At this stage, telegraphic technology was often discussed in the context of railway engineering, which was a recognized field of expertise. Until the first report of Charles Wheatstone's experiments on the Great Western Railway in 1838, only one mention had been made of the possible use of telegraphy for railways.[80] By the 1840s, the two fields had become almost indistinguishable, as articles reported either on existing trials along particular railway lines or on proposals for telegraphic forms of railway signalling. The use of electrical telegraphy for ordinary correspondence was occasionally evoked, but such concerns had taken a back seat. In any case, there was still too little differentiation in the operation of telegraph lines for railway signalling or for ordinary communication—the two aims were complementary. As the railway sector grew

[77] Anonymous, 'Über Morse's elektromagnetischen Telegraphen', *DPJ*, vol. 72 (1839), pp. 221–2; Anonymous, 'Morse's elektromagnetischer Telegraph', *DPJ*, vol. 99 (1846), pp. 48–55; Anonymous, 'Elektrischer Telegraph auf der Eisenbahn von Aachen zur belgischen Grenze', *DPJ*, vol. 89 (1843), pp. 256–6; Anonymous, 'Arago, über elektrische Telegraphen', *DPJ*, vol. 96 (1845), pp. 486–9; Oscar v. Schllerer, 'Über Sicherheitsvorrichtungen an den Ausweichstellen der Eisenbahnen', *DPJ*, vol. 99 (1846), pp. 242–7; Anonymous, 'Der elektrischer Telegraph auf der Taunus-Eisenbahn', *DPJ*, vol. 101 (1846), pp. 478–80.

[78] K. Gispen, *New Profession, Old Order: Engineers and German Society, 1815–1914* (Cambridge, 1989), pp. 7–56.

[79] Anonymous, 'Cooke's elektro-magnetischer Telegraph', *DPJ*, vol. 89 (1843), p. 317; Anonymous, 'Elektrischer Telegraph auf der Eisenbahn von Aachen'.

[80] Anonymous, 'Eisenbahnen in Verbindung mit Telegraphen', *DPJ*, vol. 56 (1835), p. 74.

in importance, however, and its objectives diverged from those of the state, a further zone of friction would emerge between them.

The apparatuses developed during this period reflected these trends. This was the era of the *Zeigertelegraph*, or pointer-telegraph, developed specifically for its simplicity and ease of use by untrained railway personnel. Although slower than the original needle-telegraphs developed by Cooke and Wheatstone in Britain, even the latter turned to this design in 1840, recognizing the greater reliability of the pointer systems. While other 'printing' and 'needle' telegraph apparatuses continued to be developed during the early 1840s, the best-known names in the field—Leonhardt, Stöhrer, Fardely, and Siemens—all also constructed and trialled pointer-telegraphs during this period.[81] When William Fardely evoked the possibility of introducing printing telegraphs more adapted to the use of governments, he added that this was to be an accessory to the signalling mechanisms installed.[82] Attention was thus increasingly towards the needs of the railways, specifically.

Optical telegraphs, meanwhile, were still in operation, and proposals for their modification and improvement were also put forward. A certain G. A. Treutler, in particular, crops up repeatedly in contemporary literature as well as archival material. Having applied to the Prussian *Technische Deputation* for a patent on his optical telegraph in 1842, his proposal was under consideration two years later.[83] In the face of competition from new telegraph mechanisms, even Treutler had now adapted his system to the purposes of railway signalling, arguing that his contraption was more reliable than the recent electrical fad. On the basis of the Prussian *Deputation*'s assessment, Treutler's optical telegraph was in use along the Nuremberg–Bamberg line in Bavaria in 1845 and would continue to arouse interest until the end of the decade.[84] Even as trials using the electric telegraph continued along the Munich–Augsburg railway in 1846, the Bavarian administration was considering his proposal.[85] The same year, Treutler published an article in *Dinglers* emphasizing the indispensability of optical telegraphs alongside the railways.[86] The older technology had not yet drawn its last breath and had been adapted to the needs of the sector most interested in telegraphy.

The development of the telegraph was thus dependent upon an expanding knowledge market. Supported by a periodical technical literature in particular, but also by the press, individual travel, and channels of diplomatic correspondence, information on the technology circulated between key people and places across Germany, Europe, and, to a lesser extent, the United States. As ideas were

[81] Aschoff, *Geschichte der Nachrichtentechnik*, ii, pp. 162–89.
[82] BHStA, MInn 45175/1, William Fardely to Ludwig I, 30 June 1843.
[83] GStA, I. HA Rep. 120 MfHuG D XIV 2 Nr. 16, BD. 1, 'Patentgesuch', Nov. 1842; cf. Anonymous, 'Treutler's Tag- und Nacht-Telegraph', *DPJ*, vol. 98 (1845), pp. 417–21.
[84] BHStA, MH 16863, 'Bericht der Eisenbahnbau-Kommission', 17 Oct. 1845; see also BHStA, MHI 16863, Treutler to Ministerium des Innern, 9 Apr. 1847.
[85] BHStA, MH 16863, Ministerium des Äusseren to Ministerium des Innern, 6 Feb. 1846.
[86] G. A. Treutler, 'Über Signale auf Eisenbahnen', *DPJ*, 99 (1846), pp. 84–93.

exchanged, the boundaries of an emerging field came into sharper focus. Initially encompassing the complementary aims of railway signalling and ordinary correspondence, distinct fields of specialization were slowly emerging.

2.3 Strategies of Innovation: Werner Siemens

The young Prussian lieutenant Werner Siemens was strategically positioned within this landscape of innovation, with social connections to the military establishment, key scientists, tradesmen, and industrial entrepreneurs in an increasingly vibrant Berlin. Born in 1816, he was trained between 1835 and 1838 as an officer at the *Vereinigte Artillerie- und Ingenieurschule* (*VAIS*) in the Prussian capital.[87] As a future artilleryman, he studied a broad range of subjects, from modern languages to the art of military fortifications, but it was his interest in the sciences which proved most enduring. At the *VAIS*, indeed, he was taught by a number of young academics who were later to become eminent professors, including Martin Ohm, younger brother of Georg, who had himself taught at the *VAIS* a few years earlier. Of most influence on Siemens's future career, however, was Heinrich Gustav Magnus, a physicist and future rector of the University of Berlin.[88] In many ways, the military school constituted a hub of knowledge in Prussia, fed by the competitive academic job market which led many aspiring professors to tour Germany in search of employment.[89]

When he left the *VAIS* in 1838, Werner Siemens was stationed in Wittenberg, Magdeburg, and Spandau, but he returned to Berlin for good in 1842. He initially remained an active officer in the Prussian artillery regiment, a position which once again placed him at the heart of a centre of innovation. Indeed, the artillery was the branch of the Prussian army which had first shed its attachment to quasi-feudal visions of medieval warfare and recognized the benefits of 'modern' technology during the 1830s.[90] Siemens therefore worked with and in close proximity to two commissions involved in technological experimentation: the *Artillerie-Prüfungs-Kommission* (Artillery Testing Commission), and the department headed by Major O'Etzel, who came to lead the *Telegraphen-Kommission* set up in 1844.[91]

[87] J. Bähr, *Werner von Siemens, 1816–1892* (Munich, 2016). See also M. Lutz, *Carl von Siemens, 1829–1906: Ein Leben zwischen Familie und Weltfirma* (Munich, 2013).

[88] W. von Siemens, *Lebenserinnerungen*, ed. W. Feldenkirchen (Munich, 2008), pp. 56–7; Jungnickel and Mccormmach, *Intellectual Mastery*, i, pp. 52–8.

[89] K. Jarausch, 'The Sources of German Student Unrest 1815–1848', in L. Stone (ed.), *The University in Society* (2 vols., Princeton, 1974), ii, 533–70.

[90] E. D. Brose, *The Politics of Technological Change in Prussia: Out of the Shadow of Antiquity, 1809–1848* (Princeton, 1993), 164–89; Dennis Showalter, *Railroads and Rifles: Soldiers, Technology and the Unification of Germany*, (Hamden, Conn., 1975), pp. 143–60.

[91] Brose, *Politics*, p. 170; Wessel, *Die Entwicklung*, p. 150.

It was through his work on the *Artillerie-Prüfungs-Kommission* during the early 1840s that Siemens came into contact with Ferdinand Leonhardt, the Berlin-based clockmaker, who later also worked for O'Etzel's commission. As a trained artisan, Leonhardt represented a pool of traditional expertise within society upon which state institutions could draw in their efforts at 'modernization'. He collaborated with Siemens in designing a mechanism to measure the speed of projectiles, and was soon tinkering with an imported model of Charles Wheatstone's telegraph apparatus on behalf of the telegraph commission.[92]

Having until then shown little interest in the matter, in early July 1846 Werner Siemens found himself attending one of the trials which Leonhardt was conducting at the home of *Hofrat* Soltmann, the father of one of his brigade comrades.[93] Later describing the events of that day to his younger brother Wilhelm, Werner explained that he had 'found Leonhardt in a great scrape, because his newly constructed telegraph was making errors which he couldn't explain. As their cause was immediately clear to me, I showed him how he might avoid them.'[94] Siemens's observations then led him to reflect upon the problems which the clockmaker had been facing, and to develop the *Zeigertelegraph* which would make his name.

At first glance, Siemens thus appears to have operated firmly within the context of state efforts to develop the telegraph, particularly within the military establishment. The trials taking place at *Hofrat* Soltmann's home, however, were the result of a broader exchange of ideas and materials across state and society. In 1841, Soltmann, an apothecary by trade, had applied for and obtained an *Einführungspatent* (patent of importation) from the *Technische Deputation* to import Charles Wheatstone's telegraph apparatus from England.[95] He was thus among the many ordinary individuals bombarding the Prussian authorities with proposals and patent requests for innovations in telegraphy.[96] Having no doubt consulted the literature listed in its *Repertorium*, the *Deputation* had approved Soltmann's request.

Siemens, Soltmann, and Leonhardt, moreover, were acquainted outside the military establishment. All three were members of the *Physikalische Gesellschaft* (Physics Society), a learned society which had grown out of a circle of young students at the University of Berlin, who regularly gathered at the home of their professor, the physicist Heinrich Gustav Magnus.[97] Siemens had himself been taught by Magnus during his days at the *VAIS*, and upon his return to Berlin his

[92] Siemens, *Lebenserinnerungen*, pp. 83–5. [93] Ibid., p. 84.

[94] Werner to Wilhelm, 15 July 1846, in C. Matschoβ (ed.), *Werner Siemens. Ein kurzgefaβtes Lebensbild nebst einer Auswahl seiner Briefe* (2 vols., Berlin, 1916), i, pp. 16–17.

[95] GStA, I. HA Rep.120 MfHuG D XIV 2 Nr. 16, Bd.1, 'Patentgesuch Soltmann', 10 May 1842.

[96] These proposals and requests can be found in the *Geheimes Staatsarchiv*: GStA I. HA Rep.120 MfHuG D XIV 2 Nr. 16, Bd.1.

[97] W. Schreier, M. Frankeunter, and A. Fiedler, 'Geschichte der Physikalischen Gesellschaft zu Berlin 1845–1900', *Physikalische Blätter*, 51, no. 1 (1995), p. 11.

mentor had invited him to join the group which formed the *Gesellschaft* in 1845.[98] Among them were a number of individuals who were to rise to prominence in the German science—in particular, Emil Du Bois-Reymond and Hermann Helmholtz. Both were at the beginning of their career in the 1840s, each investigating, in his own way, the physical, indeed electrical, basis of nervous stimulation. Through this social network, Siemens was kept abreast of developments in the field and exchanged scientific knowledge—in 1845, for instance, he presented some work on the use of electricity in measuring speed to the *Gesellschaft*, while Du Bois-Reymond discussed his research on the effects of currents on the nerves.[99]

In addition to these social connections, Werner Siemens plugged into the channels of information circulation. In 1845, for instance, he wrote articles for both *Dinglers* and the prestigious, more academically oriented *Poggendorff*'s *Annalen der Physik*.[100] As he explained to his brother, moreover, at the time he observed Leonhardt's telegraph in July 1846 he had 'been working on a history of electrical telegraphy for the annual report of the *Physikalische Gesellschaft*'.[101] After considering the topic in more depth, he was pleased to announce, 'lo and behold, I arrived at truly brilliant results, which gave me a more secure vision of recasting the whole system'.[102] Siemens's introduction to the field of telegraphy had therefore been the product of the military establishment's technological investigations, of *Hofrat* Soltmann's personal interests, of the *Deputation*'s assessment of the technology, and of clockmaker Leonhardt's professional expertise, and he was then able to channel his reflections back into the pool of knowledge upon which all depended.

Siemens's telegraph apparatus itself came to join the collection of objects being examined, tested, and adapted across Germany. He initially entrusted its construction to the man with whom, arguably, it had been developed—Ferdinand Leonhardt. Yet the clockmaker had also applied for a patent of his own and was now Siemens's competitor.[103] By October 1846, therefore, Siemens complained to his brother that his partner had been absent for six weeks, busy installing his telegraph on the Thuringian railways.[104] As Leonhardt clearly had contracts of his own to fulfil, the partnership was soon dissolved.[105]

The breakdown in relations between Siemens and Leonhardt highlighted the fact that both now operated in a competitive market. From the outset, indeed,

[98] Siemens, *Lebenserinnerungen*, p. 79. [99] *Fortschritte der Physik* (1847).
[100] W. Siemens, 'Ueber die Anwendung des erhitzten Lufts als Triebkraft', in *Gesammelte Abhandlungen und Vorträge* (Berlin, 1881), pp. 1–8; W. Siemens, 'Anwendung des elektrischen Funkens zur Geschwindigkeitsmessung', in ibid., pp. 23–32.
[101] Werner to Wilhelm, 15 July 1846, in Matschoβ, *Werner Siemens*, i, pp. 16–17. [102] Ibid.
[103] GStA, I. HA Rep. 120 MfHuG D XIV 2 Nr. 16, Bd. 1, 'Patentgesuch, F. Leonhardt', 3 Sept. 1846.
[104] SCA, W1590, Werner to Wilhelm, 1 Oct. 1846.
[105] SCA, W1593, Werner to Wilhelm, 11 Dec. 1846; Werner to Wilhelm, 4 Jan. 1847, in Matschoβ, *Werner Siemens*, i, p. 32.

Werner had set his sights high and had intended to hand over all Prussian-related affairs to Leonhardt so as to concentrate on overseas business.[106] To that end, in the summer of 1846 Werner had turned to his brother Wilhelm in London to inquire about existing English patents in telegraphy, particularly those which Professor Wheatstone might already possess.[107] Investigating the conditions for the sale of his apparatus, a few months later, he once again requested that Wilhelm send him 'brochures' about the professor's apparatus.[108]

It was in fact Wilhelm who encouraged his older brother to focus first on Prussia. Writing to Werner in December 1846, he explained that although Britain was very liberal in issuing patents, the result was a situation in which 'out of the 6,000 patents which are currently valid in England, around 2,000 have any meaning, but barely 60 provide any decent revenue'.[109] Wilhelm suggested instead that Werner concentrate on Prussia, where he was best known, and obtain a contract for the construction of a telegraph line there. Only then would it be time to apply for foreign patents, 'particularly in England where the enthusiasm for electro-telegraphy has not yet been aroused [?!]'.[110] Eight months later, as Werner's situation in Prussia began to stabilize, he would once again insist they explore the English market.[111]

Siemens faced competition at home too. Within weeks of developing his first apparatus, in August 1846, a certain Dr August Kramer made his first, but by no means last, appearance on Siemens's entrepreneurial radar. Kramer, a teacher at a *Gymnasium*, had developed a printing telegraph which was said to perform 'wonderful things', and which had gained the approval of the Prussian *Telegraphen-Kommission*'s scientific adviser, Professor Heinrich Wilhelm Dove.[112] A few months later, Kramer was presenting his apparatus in Leipzig, to a broad audience of 'scientifically eminent men, as well as a few railway directors and officials (*Beamte*)'. In a display of his machine's capabilities, he telegraphed a short poem: '*Kleine. Zeichen. in. der. Runde / Geben. Dir. die. sich're. Kunde / Selbst. bei. Nacht. aus. tiefem. Schlaf / Wecket. Dich. der. Telegraph*'.[113]

The German market soon also witnessed direct foreign competition, when a certain William Robinson arrived in Hamburg from the United States in 1847 seeking to spark interest in Samuel Morse's telegraph (without, as it turns out, Morse's authorization).[114] He too conducted public experiments and called for

[106] Werner to Wilhelm, 20 Aug. 1846, in Matschoβ, *Werner Siemens*, i, pp. 18–9.
[107] Werner to Wilhelm, 15 July 1846, in Matschoβ, *Werner Siemens*, i, p. 17.
[108] Werner to Wilhelm, 19 Nov. 1846, in Matschoβ, *Werner Siemens,* i, p. 27.
[109] Wilhelm to Werner, 22 Dec. 1846, in Matschoβ, *Werner Siemens*, i, 30.
[110] Wilhelm to Werner, 22 Dec. 1846, in Matschoβ, *Werner Siemens*, i, p. 30.
[111] Werner to Wilhelm, 10 Aug. 1847, in Matschoβ, *Werner Siemens,* i, p. 41.
[112] Werner to Wilhelm, 20 Aug. 1846, in Matschoβ, *Werner Siemens*, i, p. 18.
[113] *EBZ*, 10 Jan. 1847.
[114] F. Pichler, 'Digitale Kommunikation in der K.K. Monarchie: Die Errichtung der elektrischen Telegrafie in Österreich um 1850', *Elektrotechnik und Informationstechnik*, 121, no. 1 (2004), pp. 17–22.

'companies as well as private capitalists to introduce such telegraphs under his direction'.[115] These competitors were to remain a thorn in Siemens's side, particularly once they began to undercut his prices.[116] The same dynamism which facilitated exchange, discussion, and technical improvement in the field also produced competition, accompanied by all the benefits and tensions with which it is associated.

As long as state commissions and railway companies were broadly pursuing the same goal, they provided all the more opportunities for budding entrepreneurs to market their inventions, and Siemens worked the situation to his advantage. On the one hand, he set about persuading key members of the Prussian *Telegraphen-Kommission* to invest in his telegraph apparatus, and Major O'Etzel became his 'protector'.[117] Siemens was also invited to present a lecture on telegraphy to the Chief of the General Staff, Wilhelm Krauseneck, and he eventually claimed that Friedrich Nottebohm, the government assessor, had remarked of his apparatus that 'one could not imagine the extent of [its] future progress, and that one could safely assume that it would soon win out over all the others'.[118] As Nottebohm was the head of the patent commission, by August 1847 Siemens could assert that he was 'protected by my patent and my influence, which is already quite significant'.[119]

On the other hand, Siemens also entered into negotiations with different railway companies, including the Berlin–Anhalt line, on whose board of directors Nottebohm also sat.[120] Obtaining firm guarantees on a competitive market came with pressures of its own, however, and Siemens once complained that during the summer his 'contraption may well be gaining increasing recognition every day, but nothing is leading to contracts, principally because the Lord Directors are at the baths'.[121] As a field of opportunities opened up ahead of him, Siemens now warned his brother that 'we should no longer allow ourselves to embark on many more fantasies, rather we must hold the sparrow firmly in our hands'.[122]

It was also by means of literal competition and public confrontation that Siemens was able to secure his apparatus's position on the private and state market. A trial conducted along the Berlin–Potsdam railway by the *Telegraphen-Kommission*, for instance, confirmed that his model was not only more efficient but also faster than that of his former partner, Leonhardt.[123] At the same time, Siemens himself chose to spark a 'polemic' over his telegraph by means

[115] *EBZ*, 18 July 1847. 'Little. Symbols. In. A. Row. / Make. Sure. To. Keep. You. In. the. Know. / Even. At. Night. From. The. Deepest. Sleep. / The. Telegraph. Will. Make. You. Leap' –author's translation.
[116] Werner to Wilhelm, 5 July 1847, in Matschoβ, *Werner Siemens,* i, p. 37.
[117] Werner to Wilhelm, 25 Jan. 1847, in Matschoβ, *Werner Siemens*, i, p. 34.
[118] Werner to Wilhelm, 13 July 1847, in Matschoβ, *Werner Siemens*, i, p. 40.
[119] Werner to Wilhelm, 25 Aug 1847, in Matschoβ, *Werner Siemens*, i, p. 43.
[120] Werner to Wilhelm, 5 July 1847, in Matschoβ, *Werner Siemens*, i, p. 37.
[121] SCA, W1071, Werner to Wilhelm, 10 Aug. 1847.
[122] Werner to Wilhelm, 25 Aug 1847, in Matschoβ, *Werner Siemens*, i, p. 45.
[123] Werner to Wilhelm, 9 Jul. 1847, in Matschoβ, *Werner Siemens*, i, p. 38.

of a presentation he gave at the *Polytechnische Gesellschaft* in Berlin. The society, which was composed of local entrepreneurs and was independent of the state, had provided a forum in which to publicize his work, and he expected the 'polemic' to be played out in the press.[124] '[T]his is the only means of countering the attacks from others', he explained, aware that public discussion and competition were the best means of securing interest in his product.[125]

But changes in the field also began to create difficulties for Siemens, as apparatuses built for the purpose of railway signalling increasingly differed from those designed for ordinary correspondence. In dire need of lucrative contracts, in July 1847 he decided to set aside the construction of a printing mechanism, which he had initially hoped might compete with existing models, and focus on his contracts with the railway companies. Producing the printer, he explained, would 'cost time, which would be useless now, as the railways can make no use of printing'.[126] The distinctions which had emerged between the different purposes of telegraphic communication had disrupted his plans.

By October 1847, Siemens had established his own independent business. Having fallen out with Leonhardt, it was once again in the *Physikalische Gesellschaft* that he found a long-time partner, Johann Georg Halske, with whom the firm of Siemens & Halske was established.[127] The young entrepreneur recognized that telegraphy was still in its infancy and could no doubt foresee its future diversification. Seeking to ensure that he might in future benefit from a broad spectrum of investors, therefore, he specifically chose to establish his company as a '*Maschinen-Bauanstalt*', using the rather vague term 'in order to keep our hands completely free'.[128]

Navigating between the important sites within the landscape of innovation by means of his social contacts and the knowledge circulating between them, Siemens had established a solid foundation for his now world-renowned business.[129] His example demonstrates how developments in the field of telegraphy derived not from a single invention or initiative. They were the product of exchange, cooperation, and confrontation between railway companies, scientists, inventors, and administrators dispersed across Germany and beyond.

[124] Werner to Wilhelm, 10 Aug. 1847, in Matschoβ, *Werner Siemens*, i, p. 41; I. Mieck, *Preussische Gewerbepolitik in Berlin, 1806–1844* (Berlin, 1965), p. 162.

[125] Werner to Wilhelm, 10 Aug. 1847, in Matschoβ, *Werner Siemens,* i, p. 41.

[126] Werner to Wilhelm, 5 July 1847, in Matschoβ, *Werner Siemens*, i, p. 37.

[127] E. Du Bois-Reymond, 'Nachruf an Johann Georg Halske', *Verhandlungen der Physikalischen Gesellschaft zu Berlin im Jahre 1890*, 10 (1891), p. 42.

[128] Werner to Wilhelm, 25 Aug. 1847, in Matschoβ, *Werner Siemens*, i, p. 42.

[129] For an in-depth analysis of Werner Siemens's social networks in Berlin during the 1830s and 1840s, see J-M. Johnston, 'The Time and the Place to Network: Werner Siemens during the Era of Prussian Industrialization, 1835–1846', *Central European History*, vol. 50, 2 (June 2017), pp. 160–83.

2.4 The Hanseatic Exception

In Bremen, where public and private interests were more closely aligned, the process of technological development produced fewer tensions and brought plans for a telegraph line more rapidly to fruition. The need for improved communication between the city and its harbour in Bremerhaven having been acknowledged during the 1830s, once electrical telegraphy had become the object of discussion across Germany and Europe, potentially diverging interests were more easily accommodated in order to facilitate its introduction. While deliberations taking place elsewhere between 1840 and 1847 generated friction between the actors involved, in Bremen they led to the establishment of Germany's first publicly accessible electric telegraph line.

In August 1845, a circular soliciting support for the establishment of a *Telegraphen-Verein* was issued, most likely to members of the *Bremer Börse* (Bremen Exchange). The author, presumably the captain and engineer Johann Wilhelm Wendt, intended for the projected association to invest in, and derive profit from, the building of an electric telegraph line between Bremen and Bremerhaven. The proposal repeated the arguments put forward a few years earlier by Johann Schmidt, referring primarily to the recognized importance of improving communication between Bremen and Bremerhaven.[130] Like Schmidt's proposed optical telegraph in 1838, which was currently in operation between Hamburg and Cuxhaven, the Bremen–Bremerhaven electric telegraph connection was primarily intended for the use of the city's merchants and shipowners.

As we have seen, Schmidt's earlier initiative had failed to raise the expectations necessary to attract sufficient interest and investment. This time, however, the author could point to developments elsewhere in support of the idea, venturing to 'presuppose that it is now well-enough known to you how many applications of the electromagnetic telegraph have been made in recent times'.[131] The assumption was clearly justified, as in October 1845 a group of eighteen individuals presented their request to the *Senat* for a concession allowing the newly constituted *Telegraphen-Verein* to construct the Bremen–Bremerhaven line. Reiterating the ever growing 'necessity' (*Nothwendigkeit*) of ensuring 'uninterrupted' communication between the city and its harbour, particularly given Bremen's expanding trade, they also referred to the 'most astonishing results' of the experiments conducted by Gauβ and Steinheil.[132] The technology's progress, they asserted, had 'already resulted in the abandonment of the former semaphoric telegraph in a number of countries, namely England, France and the United States of North America'.[133]

Where expectation had failed to stimulate support in the 1830s, widespread knowledge of recent achievements in the field of electrical telegraphy now ensured

[130] StABn 2-R.15.b.1, Circular (untitled) Aug. 1845. [131] Ibid.
[132] StAB 2-R.15.b.1, Supplikat, 28 Oct. 1845. [133] Ibid.

that these individuals could make the leap of faith required to invest in the technology. Explicitly comparing the latest innovation with Johann Schmidt's earlier proposal, the petitioners pointed to the atmospheric conditions which rendered optical telegraphy impotent at the very moments when the dangers of navigation along the Weser were heightened. It was for this reason, they argued, that the earlier project had failed to gain support from the local *Börse*.[134]

The *Senat*'s response to the request reaffirmed the mutual interests of the government and its merchant community in the city state. In particular, the petition found enthusiastic support from Senator Arnold Duckwitz, a driving force in the modernization of Bremen's infrastructure.[135] The *Senat* extended its approval of the project, and *Bürgermeister* Smidt underlined the 'important names from our *Börse*' who had signed the petition.[136] This statement marks a significant contrast to the situation in Prussia and Austria, where the authorities were in fact concerned at the involvement of 'bourgeois' forces in the project. While the rubbing together of public and private interests had caused friction in Prussia, Austria, and Bavaria, Smidt understood that the undertaking in fact presented 'absolutely no risk' for the state and could in fact only benefit the latter, by enabling it not to fall behind other states in the 'acceleration and ensuring of trade and communication'.[137] The wider context of developments had helped bring together the principal players in the city state's political and economic life.

Indeed, the petitioners counted upon this collaboration to help them avoid the diplomatic obstacles which had further hindered Schmidt's project in the 1830s. They called for the *Senat*'s help in negotiating with the government of Hanover, whose territory the line would have to traverse, in order to persuade it that their enterprise was 'planned in the interest of the common good [and] is distinct from ordinary private speculation'.[138] Here was also an acknowledgment that private economic activity could be considered beneficial to the state as a whole. In contrast to the rest of the country, in Bremen the first telegraph line was to remain in private hands for much of the nineteenth century.[139]

Of course, Bremen was by no means entirely immune to the confrontation and competition between individuals and ideas which were stimulated by the literature on the subject. As evoked earlier, in Prussia and Bavaria, G. A. Treutler sought to defend the desirability of his optical telegraph system in the face of modern technology. In a similar way, Johann Schmidt professed the continued utility of his system in Bremen and Hamburg in the face of emerging competition. In 1844, before the new *Telegraphen-Verein* had come into existence, one article in the *Weser-Zeitung* had already expressed indignation at Johann Wilhelm Wendt's

[134] Ibid.
[135] StAB, 2-R.15.b.1, 'Extract aus dem Senatsprotocolle', 29 Oct. 1845; A. Duckwitz, *Denkwürdigkeiten aus meinem öffentlichen Leben, von 1841–1866* (Bremen, 1877), pp. 5–75; Seidel, 'Verkehrsmittel Telegraph', p. 185.
[136] StAB 2-R.15.b.1, Smidt to Freiherr von Falke, 2 Nov. 1845. [137] Ibid.
[138] StAB, 2-R.15.b.1, Supplikat, 28 Oct. 1845. [139] Seidel, 'Verkehrsmittel Telegraph', p. 346.

inquiries into the new electric telegraph.[140] The article engaged a public discussion of the issue, and two further articles were sent in to the newspaper which highlighted the broader implications of each telegraph system for the local economy.

In defence of the electromagnetic system, one article emphasized its reliability throughout the year and the uninterrupted service it could provide. The optical telegraph, it argued, being out of action at night and in times of heavy fog, was effectively of use only during a total of three months in the year. The electric telegraph, on the other hand, would enable orders to be sent to the captain of a ship even at 2 a.m.: 'the shipowner thus lives, so to speak, in Bremerhaven and has unlimited, unhindered control over his ship'. A merchant knew, it continued, what little value unreliable communication had, and the electric telegraph would prevent cases where 'business is forced to stand still'.[141]

In defence of Schmidt's '*Signaltelegraph*', on the other hand, the author of the second article insisted that, given the new technology's as yet incomplete development, the safest option was to maintain the system which had proven itself over the last five years in Hamburg. While conceding that the *Signaltelegraph* was prone to interference both from lighting and weather conditions, the author questioned the very need for an uninterrupted service. When weather conditions were bad, they argued, or during the night, no ships were likely to be sailing anyway. Foreshadowing the terms of debate which would take place elsewhere in Germany during the 1850s, they insisted that night-time should be reserved—as it always had been—for sleeping.[142]

Yet despite these arguments, the author underscored the shared concern of the partisans of both technologies: the absolute necessity of a telegraphic connection.[143] Eventually, in fact, the *Senat* decided that the concession which it granted to the *Verein* should not be exclusive. In the authorities' view, Schmidt's planned line should be allowed, indeed encouraged, to go ahead as it was to offer broader connections with towns along the Elbe as well as Holland, which the electric telegraph line would not. Moreover, it emphasized that 'the majority of our public expects ensuing advantages from the competition between the two institutions, and it can therefore only appear desirable that both should be brought to life as soon as possible'.[144] The dovetailing of government and business in Bremen, a characteristic of the coastal *Hanse* cities richly portrayed in Thomas Mann's *Buddenbrooks*, removed the bureaucratic obstacles that were slowing down the decision-making process elsewhere in Germany.[145] In theory, at least, competition was viewed as a means of obtaining complementary services for the benefit of the community.

[140] StAB, 2-R.15.b.2, *Weser-Zeitung*, 21 Mar. 1844.
[141] StAB, 2-R.15.b.2, *Weser-Zeitung*, 14 Nov. 1844.
[142] StAB, 2-R.15.b.2, *Weser-Zeitung*, 16 Nov. 1844.
[143] Ibid.; see also Seidel, 'Verkehrsmittel Telegraph', pp. 211–14.
[144] StAB, 2-R.15.b.1, Smidt to Freiherr von Falke, 2 Nov. 1845.
[145] T. Mann, *Buddenbrooks: Verfall einer Familie* (Berlin, 1901).

The '*Bremer Telegraphen-Verein*' was finally granted a concession for its project in December 1845, and its statutes were established on 7 May 1846. While the *Senat* reserved the right to inspect the establishment and make use of the technology, the line was to remain under the control of the *Verein* and was immediately to be opened to the general public, at a rate to be established in the near future.[146] Given the prominence of the merchant and ship-owning community which had funded the project, the telegraph almost immediately and literally became central to the city's economic life. Bremen's first telegraph office, indeed, was set up in the *Museum*, in the centre of town, and a stone's throw away from the town hall as well as the *Börse*—the heart of trading activities.[147]

Although the service was to be open to any member of the public who could afford it, from the outset it relied upon the subscriptions of individual businessmen. Subscribers would receive regular updates on the ships entering and leaving the Weser at Bremerhaven, and benefited from a discount on the transmission of telegrams.[148] Before the Bremen–Bremerhaven line was finally opened on 1 January 1847, therefore, the telegraph service had already been set up to develop into an essential component of the local economy.

* * *

Between 1840 and 1847, the development of the electric telegraph had necessitated the collaboration of those actors able to support it logistically, financially, and technically. The actors were brought together by their high hopes for the technology, but the negotiations in which they engaged revealed a more sober reality—their interests were seldom perfectly aligned. But they also revealed the growing number of channels through which knowledge was circulating between individuals in state and society, across a broad landscape of innovation that characterized this period of early industrialization. The exchanges which took place between producers and consumers of knowledge across Germany served to define both the contours of the field of telegraphy itself and the spheres of interest, expertise, and authority of the actors involved. For a while entrepreneurs such as Werner Siemens were able to thrive by establishing connections to these many different sources of knowledge and investment, but even he began to feel the pressures of diverging interests. In Bremen, the close alliance of business and government ensured a smooth passage to the age of electrical telegraphy. But elsewhere in Germany, the inevitable friction which developed between science, enterprise, and state administrations eventually halted progress. It would take the upheavals of the mid-century to resolve many of the tensions which had developed.

[146] StAB, 2-R.15.b.1, 'Statuten des Bremer Telegraphen-Vereins', 7 May 1846.
[147] StAB, 2-R.15.b.3, Extract aus dem Senatsprotocolle, 27 Dec. 1850.
[148] StAB, 2-R.15.b.1, Public notice, 'Bremer Telegraphen-Verein benachrichtigt das geehrte Publikum', 1 Jan. 1847.

3
Resolution

The geopolitical shockwaves of the 1848 revolutions released much of the tension that had built up between the multiple actors engaged in developing the telegraph. Over the preceding decade, railway companies and state commissions had worked towards broadly compatible aims, drawing wherever possible upon scientific expertise and providing diverse opportunities for entrepreneurs such as Werner Siemens to market their inventions. Competition had, for a while, fuelled a dynamic process of technological innovation, but it had also revealed the diverging interests and ambitions of the people involved. Much like the mounting social and political pressures that many predicted were soon to explode, tensions in the field of technological development had reached a breaking point.

Looking back on the 1840s, the engineer and ministerial councillor Max Maria von Weber blamed the slow implementation of the new technology along the railway lines on 'the all too widespread attempt to develop installations which could accomplish different goals at one and the same time, and thereby often achieved none to a satisfactory degree'.[1] The problem was compounded by the fact that governments had by now set their sights on using the telegraph for the purposes of ordinary correspondence, and, as Werner Siemens observed, it was no longer possible to design a 'one-size-fits-all' apparatus that would suit the aims of all potential clients. The time had come to specialize, and state telegraph commissions unleashed yet another seemingly unending cycle of experimentation with different forms of telegraphy, and began once again to consider its logistical, financial, and security implications.

The upheavals of 1848/9 by no means triggered the development of the telegraph, therefore, but rather forced the resolution of many of these issues. The disturbances themselves, and particularly the resurgence of Frankfurt am Main as an active political centre in the German Confederation, encouraged governments to build direct lines of communication to other centres of power. Many of the internal tensions which had built up during the *Vormärz* were thus relieved by the counter-pressure placed upon governments to take control of the production process and launch the construction of a network. But as the state entered the limelight, a new source of friction emerged in the field of international

[1] M. M. von Weber, *Das Telegraphen- und Signalwesen auf den Eisenbahnen* (Weimar, 1867), p. 40.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0005

relations, where governments were required to establish the treaties that would govern the telegraphic communication across Central Europe and beyond.

The shape and structure of Germany's incipient telegraph network could not but be influenced by the events of these revolutionary years. Governments undertook to construct their first lines of communication across state borders at a time when those very borders were being put into question by the National Assembly convening in Frankfurt. If nothing else, as we shall see, the Assembly's decision to establish a provisional '*Centralgewalt*', or central authority, in Frankfurt for the German nation state which they hoped to create led some administrations to expect some kind of direction or instruction from the new centre of power. At the same time, however, states such as Prussia were eager to defend their autonomy in constructing their own network. Often marginalized in the historiography of the 1848 revolution, matters of transport and communication constituted a field on which the contest between competing conceptions of the nation and the state could be played out.[2] The establishment of new networks of communication thereby heightened the clash of federalist and centralizing forces which had long shaped the history of German-speaking Europe, and which reached a milestone in 1848.[3]

The draft constitution prepared by the National Assembly, moreover, was the first systematic attempt to set down the relationship between the state and the new networks of communication that were emerging. The role which the constitution assigned to these networks, as a framework provided by the state to support economic growth, strongly influenced the attitudes which individual German governments then adopted towards technologies such as the telegraph during the following decades. While there are many reasons to view 1848 as a failure for the national and liberal cause—the National Assembly, after all, was quickly dissolved—in this area, as in a number of other fields of economic policymaking, it laid the foundations for the era of free trade and exchange that was about to begin.[4] The intellectual middle classes may have been silenced by the end of 1849, but a bourgeois revolution of another kind was underway.

By 1849, the state had established its control over telegraph networks across Germany. But it had done so through the prism of the debates in the Frankfurt

[2] B. Vick, *Defining Germany: The 1848 Parliamentarians and National Identity* (Cambridge, Mass., 2002); W. Siemann, *The German Revolution of 1848–9*, trans. Christian Banerji (Basingstoke, 1998); J. Sheehan, *German Liberalism in the Nineteenth Century* (London, 1978), pp. 59–76.

[3] M. Umbach (ed.), *German Federalism: Past, Present, Future* (Basingstoke, 2002); for a critical evaluation of this 'tradition', see A. Green, 'The Federal Alternative? A New View of Modern German History', *Historical Journal*, vol. 46, no. 1 (Mar. 2003), pp. 187–202.

[4] T. S. Hamerow, *Revolution, Restoration, Reaction: Economics and Politics in Germany, 1815–1871* (Princeton, 1966), pp. 75–196; W. O. Henderson, *The Rise of German Industrial Power, 1834–1914* (Berkeley, 1975), pp. 94–5. On the 1848 revolutions as a crucial turning point, see M. Hewitson, *Nationalism in Germany 1848–1866: Revolutionary Nation* (Basingstoke, 2010). On their importance in shaping European political thought, see D. Moggach and G. Stedman Jones (eds.), *The 1848 Revolutions and Political Thought* (Cambridge, 2018).

National Assembly and the geopolitical upheavals of the previous year. Tensions between the public and the private sector had been sidelined, but governments now faced the prospect of collaboration and conflict with their neighbours, and the spectre of domestic consumer demand and parliamentary pressure loomed ominously on the horizon.

3.1 Developmental Deadlock

At first glance, the closing years of the decade seem to have constituted a period of accelerated technological progress in the field of telegraphy. By May 1847, the trials begun three years earlier by the engineer-entrepreneur William Fardely along the private *Taunus-Bahn* near Frankfurt were concluded, and the company's inspector Meller asserted that the telegraph would soon be the 'faithful companion of the railways'.[5] The utility of the technology to the slowly expanding railway network was now established, and the *Eisenbahn-Zeitung* reported that, '[g]iven the importance which this means of communication has already attained, and promises to achieve to a higher degree, given its intrinsic relationship [*Zusammenhang*] to the railway service, it will be our task to pay it our continued attention, and to transmit in these pages all the material concerning it which we are able to collect, insofar as it is informative and interesting'.[6]

The variety of apparatuses and entrepreneurs involved in the trials that took place across Germany is a testament to the dynamism of the contemporary technological market. By June 1847, for instance, Fardely's apparatus had also been tested in Saxony, on the private *Sächsisch-Schlesische Eisenbahn*, and was to be introduced on the Dresden–Leipzig line as well as the now state-owned *Sächsisch-Bayerische Eisenbahn*.[7] Further west, meanwhile, his invention was being trialled by the *Köln-Mindener Eisenbahn Gesellschaft*, alongside the telegraphs constructed by August Kramer and Ferdinand Leonhardt—Werner Siemens's two principal competitors.[8]

Another manufacturer, L. Drescher, was due to run trials along the *Ferdinand-Wilhelm Nordbahn*, with the agreement of both the railway company and the government of Kurhessen, through whose territory it ran.[9] As the results of his trials came through, Drescher also presented a proposal to the Bavarian government for the adoption of his apparatus.[10] In Württemberg, where railways were under the authority of the state, the first operational railway telegraph was

[5] *EBZ*, 30 May 1847. [6] *EBZ*, 3 Jan. 1848. [7] *EBZ*, 13 June 1847, 15 Aug. 1847.
[8] *EBZ*, 19 Dec. 1847. [9] *EBZ*, 21 Nov. 1847, p. 382.
[10] BHStA, Verkehrsarchiv 30056, Drescher to Direction, 30 Oct. 1847.

introduced in the spring of 1847.[11] In Hanover, the state expressed its intention to run trials along the section of its earliest railway line leading to Harburg, and in Mecklenburg, a company envisaged making a similar installation on the line between Schwerin and Hagenow.[12] Wherever railways were constructed, it was now expected that telegraph lines would follow, ensuring their smooth and safe operation.

Along the North Sea coast, the success of the telegraphic connection between Bremen and its port in Bremerhaven, opened to the public on 1 January 1847, had created demand for a similar service among the mercantile and shipping communities in its sister city of Hamburg. Although Hamburg possessed a privately run optical telegraph connection to its harbour in Cuxhaven, the advantages of the electrical system were increasingly patent.[13] The mutual trading interests of the two *Hanse* cities were recognized, and plans were drawn up for yet another private enterprise to establish a telegraph line linking Bremen, Bremerhaven, Cuxhaven, and Hamburg.[14]

Together, the state and the private sector had thus far contributed to the technology's overall development, but their diverging aims were increasingly apparent. Only in Austria had the haphazard construction of private and state-owned telegraph lines already given way to a more coordinated division of labour. On 16 January 1847, it was established that 'no private party, neither an individual nor a company, will be allowed to establish telegraphs without prior permission from the Kaiser himself'.[15] Somewhat in advance of its German neighbours, moreover, the Austrian government had already begun to establish a number of connections to the important regional centres of the Habsburg Empire. On 23 January 1847, the telegraph between Vienna and Brünn (Brno) was demonstrated in front of the Kaiser, and by November the line had been extended to Prague. In the meantime, plans were drawn up to link the capital city to Pressburg (Bratislava), where the Hungarian parliament was due to convene.[16]

In Bavaria, however, the friction between the government and Carl Steinheil had brought developments to a standstill. In principle, both of the region's existing railways were now owned by the state and, as we have seen, the government had reluctantly granted Steinheil a patent on his invention, in order to obtain his assistance and speed up matters. In January 1846, Interior Minister Abel called for the experiments along the Munich–Augsburg railway to be carried out under

[11] F. Weber, *Post und Telegraphie im Königreich Württemberg: Denkschrift aus Anlass des Ablaufs der fünfzigjährigen Verwaltung des württembergischen Post- und Telegraphenwesens durch den Staat* (Stuttgart, 1901), p. 174.

[12] *EBZ*, 17 Jan. 1847; 19 Sep. 1847, p. 306.

[13] StAB, 2-R.15.b.2, *Priviligierte wöchentliche gemeinnützige Nachrichten von und für Hamburg*, 21 Oct. 1847.

[14] *EBZ*, 1 Aug. 1847.

[15] *EBZ*, 21 Feb. 1847.

[16] G. Lobentanz, 'Zur Geschichte der Telegraphie in Österreich: Von den Anfängen bis ca. 1850' (PhD Thesis, University of Vienna, 1967), pp. 28–31.

Steinheil's supervision, but nothing, it seemed, could go according to plan. To begin with, some railway personnel were injured when electricity struck them through the telegraph wires during a thunderstorm. Over the course of the following year, Steinheil attempted to resolve the issue himself, before finally conceding that the best solution would be to adopt a method of wire insulation used in Austria.[17] A fire then broke out in the Munich railway station, destroying the building and bringing the trials to an abrupt end.[18]

Despite these obstacles, by June 1847 the Foreign Ministry, under whose authority the technology fell, believed that a satisfactory conclusion had been reached but that no decisions should be made until the administration had completed its report.[19] Although the report highlighted the success of Steinheil's installation as a whole, it nonetheless recommended postponing any final decisions until a number of further technical issues were resolved. In line with the report's recommendations, King Ludwig I ordered that the trials be reprised, and his personal interest in the matter once again led him to press the administration for updates on the situation.[20] As the *Eisenbahn-Zeitung* reported, by December 1847 a new railway station had been built in Munich and trials with Steinheil's telegraph had been relaunched, but by January 1848 results were still discouraging—weather conditions continued to interfere with the installation, sporadically setting off the telegraph.[21]

As this seemingly incessant cycle of experimentation continued, the minister of the interior pointed out that other states had made more progress. In some places, additional wires were now being laid for the purposes of correspondence, alongside those intended for railway signalling. Given the growing importance of telegraphy as a means of regular communication, the minister recommended calling in an external adviser with the appropriate expertise to supervise the introduction of a similar installation in Bavaria. The king not only approved of this decision but also suggested that they adopt the system introduced in England, where telegraphy was making significant advances. As his annotation indicated, security concerns were at the forefront of his mind: 'The telegraph associated with the railways is almost the only means of arresting criminals fleeing the police (the poison is its own antidote). In England it is used with success.'[22]

Lacking the expertise to make this technical shift, the *Eisenbahnbau-Kommission* was sent on a tour of foreign countries to determine which system to adopt. In its report, the commission considered the advantages and

[17] BHStA, MH 16863, Abel to Ludwig I, 13 Jan. 1846; DMM, FA005/582, Erdinger to Steinheil, 18 July 1846; DMM, FA005/582, 'Bericht des K. Bahnamtes München', 18 May 1847. The method in question was the use of porcelain 'bulbs'.

[18] BHStA, MH 16863, MInn to Ludwig I, 26 June 1847.

[19] BHStA, MH 16863, MA to MInn, 7 June 1847.

[20] BHStA, MH 16863, MInn to Ministerial-Referent, 13 Nov. 1847.

[21] *EBZ*, 10 Jan. 1848; BHStA, MH 16863, 'Antrag des Ministers des Innern', 8 Jan. 1848.

[22] BHStA, MH 16863, 'Antrag des Ministers des Innern', 8 Jan. 1848.

disadvantages of a number of mechanisms developed by William Fardely, Samuel Morse, the Scotsman Alexander Bain, and the Saxon Emil Stöhrer. Whatever the commission's choice of apparatus, however, the report also pointed out that their actions were constrained by the terms of the *Privilegium* granted to Steinheil, which explicitly covered all devices which used the earth as a conductor in the electrical circuit. As this was now common practice and had been adopted by many inventors outside Bavaria, none of the proposed mechanisms could be introduced without infringing Steinheil's rights. It was therefore recommended that no action be taken until his *Privilegium* expired on 30 August 1849.[23]

In Prussia, progress had similarly stalled, as the authorities struggled to determine the state's and the private sector's respective jurisdiction in the construction and use of telegraph lines. In June 1847, the *Telegraphen-Kommission* reported that 'different railway companies, such as the Niederschlesich-Märkische, the Berlin-Potsdamer-Magdeburger, the Berlin-Hamburger, the Köln-Mindener, and the Stargard-Posener are only waiting for the state authorities' permission to make such installations'.[24] The conditions, established on 27 August 1847, guaranteed the state not only the right to install wires alongside those of the companies but also that the latter should be obliged to transmit state telegrams free of charge.

These terms were to be a continued source of friction and no doubt exacerbated the ongoing conflict between the government and the railway companies that were suffering from an economic downturn.[25] The liberal *Eisenbahn-Zeitung*, now acting as a mouthpiece for the *Verein Deutscher Eisenbahnverwaltungen*, expressed the companies' frustration at the situation in Prussia: 'The government is now eagerly pursuing the installation of electromagnetic telegraphs. It had hoped to attribute the task to the railway companies, but set them such conditions that, we are told, most of them would prefer entirely to abandon such a project. As the state principally hopes to use the telegraph for its own purposes, so it seems natural for it to build them independently and at its own cost, while providing for the railways, who give their tracks and other installations for the purpose, a necessary telegraphic connection for their service.'[26] The existing rift between the parties had been widened by the diverging applications of the telegraph which they had in mind.

A similar deadlock had emerged between the state and the private sector in other parts of Germany. In Hessen, for instance, the trials using Drescher's

[23] BHStA, MH 16863, 'Bericht der Eisenbahnbau-Kommission', 12 May 1848.

[24] W. Löser, 'Die Rolle des preußischen Staates bei der Ausrüstung der Eisenbahnen mit elektrischen Telegraphen in der Mitte des 19. Jahrhunderts', *Jahrbuch für Wirtschaftsgeschichte*, vol. 4 (1963), pp. 196–8.

[25] J. M. Brophy, *Capitalism, Politics, and Railroads in Prussia, 1830–1870* (Columbus, 1998), pp. 42–9.

[26] *EBZ*, 14 Nov. 1847.

apparatus were abandoned when the government insisted that telegraph lines, established at the expense of the railway company in question, were to remain in state hands. Criticizing the decision, the *Eisenbahn-Zeitung* reported that 'this condition convinced the company to forego the electric telegraph altogether, and to settle, for now, on exchanging hand signals from one railway operator to another'.[27] The cooperation which had prevailed in the early 1840s was unravelling fast.

On 16 March 1848, two days before the eruption of hostilities in Berlin, the Prussian finance minister Franz von Düesberg moved to defuse the situation. For the sake of expediency, the *Niederschlesisch-Märkische Eisenbahn-Gesellschaft* was permitted to install a telegraph without respecting all the conditions imposed.[28] The logistical separation of railway and state telegraphy had begun, but the Prussian *Telegraphen-Kommission* had yet to answer a number of technical questions.

Meanwhile, Werner Siemens had been busy attempting to establish his reputation with both the *Telegraphen-Kommission* and the railway companies intending to build telegraphs along their lines. By now, he was convinced that he had made a considerable impression upon 'high society'—indeed, in his memoirs, he would later claim that his chances of obtaining a position as future director of the state's telegraph line at this stage had been almost guaranteed.[29] But the commission was also assessing other options. The apparatuses constructed by Siemens's competitors Ferdinand Leonhardt and August Kramer were still under consideration. Along the Cologne–Minden railway line, for instance, it had been determined that Leonhardt's was best.[30] In late 1847, therefore, the commission decided to set up a contest between a number of telegraph apparatuses drawn from across the world, in order to select the best option for its purposes. The competition, by a twist of fate, was to take place in March 1848. As far as Siemens was concerned, however, it was a mere formality and would serve primarily to guarantee that he received contracts from the state, 'without appearing to constitute both judge and jury'.[31]

Having initially sought to take advantage of a vibrant market, Siemens now struggled to juggle his different potential contracts with the state and private railway companies. Writing to his brother around this time, Siemens explained his situation: 'As I don't want to lose the state telegraph (postal telegraphy throughout Prussia) out of my hands, I have little or no time at all left for the installation of railway telegraphs here, nor for foreign matters.'[32] As the needs of his potential

[27] *EBZ*, 11 Sept. 1848. [28] Löser, 'Die Rolle des preußischen Staates', p. 204.
[29] W. von Siemens, *Lebenserinnerungen*, ed. W. Feldenkirchen (Munich, 2008), p. 99.
[30] *EBZ*, 28 Feb. 1848.
[31] Werner to Wilhelm, 6 Nov. 1847, in C. Matschoβ (ed.), *Werner Siemens. Ein kurzgefaβtes Lebensbild nebst einer Auswahl seiner Briefe* (2 vols., Berlin, 1916), i, p. 47.
[32] Werner to Wilhelm, 20 Dec. 1847, in Matschoß, *Werner Siemens*, i, pp. 49–51.

clients diversified, the multitude of opportunities he had relished now began to constitute a challenge.

The disturbances which erupted in Berlin in March 1848 initially served only to enhance the atmosphere of uncertainty. As political gatherings turned into demonstrations calling for constitutional reform and then violence when weapons were discharged, Werner, witnessing the events, wrote to his brother excitedly that 'the two accidental shots fired on the Schloßplatz have, in one leap, pushed Germany forwards a generation'. As for the planned competition, however, he was left in the dark.[33] Although the telegraph commission was by no means dissolved, all activities, as far as Siemens was aware, had been suspended, and the Siemens & Halske manufacture continued to turn out apparatuses without receiving any firm orders. As the political turmoil grew, Werner waited in vain to be asked to discharge his duties as an officer, and with the prospect looming of conflict between Denmark and Prussia, Siemens appeared to abandon his entrepreneurial activities.[34] Having communicated with his sister and brother-in-law in Kiel, where the threat of war was acutely felt, he travelled to the northern coast, driven by a sense of duty, national pride, and concern for his family. But the outbreak of hostilities also provided him with another opportunity for experimentation and publicity: he proposed and constructed a set of electrically detonated naval mines in defence of Kiel harbour.[35]

Back home, meanwhile, the telegraph commission's contest planned for 15 March 1848 was not, as Siemens surmised, 'brought to an abrupt end'.[36] A report from the commission, presented on 13 June 1848, indicates that the trials did indeed take place. As the report indicated, however, the disturbances had led a number of foreign competitors to withdraw from the competition, leaving Siemens to face only home-grown apparatuses. The principal challenger, it seems, was August Kramer, long identified by Siemens as a key competitor, and Ferdinand Leonhardt, his erstwhile colleague and earliest collaborator in the field.[37] The upheavals of 1848 tipped the balance in Werner Siemens's favour.

3.2 Resolutions

Two months after the convening of the German National Assembly in May 1848, Friedrich Wilhelm IV of Prussia ordered the construction of two telegraph lines, linking Berlin to Frankfurt am Main and Cologne.[38] Later in the year, when the Austrian *Reichstag* was relocated from Vienna to Krems following the October

[33] Werner to Wilhelm, 20 Mar. 1848, in Matschoß, *Werner Siemens*, i, pp. 53–4.
[34] Siemens, *Lebenserinnerungen*, p. 105. [35] Ibid., pp. 101–27. [36] Ibid., p. 100.
[37] E. Feyerabend, *Der Telegraph von Gauss und Weber im Werden der elektrischen Telegraphie* (Berlin, 1933), p. 208.
[38] H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland und die rheinische Industrie: von den Anfängen bis zum Ausbruch des Ersten Weltkrieges* (Wiesbaden, 1983), p. 153.

uprisings, existing telegraph lines were extended to ensure communication between the capital city and the deputies' new meeting place.[39] Over the next eighteen months, many of the German states followed the example of Prussia and Austria, launching the construction of extensive lines across the region, principally for the government's use.

The Gordian knot of the production process appeared to have been cut: experimentation was brought to a rapid conclusion, apparatuses were chosen, wires were laid, and responsibilities distributed. For a brief moment the state seemed to be in control, but it was immediately confronted with the need for a new form of cooperation. The networked nature of telegraphy had reared its head, requiring governments to negotiate with one another the terms by which they would manage and finance this infrastructural transformation. Having been triggered by the seismic geopolitical events of 1848, these negotiations were necessarily shaped by the clash of centripetal and centrifugal forces across Germany, and focused upon Frankfurt.

The Prussian king's decision to establish two telegraphic connections had, of course, been strategic. The line to Frankfurt would ensure that the monarch and his government were kept abreast of developments at the heart of the German Confederation, where the fate of the nation was being discussed. It was to be fitted with Siemens's telegraph apparatus, and in August the *Eisenbahn-Zeitung* reported that the lieutenant had been called back from the front line in Schleswig-Holstein to carry out these works.[40] The second line, meanwhile, was to replace Prussia's existing optical telegraph connecting the state heartland to its Rhineland territories—it was to be fitted with apparatuses constructed by Siemens's principal competitor, August Kramer.[41]

Building a telegraph line from Berlin to Frankfurt required the consent of a number of states whose territory it would cross. By 5 September 1848, having agreed the relevant terms with the majority of the governments concerned, the Prussian authorities had finally prepared a treaty to be submitted for consideration by the *Senat* which governed the city state of Frankfurt itself—the final link in the chain. Presenting the issue to the city's *Constituierende Versammlung* for debate in November, *Bürgermeister* Carl von Heyden described the telegraph as one of 'those continually improving means of accelerated communication, over which the different countries and nations and Europe compete'.[42] The technology, he believed, was another attempt 'to outpace the letter post and thereby make a

[39] Lobentanz, 'Zur Geschichte', p. 31.
[40] *EBZ*, 21 Aug. 1848.
[41] Wessel, *Die Entwicklung*, pp. 155–6.
[42] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Vortrag des Senats an die Constituirende Versammlung', 21 Nov. 1848.

profit in business' that would be of use for both 'public' and 'private communication', a tool of social and economic interaction.[43]

Heyden also highlighted the evident, yet only now relevant, dilemma of managing the 'great expansion of telegraph lines, which extend from central points to central points (*Hauptpunkten*), with no regard for territorial borders'. On the one hand, the lines would inevitably 'traverse different German states'. On the other hand, he opined, 'they cannot be installed and administered by different national administrations', as this would prove a logistical nightmare. 'It is therefore entirely appropriate', he added, 'that the Prussian government has undertaken this matter and drawn up treaties with the smaller German states which lie between Berlin and Frankfurt . . . .'[44]

Frankfurt's *Constituirende Versammlung* (Constituent Assembly) was not so sure. The assembly was the product of conflicts between the conservative *Senat* and the efforts of local liberals to introduce constitutional rule in the city state. In September 1848, popular demonstrations which had degenerated into street fighting had led the National Assembly convening nearby in the Paulskirche to declare a state of siege in the city. The uprising had been put down with the aid of Prussian, Bavarian, and Austrian troops, but it had also resulted in elections to a new constituent assembly.[45] As the product of both liberal and democratic forces, and of occupation by troops from neighbouring states, the *Constituierende Versammlung* was hostile to the idea of a telegraph line built entirely by the Prussian authorities.

Negotiations over the proposed telegraph treaty therefore became a means for the city's representatives to demonstrate their allegiance to the provisional *Reichscentralgewalt* that had been called into being by the National Assembly in July 1848, at the behest of Heinrich von Gagern. Dr Friedleben, a member of Frankfurt's *Deutscher Verein*, spoke out against the treaty 'through which Prussian particularism can easily be advanced to the detriment of the interests of the central authority'. '[A] new postal life begins with telegraphy', another member asserted, and so 'this [was] a matter for the central authority', particularly as the '*Reichsversammlung*', currently in session, had recently decided that the provisional *Centralgewalt* was to be empowered to make use of the telegraph.[46] Appeals to the 'central authority' had become a means both of opposing Prussian

[43] Ibid.

[44] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Vortrag des Senats an die Constituirende Versammlung', 21 Nov. 1848.

[45] V. Valentin, *Frankfurt am Main und die Revolution von 1848/9* (Stuttgart, 1908), pp. 309–54, 361–4; C.-L. Holtfrerich, *Frankfurt as a Financial Centre: From Medieval Fair to European Banking Centre* (Munich, 1999), pp. 116–25.

[46] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Auszug Protokolls der verfassunggebenden Versammlung', 22 Nov. 1848.

particularism in favour of the new German nation state being envisioned in Frankfurt and of defending the interests of the small city state against Prussian expansionism.

A commission was established to consider the proposed terms, and it reported back on 8 December 1848. It recommended signing the treaty with Prussia but also hinted at some of its potential dangers. From a practical perspective, it was recognized that 'no state which sets its sights upon the interests of public and private communication can exclude itself from the installation of electromagnetic telegraphs'. The 'given relations' in Germany called for the 'collaboration of a number of states' [underlined in the original], and the five German states participating in the construction of the Berlin–Frankfurt line had 'recognized the necessity of assigning its installation and administration to a single government'.[47]

Prussia had undertaken to pay for the line and would employ its own personnel, including on Frankfurt's territory. But these were to swear an oath to both governments and be 'entirely subject to the authorities and laws of the *Freistaat* of Frankfurt'. The commission also wondered if a future amendment might not allow for locals to be employed as telegraph personnel, something which it considered 'an entirely natural demand'.[48] Pragmatism dictated that management of the line should be delegated to Prussia, as long as the treaty guaranteed the city state's sovereignty.

On the other hand, the commission also expressed its desire for a collaborative, rather than delegated, enterprise. As it was currently planned, the undertaking would take the form of a concession from the *Freistaat Frankfurt* to Prussia, which would then cover its costs. 'It would have been more just', the commission added, 'had all the participating governments reached an agreement together [*gemeinschaftlich*] [underlined in original] as to the construction of the telegraph, and had the construction and exploitation taken place at a shared cost and therefore for a shared benefit.'[49] Whatever the commission's desires, however, work needed to begin soon, and there were obvious benefits in allowing Prussia to bear the financial burden.

The negotiations also revealed the persisting tangle of railway and state interests: the governments of Kurhessen and of the Grand Duchy of Hessen had to be drawn into negotiations solely, it seems, because they were participants in the construction of the Main–Weser railway line which the telegraph was to come into contact with. As the Frankfurt commission pointed out, if the treaty contravened their interest in the railway, these governments would not agree to the contract. For the most part, the treaties between the different states were similar, but the agreement between Prussia and the Grand Duchy of Hessen left the

[47] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Bericht der Commission', 4 Dec. 1848.
[48] Ibid.
[49] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Bericht der Commission', 4 Dec. 1848.

decision as to the use of the telegraph by the general public unresolved and open to later negotiation.[50]

These attempts to balance interstate collaboration and centralized management while defending the interests of Frankfurt as a city state were intimately connected to the discussions taking place only a few streets away in the National Assembly. To be sure, the construction of telegraph networks was not the deputies' most pressing concern, engaged as they were in establishing the framework for a new German nation state. One analysis of the petitions sent to the parliament has identified a single mention of telegraphy by one of the national representatives.[51] No wonder, then, that the assembly's attitude to transport and communication has attracted little attention in the literature on the 1848/9 revolutions. And yet, its attitude towards the running of the post, railways, and the telegraph reflected the structure which it envisaged for the future nation state.

The potential utility of the telegraph was clearly understood by the deputies meeting in the Paulskirche. Even before Friedrich Wilhelm ordered the construction of a line from Berlin to Frankfurt, in fact, the National Assembly had begun to make use of the telegraph along the Taunus railway, repurposing the installation originally designed as a signalling mechanism. On 23 May, as the assembly discussed its response to the extraordinary measures introduced by the government of Mainz after recent clashes between citizens and soldiers, a telegram informed the deputies that the fortress city had once again been sealed off.[52] Within a year, an oblique reference in the proceedings of the assembly suggests that certain deputies were even able to send in their votes by means of the telegraph.[53]

The assembly's *volkswirtschaftlicher Ausschuß*, meanwhile, was charged with defining the constitutional arrangements which were to govern a future national telegraph network. In July 1848 it was initially proposed that these be placed alongside the regulations applying to the railways, as the technical and logistical interdependence of the two technologies at the time appeared to warrant their association. It was soon realized, however, that to do so would place the future telegraph network at the mercy of the complex relationship between the many private and state railway administrations across Germany.[54] Just as states were seeking to assert their authority in the management of the telegraph, this arrangement threatened to constrain the government's sphere of action. Overcoming the

[50] Ibid.

[51] W. Conze, R. Moldenhauer, and W. Zorn (eds.), *Die Protokolle des volkswirtschaftlichen Ausschusses der deutschen Nationalversammlung 1848/49* (Boppard am Rhein, 1992), p. 152.

[52] F. Wigard (ed.), *Stenographische Berichte über die Verhandlungen der Deutschen Constituierenden Nationalversammlung zu Frankfurt am Main* (10 vols., Frankfurt am Main, 1848–50), i, p. 59.

[53] Ibid., viii, p. 5834.

[54] Conze, Moldenhauer, and Zorn, *Protokolle des volkswirtschaftlichen Ausschusses*, p. 89.

administrative quagmire in the railway sector was in fact to take almost a century, only to be achieved with the establishment of the *Reichsbahn* in 1920.[55]

When it came to transport and communication, the *volkswirtschaftlicher Ausschuß* was especially forceful in pushing for a centralized, unitary state—to the extent that its proposals were often tempered through subsequent revisions by the *Verfassungsausschuß*.[56] The committee saw its task as to respond to the 'material' demands expressed in the petitions presented to the parliament. To do so was to help address the 'social question' which had been at the heart of the revolutions, but also to contribute to the project of German unification.[57] It had formed the conviction that 'the greatest possible fusion of the material interests of all of Germany's peoples [*Volksstämme*] through the achievement of a unified system, both internally and externally, would be the most fruitful way to ensure the prosperity of the often vainly vaunted unity of Germany'.[58]

Some of the committee members' hopes for the immediate introduction of a 'national', supra-state *Reichsbahn* and *Reichspost* were dashed, however, and the proposed authority of the *Reichsgewalt* was limited to 'the right of legislation and supervision'. In the case of the railways, the caveat was added that this was 'insofar as the defence of the *Reich* and the interests of common transport require it'.[59] In his seminal account of the revolution, Veit Valentin considered these provisions of the draft constitution a defeat for the *volkswirtschaftlicher Ausschuß*'s aim of economic unity.[60] In fact, however, the terms were sufficiently flexible both to guarantee the rights of the parties already administering railways and postal services, on the one hand, and to secure the authority of the future *Reichsgewalt* in managing state communications networks, on the other.

Indeed, conditional upon the needs of the 'defence of the *Reich* and the interests of common transport', the *Reichsgewalt* was to be allowed to establish railways of its own if and when an individual state refused to do so. The central authority was also to be entitled to use existing railways, in exchange for compensation, and for state purposes.[61] In postal matters, treaties with foreign countries were only to take place through or with the approval of the central authority, whose right it also was to manage 'relations between the different postal administrations'. In fact, the *Reichsgewalt* was to be permitted to regulate the different postal routes running

[55] L. Gall and M. Pohl (eds.), *Die Eisenbahn in Deutschland: Von den Anfängen bis zur Gegenwart* (Munich, 1999), pp. 75–81.

[56] Cf. S. Oelsner, 'Die wirtschaftlichen und sozialpolitischen Verhandlungen des Frankfurter Parlaments', *Preussische Jahrbücher*, 87 (1897), pp. 81–100.

[57] D. Lindenfeld, *The Practical Imagination: The German Sciences of State in the Nineteenth Century* (Chicago, 1997), p. 159.

[58] Wigard, *Stenographische Berichte*, v, p. 3205.

[59] E. R. Huber, *Dokumente zur deutschen Verfassungsgeschichte* (3 vols., Stuttgart, 1961–6), i, pp. 304–7.

[60] V. Valentin, *Geschichte der deutschen Revolution von 1848–49* (2 vols., Berlin, 1930–1, this edn., 1968), ii, pp. 317–29.

[61] Huber, *Dokumente zur deutschen Verfassungsgeschichte*, i, pp. 304–7.

through different postal territories 'in the interest of common transport', and ultimately to 'take over the German post for account of the Reich in accordance with an imperial law, conditional upon a proper compensation of the legal beneficiaries', and 'insofar as it seems necessary to it [the *Reichsgewalt*]'.[62] The draft constitution thereby acknowledged the realities of Germany's divisions, while also transferring political notions of the 'common good' from the individual states to the supra-regional state which the deputies were seeking to establish.

Significantly, the final draft of the constitution presented in March 1849 dissociated telegraphy from the railways, and assigned it to article VIII covering the regulation of postal services in the future 'Reich'. The shift reflected the conceptual and technical distinction which had now been established between railway and correspondence telegraphs—the latter thereby being placed firmly under the authority of the state. There was, of course, a precedent for doing so, given that postal services had been progressively 'nationalized' since the early nineteenth century. But it also demonstrated how the *volkswirtschaftlicher Ausschuß* conceived of the purposes of communications infrastructure. Its guiding principle, it clearly stated, was that 'all means of communication [*Verkehrsmittel*] must be facilitated and accelerated in every possible way'.[63] While the state was to control the post, it was to be administered 'solely to the benefit of the general interest'. The committee also believed that the post was to 'perform those services to the German people which it should, and that from a financial institution, it [should] become a mere establishment for the support of communication'.[64] The constitution thus clearly expressed the desire to put the economic role of communication first, setting aside its function as a source of revenue for the state.

Telegraphy, moreover, did not carry the complex logistical heritage of the railways, nor the entrenched practices of the older postal services, and could thus be subjected to further-reaching regulations. Article VIII §43 of the final text of the constitution presented in 1849 determined that 'the *Reichsgewalt* is entitled to install telegraph lines, and to use those already in existence, in exchange for compensation'. It also entitled the Reich to 'come into possession of them by way of expropriation', giving it far more authority here than in other sectors.[65] During its debates on the matter, the *volkswirtschaftlicher Ausschuß* had pushed for the *Centralgewalt* to be attributed the 'exclusive' right of legislation and supervision over telegraph lines, 'both in the interest of the state and because only in this way could a grand, unified telegraph system for Germany be secured'.[66] In the final draft, this clause was omitted, though future changes were clearly envisaged, as it specified that 'further decisions on the matter, as

[62] Ibid. [63] Wigard (ed.), *Stenographische Berichte*, v, p. 3217. [64] Ibid.
[65] Huber, *Dokumente zur deutschen Verfassungsgeschichte*, i, pp. 304–7.
[66] Wigard (ed.), *Stenographische Berichte*, v, p. 3217.

well as concerning the use of the telegraph for private communication are subject to imperial legislation'.[67]

Thus, although the constitution of 1849 ultimately failed to establish a German nation state, its preparation laid the groundwork for many of the developments of the post-revolutionary era. The German telegraph network was still in its infancy, and its discussion by the National Assembly was one of the first explicit attempts to conceptualize and establish its relationship to the state. In doing so, it asserted the primacy of economic interests over fiscal concerns, foreshadowing the attitude which would come to dominate the management of communications infrastructure in the decades that followed.

The existence of a projected Reich 'central authority', moreover, though inevitably ephemeral, nevertheless also impacted upon the individual states' simultaneous efforts to develop their own networks. For this reason, the aforementioned commission established by the city of Frankfurt to consider its treaty with Prussia followed these developments closely, adapting its stance in accordance with the changes being debated in the National Assembly. The commissioners regretted, for instance, that the treaty, drawn up in September, did not take into account the National Assembly's subsequent decisions regarding the central authority's jurisdiction—namely, its right to install and use existing telegraph lines and to plan future legislation, as eventually appeared in Article VIII of the draft constitution.[68]

In this regard, the commission demonstrated its strong support for the objectives of the National Assembly. It was 'of the opinion that the German state governments, who have a particular duty to aid in the construction of German unity, may no longer sign any state treaty which does not account in every possible way for the legislation of the Reich, and which does not depend upon it'. The negotiations also provided an opportunity to display the liberal *Constituierende Versammlung*'s commitment to the project of national unification: 'The commission fully recognizes what a good impression it would create everywhere if the Prussian and present government had both been able to commit themselves in the treaty to follow all orders from the *Reichsgewalt* regarding the telegraph lines in question. But the treaty was . . . decided upon at a time when the relevant legislative powers of the Reich were not yet known.'[69]

It is questionable to what extent the Prussian government would have agreed and, perhaps pre-empting its attempts to entrench its position, the commission's report added that, 'although the aforementioned §43 of the German constitution is not yet in force . . . it is already not to be ignored, because . . . it can only be to the honour of the governments concerned and of encouragement to Patriots to

[67] Huber, *Dokumente zur deutschen Verfassungsgeschichte*, i, pp. 304–7.
[68] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Bericht der Commission', 4 Dec. 1848.
[69] Ibid.

demonstrate that the separate treaties of individual German states are subject to the higher authority of the *Reichsgewalt*, and to the commandment of unity of the fatherland . . . it must in particular be considered self-evident that the legislative power of the Reich is brought to bear upon the present treaty'. In order to cement this stance, the commission even called for the *Senat* to make known to the German central authority its decisions regarding this treaty.[70]

The concept of the telegraph as a structural component of a new German 'Reich' had at least some broader resonance. In 1848, a little-known article was penned by Adolph Poppe, son of Johann Heinrich Moritz Poppe, whose observations on the (optical) telegraph were evoked in Chapter 1.[71] It was one of the very few early texts aimed at the general public explicitly to deal with the possible shape of a future network, and it placed Frankfurt at its heart. Published in *Dinglers* and partly reproduced in the *Eisenbahn-Zeitung*, it suggested that establishing a '*Reichstelegraphensystem*' might resolve some of the issues caused by Germany's geographical situation, which called for 'constant political vigilance' as well as the 'peculiarity of its internal structure'. The country's layout, it argued, necessitated the 'facilitation and acceleration of communication between the central government and the governments of the individual states, as well as a rapid collaboration of the leading authorities'. Improved communications, it added, would also aid in the acceleration of military operations.[72]

The network envisaged by Poppe was to be centred upon the seat of the imperial government, which he identified as Frankfurt, and *großdeutsch* in form. Three lines would emanate from Frankfurt: one leading southwards and eastwards through Stuttgart, Ulm, and Munich to Vienna; one in a north-easterly direction through Leipzig, Berlin, and Stettin to Königsberg; and one northwards through Hanover to Hamburg and Lübeck.[73] 'From the heart of Germany,' Poppe imagined, 'the imperial government's dispatches will reach the seats of government of the individual states within minutes, as well as the furthest war ports and border fortresses; the Reich government will thereby be omnipresent, so to speak, and every political movement, every strike from outside will—through the telegraph as through nerves—instantaneously be transmitted to the central organ of the state body.'[74] The telegraph, for Poppe, was to form the nervous system of a future Reich, whose constituent limbs would be in constant communication with Frankfurt.

In the end, the dissolution of the National Assembly, and with it the provisional *Centralgewalt*, struck a serious blow to liberal hopes for a centralized nation state. In a display of (tragic?) irony—or perhaps vindication—just as the emergence of

[70] ISGFM, Verfassungsgebende Versammlung Nr. 8, 'Bericht der Commission', 4 Dec. 1848.
[71] A. Poppe, 'Vorschlag zur Organisation eines deutschen Reichs-Telegraphensystems', *DPJ*, vol. 110 (1848), pp. 394–5; cf. Chapter 1, p. 33, n 2.
[72] Ibid., p. 394. [73] Ibid., p. 395. [74] Ibid., p. 394.

the National Assembly had triggered Friedrich Wilhelm IV's decision to construct a telegraph line from Berlin to Frankfurt, it was by means of the very same line that he officially refused the offer of the imperial crown which arguably signed its death warrant, on 28 April 1849.[75] A few weeks later, a petition sent in to the Assembly called for the Berlin–Frankfurt line to be dismantled as it was serving the needs of 'rebellious princes'.[76]

The previously implicit pressure placed upon governments to keep pace with technological developments abroad had now become explicit, as the construction of the first extensive telegraph lines underscored the cooperation required of states in Germany and beyond. This pressure, triggered by the events of 1848, was channelled through the prism of events in Frankfurt, highlighting the geopolitical tensions across Germany. As one newspaper lamented, 'The difficulties and the circuitousness of negotiations which the current state of German constitutional law necessitates in order for quite a few German dynastic lands and free-state territories to establish a great and useful installation, is exemplified by the fact that the electromagnetic telegraph line from Berlin to Cologne and Frankfurt a. M. has required no fewer than nine international contracts and one private contract.'[77]

* * *

The same shifting geopolitical balance helped break the developmental deadlock in Bavaria. On 23 December 1848, the Austrian ambassador communicated his government's intention to construct a telegraph line from Trieste through Vienna and Munich to Strasbourg. The Bavarian government was invited to help build the section between Munich and Vienna, and to commit to extending the line along the Munich–Stuttgart–Karlsruhe railway towards Paris, as well as to Frankfurt.[78] The Austrian government had long since tended to its own internal needs, establishing telegraph lines between Vienna and Prague, Pressburg, and Krems, but recent events had highlighted the need for much broader, international channels of communication. The ambassador expressed the hope that Bavaria would 'not only offer a helping hand in a friendly neighbourly fashion, but also in their reciprocal interests and those of all south German states'.[79] The very terms of the proposal, therefore, brought the political layout of the region into play.

At stake were both Austria's relationship with the *Reichscentralgewalt* in Frankfurt and the need to strengthen relations across southern Germany. By this time, indeed, Austrian Minister-President Prince Schwarzenberg and his new conservative government had declared their opposition to the National Assembly's proposals for a '*großdeutsch*' solution to the national question. As a result, the Assembly's attention had turned to Prussia as a potential leader in the

[75] Siemann, *German Revolution*, p. 199. [76] Wigard, *Stenographische Berichte*, ix, p. 6632.
[77] *Königlich priviligierte Berlinische Zeitung*, 10 Jan. 1849, quoted in Siemens, *Lebenserinnerungen*, p. 133.
[78] BHStA, MH 16863, Oberst von Mayern, 'Memorandum', 23 Dec. 1848. [79] Ibid.

unification process, and it was therefore all the more important that Austria obtain support for the loose German confederation which it propounded instead.[80]

A memorandum on the issue, prepared by Colonel von Mayern, highlighted the strategic and domestic interests involved. '[T]oday,' he wrote, 'now that steam-powered means of communication have taken away from governments their precedence in the knowledge of distant events, it can only be won back using telegraphic connections . . . Prussia has already recognized this.'[81] Indeed, the construction of the line from Berlin to Frankfurt being undertaken by Siemens at this time cannot have gone unnoticed, and the memorandum no doubt masked a deeper concern that southern Germany was being drawn into the Prussian orbit. Turning to history for effect, Mayern proceeded to evoke the considerable advantages which Napoleon had drawn from his (optical) telegraph network in the early nineteenth century, and the natural 'geographical and ethnographical layout of the theatre of war towards the West'. In this regard, Colonel von Mayern emphasized that the telegraph could reduce the time needed to inform Vienna that an enemy army had crossed the Rhine from four days to a matter of hours.[82] But Mayern also highlighted the domestic issues which the installation could help resolve in Bavaria. He suggested, for instance, that it might secure closer relations with the Pfalz, Bavaria's province beyond the Rhine, much as Prussia had established with its Rhineland territories.

The Austrian initiative revitalized the Bavarian administration's interest in the technology, and by January 1849 inquiries confirmed that neighbouring Baden and Württemberg were also on board with this south German telegraph project.[83] Foreign Minister Otto von Bray-Steinburg then wrote to the minister of war to emphasize the strategic interests involved, particularly regarding the kingdom's defence against the West, asserting that the matter had already been raised in Frankfurt.[84]

As with the negotiations regarding the Berlin–Frankfurt line, the south German initiative spotlighted the geopolitical uncertainty that reigned during the period when the role of the National Assembly and the future of the German Confederation remained unclear. Austria, Bavaria, Baden, and Württemberg were invited to collaborate in different capacities: on their own account and in their own interest, but also as a 'south German' grouping opposed to Prussian domination, as well as in consultation with the provisional *Centralgewalt* established in Frankfurt, whose precise claims to authority were still vague and contested.

[80] Siemann, *German Revolution*, pp. 188–99.
[81] BHStA, MH 16863, Oberst von Mayern, 'Memorandum', 23 Dec. 1848.
[82] Ibid.
[83] BHStA, MH 16863, Brenner to Bray-Steinburg, 17 Jan. 1849.
[84] BHStA, MH 16863, Bray to Le Suire, 31 Jan. 1849.

Conflicts between the states were inevitable, and Bray-Steinburg wrote to the new minister of trade, under whose authority telegraphy now fell, pointing out the issues with the Austrian proposition. Mirroring the process which had taken place in northern Germany, Austria intended to take charge of construction on Bavarian territory, but unlike the authorities in the small city state of Frankfurt, Bray-Steinburg was in a position to categorically refuse such an arrangement. Once again, the provisional *Centralgewalt* in Frankfurt served as a buffer between the states, and Bray insisted that the matter should be discussed by the Bavarian representative in Frankfurt and decided upon in conjunction with the *Reichsministerium*. It was uncertain, he explained, whether the latter would consider the installation a '*Reichsanstalt*', and to what extent it might encourage Baden and Württemberg to work on the project.[85]

From January until the summer of 1849, the Bavarian state engaged in discussions with neighbouring states in order to establish the logistical, financial, and legal status of its future telegraph lines. Additionally, earlier plans for a north–south line from Kaufbeuren to Hof were revived, as the objective of a full statewide network reappeared on the horizon.[86] Initially, it was expected that the *Reichsministerium* might mediate the negotiations between Bavaria, Baden, and Württemberg.[87] By the end of March, however, the new Reich constitution had been published, Austria had effectively been excluded from the process of unification, and the imperial crown had been offered to Friedrich Wilhelm IV in Prussia.[88] Now, Bray-Steinburg believed that the Bavarian authorities should initiate independent negotiations with Austria directly.[89]

The circuitousness of this process is all the more significant insofar as Bavaria famously rejected the constitution of 28 March 1849, along with Austria, Württemberg, Saxony, and Hanover. Indeed, despite the government's opposition, throughout the *Centralgewalt*'s existence between 1848 and 1849 its potential authority was taken seriously and affected the course of negotiations. Whether this was out of support for the project of unification or—most likely—for the utility of using the 'central authority' as a safeguard against the claims of both Prussia and Austria, these developments lend credence to the argument that, contrary to widespread perceptions, the authority being constituted in Frankfurt did indeed enjoy a degree of support, or at least recognition, from the German governments.[90]

After the National Assembly disbanded in May 1849 and the prospect of a German Reich centred in Frankfurt faded, the new Foreign Minister Ludwig von der Pfordten decided that contracts should be established with the individual

[85] BHStA, MH 16863, Bray to HM, 22 Feb. 1849.
[86] BHStA, MH 16863, Bray, Memorandum, 30 Mar. 1849.
[87] BHStA, MH 16863, 30 Mar. 1849.
[88] Siemann, *German Revolution*, pp. 188–99.
[89] BHStA, MH 16863, Bray, Memorandum, 30 Mar. 1849.
[90] Siemann, *German Revolution*, p. 130.

states affected by the projected telegraph lines, and that inquiries should be made as to the arrangements which had been agreed between Prussia and Saxony, so as to adopt a similar model.[91] The system of bilateral agreements had prevailed.

By the spring and summer of 1849, the interdependence of the states involved in establishing the line had further increased the pressure upon Bavaria to initiate construction. Already in March, Bray-Steinburg had asserted that '[u]nder the present circumstances, and given the widespread usage of telegraphs now in different parts of Germany, there cannot be the least doubt as to the importance and decided necessity of a rapid introduction of telegraph lines in different directions in Bavaria, and we will have to proceed to negotiate its most important undertaking'.[92] Around the same time, the *Akademie der Wissenschaften* urged the government not to wait for a decision from the military authorities, as the social, commercial, and military incentives for the line were clear enough. The *Akademie*'s report even briefly looked ahead to consider the potential shape of a future network, proposing that Augsburg be considered its central point, as the junction between north–south and east–west traffic flows. There were no [longer] political reasons for a line to be established to Frankfurt, it claimed, but economic motivations might still support the idea. Above all, however, the *Akademie* urged the government to abandon any further experimentation and to adopt a system which had proved successful elsewhere.[93] The chief engineer of the *Eisenbahnbau-Kommission* himself asserted that he was ready to begin work upon the Munich–Vienna line as soon as Carl Steinheil's patent expired at the end of August.[94]

In Prussia, as we have seen, the events of March 1848 had served to streamline the technical decision-making process and to sway the state administration's decision in favour of Werner Siemens's enterprise. Similarly, although progress in Bavaria was ultimately blocked by the government's commitment to Steinheil's *Privilegium*, external pressures had accelerated the preparatory process, initiating negotiations with neighbouring states, the planning of individual lines, and even the abandonment of Steinheil's apparatus in a search for alternatives.

To speed up the process, the Austrian administration had in fact initially proposed that an optical telegraph be employed on the Munich–Vienna line. Both the Bavarian *Polytechnischer Verein* and the *Akademie der Wissenschaften* were asked to evaluate the proposal, and although they struggled to access any published material on the proposed model, designed by a certain Christoph Rad, both concluded that adopting an optical system would be to 'regress' [*zurückgehen*].[95] Steinheil himself was involved in the evaluation of the available

[91] BHStA, MH 16802, Pfordten to Bever, 9 July 1849.
[92] BHStA, MH 16863, Bray, Memorandum, 30 Mar. 1849.
[93] BHStA, MH 16863, 'Bericht, Vorstand der Akademie der Wissenschaften', 15 Mar 1849.
[94] BHStA, MH 16863, 'Bericht der Eisenbahnbau-Kommission', 27 Mar. 1849.
[95] BHStA, MH 16863, Bever to Polytechnischer Verein, 13 Feb. 1849; BHStA, MH 16863, Polytechnischer Verein to HM, 14 Mar. 1849.

options, and while he also preferred adopting an electrical system, he recognized the advantages which an optical telegraph might offer when its counterpart was interrupted—in times of war, for instance. 'It would certainly be safer to leave both mechanisms alongside each other; but this could be too expensive to set up,' he concluded.[96] Shortly thereafter, the Austrian government itself abandoned the '*Rad'sche Telegraph*', effectively signing the optical telegraph's death warrant as a means of ordinary correspondence in the south of Germany.[97]

By now, Steinheil was forced to acknowledge his own apparatus's shortcomings, but he still used the opportunity to emphasize the advantages of the auditory component which he had included in his mechanism. His system enabled telegraphic transmissions to be heard through a system of bells. '[Its] advantages are so evident', he wrote, 'that even the great difficulties with which the galvanic telegraph is currently struggling would not be in a position to prevent its rapid dissemination.'[98] Even in the thick of practical decision-making, the academic set his sights upon the much more distant horizon of telephonic communication.

While Steinheil's telegraph initially remained on the cards, the need for alternatives was pressing, and the negotiating parties were becoming restless. The *Eisenbahnbau-Kommission* had already inquired into the system developed by a manufacturer in Saxony, Emil Stöhrer, and under the circumstances Bray-Steinburg believed that, as 'a loss of time in the field of our own further experiments could be involved, it seems necessary to get to know the electromagnetic telegraph installations in the other German states . . . '.[99] The American Robinson, who had helped introduce Morse's apparatus to the German market, had offered his services as a consultant, but Carl Steinheil himself proposed to tour Germany on the commission's behalf. The minister recommended taking up the latter's offer, in the hope that to do so would 'simultaneously help set aside a forthcoming disagreement in relation to Steinheil's *Privilegium*', and thus help resolve the situation.[100]

Preparations were continued, but the Bavarian envoy in Austria noted his counterparts' impatience and their shock at the slow pace of progress.[101] Both the *Polytechnischer Verein* and the *Akademie der Wissenschaften* now insisted that telegraph lines would be needed both along railways and outside them, an issue which Prussia and Austria had confronted years earlier.[102] This realization in turn

[96] BHStA, MH 16863, 'Auszug, Protokoll der dritten Sitzung der math-phys. Klasse', 10 Mar. 1849.
[97] BHStA, MH 16863, Bray, Memorandum, 30 Mar. 1849.
[98] BHStA, MH 16863, 'Auszug, Protokoll der dritten Sitzung der math-phys. Klasse', 10 Mar. 1849.
[99] BHStA, MH 16863, 'Bericht der Eisenbahnbau-Kommission', 12 May 1848; BHStA, Verkehrsarchiv 30056, 'Bericht der Eisenbahnbau-Kommission', 1 Feb. 1849; BHStA VA; BHStA, MH 16863, Bray, 'Antrag an den König', 28 Mar. 1849.
[100] BHStA, MH 16863, Bray, 'Antrag an den König', 28 Mar. 1849.
[101] BHStA, MH 16863, 'Bericht des Civil-Ingenieurs F. Kreuter', 24 Apr. 1849.
[102] BHStA, MH 16863, Bray, 'Antrag an den König', 28 Mar. 1849.

highlighted the need for separate wires and apparatuses along the same lines—simple pointer-telegraphs for the railway service, and printing telegraphs for government service.[103] Other rapid decisions were made so as to speed up the project, as preparations began to outpace the production process: when the Munich–Hof line was begun ahead of schedule in May, for instance, iron rather than copper wires were chosen, and it was recognized that certain wires would have to be placed above ground rather than laid underground 'in consideration of the fact that the line must be established as quickly as possible'.[104]

On 30 August 1849, Carl Steinheil's *Privilegium* finally expired, and work began on the construction of the telegraph line between Munich and Salzburg. By then, the geopolitical situation had changed, and Württemberg had backed out of the project to extend the line to Strasbourg. Not only had the turbulence of the period subsided, no doubt removing both socio-economic pressure and encouragement from the *Reichsministerium*, but political events had left the state with too little money to devote to the telegraph line.[105] In order to circumvent Württemberg, another line was proposed which would cross the city of Frankfurt on its way to Strasbourg and Paris, and which the foreign minister, Ludwig von der Pfordten, believed would be one of the most important, 'particularly if Frankfurt were to remain the centre of the Confederation's affairs'.[106] Frankfurt's future political status was now uncertain, however.

The government's priority had been the Munich–Salzburg line, and only once the pressure diminished in late October could proper consideration be given to the broader network of which it was to be a part. 'The next and most pressing task', Pfordten explained, 'now consists of deciding here in Bavaria on the direction of the principal lines, their priority, the system to be adopted, as well as the form of administration, etc., and to make the necessary means available. In both respects, the preparatory work will be the task of the relevant competent organization, but the decision will have to be submitted for joint ministerial consideration, in which the royal war ministry should be considered a participant.'[107]

3.3 The Hanseatic Exception

From the outset domestic demand, rather than strategic or political necessity, had been at the heart of Bremen's telegraph network. As we have seen, the city's connection to Bremerhaven, which had opened on 1 January 1847, was both financed and administered by the private *Telegraphen-Verein* on behalf of the

[103] BHStA, MH 16863, 'Bericht der Generalverwaltung der Posten und Eisenbahnen', 7 Apr. 1849.
[104] BHStA, MH 16802, 'Sitzung im MA', 10 May 1849; BHStA, MH 16863, 31 May 1849.
[105] BHStA, MH 16802, Pfordten to MA, 5 Aug. 1849.
[106] BHStA, MH 16799, Pfordten to HM, 25 Sep. 1849. [107] Ibid.

city's business community. After 1849, however, here too the need to establish treaties with neighbouring states led the local government to assume a managerial role in the network's development. The revolutions, indeed, had drawn the *Hansestadt* closer to its German neighbours. It too had been shaken by popular revolts, and government reform had threatened to weaken the authority of the ruling *Senat*. One of its leading figures, Senator Arnold Duckwitz, moreover, had led the provisional *Reichshandelsministerium* in Frankfurt, where he called for the formation of a united German navy, in particular.[108] Certain sections of the city state's elite were now turning their attention away from the coast and towards the rest of Germany, and the *Senat* and *Handelskammer* increasingly struggled to align domestic and foreign interests.

As we have seen, in 1847 demand for a telegraph line between Hamburg and Cuxhaven had generated further proposals for the connection to be extended to Bremen. In February 1848, the company running matters in Hamburg had obtained a concession from the Hanoverian government for the construction of the Hamburg–Cuxhaven portion.[109] A year later, as the extension of the line to Bremen was envisaged, the director of the *Bremer Telegraphen-Verein* asked the local *Senat* for a concession to establish the connection.[110] Traditions of private enterprise were clearly still strong on the north-western coast, but the need to negotiate an acceptable treaty for the installation of wires along the territory of neighbouring Hanover and Prussia required the *Senat* to intervene.

By November 1849, with states throughout Germany projecting lines in multiple directions, Bremen too was drawn into the diplomatic game. Freshly returned from Frankfurt, Arnold Duckwitz addressed the *Senat* on the issue of establishing telegraph connections with Prussia and Hanover. The Prussians, in particular, had approached the government in the hope of establishing a connection between their existing telegraph lines and their post office within Bremen. As Duckwitz explained, this posed a dilemma for Bremen.[111]

On the one hand, he emphasized 'the great importance of such a connection for communication'. On the other hand, he evoked its 'implication for the independent position of the state in relation to the telegraph institute'. In this regard, he believed 'it would be very questionable to grant the Prussian post office, or any other foreign government, similar rights as those they possess contractually in postal matters in the sphere of telegraphic correspondence'. Duckwitz recognized the geopolitical fact that 'Bremen is also unable to enter into possession of this new important means of communication without the cooperation of foreign governments, namely Prussia and Hanover'.[112] As the erection of the Berlin–Frankfurt

[108] H. Schwarzwälder, *Geschichte der Freien Hansestadt Bremen* (4 vols., Bremen, 1975–85), ii, pp. 181–96.
[109] *EBZ*, 28 Feb. 1848.
[110] StAB, 2-R.15.b.1, Direktoren des Bremer Telegraphen-Vereins to Senat, 23 Jun. 1849.
[111] StAB, 2-R.15.b.3, 'Extract aus dem Senatsprotocolle', 28 Nov 1849. [112] Ibid.

line had revealed, small states, in particular, had little choice but to cooperate with their larger neighbours if they were to obtain useful telegraphic connections. At the same time, Duckwitz was also concerned to defend the 'independent position' of the *Telegraphen-Verein*.

Assuming responsibility for the telegraph network would carry other potential benefits for the *Senat*, however. Duckwitz understood that the importance of telegraphic communication for Bremen's trade would increase once it was used 'not only for exceptional notifications, but on a regular basis, [for] reports and business transactions'. At that point, as had been the case with the postal service, 'this type of correspondence might be associated with significant financial and state interest'. In the future, therefore, he believed that 'certain questions will be addressed, which will require the constant attention of the *Senat* . . . '.[113]

Allowing Prussia to dominate the telegraph network at an early stage, Duckwitz argued, would enable it to reap the financial and strategic benefits which would later derive from the institute. 'Prussia is therefore handling matters very cleverly', he stated, by engaging in negotiations 'at a time in which we cannot survey the consequences and importance of postal-telegraphic correspondence'. In addition, Duckwitz believed that the foreign government's intentions might well be to administer and finance the lines themselves, and to reserve it for Prussian use. This was the case, he erroneously believed, on the Berlin–Frankfurt line, and Duckwitz therefore advised collecting 'more details on the intentions of Prussia, as well as the views of Hanover' so as 'not already to commit ourselves to obligations'.[114] The *Senat*, Duckwitz made clear, must intervene in the establishment of new telegraph lines to defend the strategic interests of the city state as a whole.

Negotiations with Prussia and Hanover had highlighted not only the strategic interests which the *Senat* was now called to defend but also the importance of establishing connections to German markets, in addition to Bremen's existing overseas interests. While the Prussian proposal was under consideration, another telegraph line was also due to be installed along the railway leading southwards from Bremen towards Wunstorf and Hanover, for signalling purposes. The connection could also provide easier access to these markets, and so it was hoped that the telegraph might also be used to transmit ordinary correspondence.

In November 1849, therefore, Hermann Heye wrote to the *Senat* on behalf of the *Handelskammer*, asking that it establish contact with the Hanoverian government regarding the proposed Bremen–Wunstorf line. Heye explained that Bremen should not be excluded from such a 'significant tool of trade' which was being constructed 'between almost all places of significance in Germany', particularly given 'the recent permission granted by the respective governments for its use in the transmission of private correspondence'.[115]

[113] Ibid. [114] Ibid. [115] StAB, 2-R.15.b.3, Hermann Heye to Senat, 29 Nov. 1849.

There was an alternative to the direct Bremen–Wunstorf line, but it would threaten the city's position within the German market. Indeed, Bremen would also benefit from the Bremerhaven–Cuxhaven–Hamburg connection which was under consideration by the private enterprise evoked earlier. In conjunction with the Hamburg–Wunstorf line, Bremen could then communicate with Hanover through Bremerhaven, but this convoluted connection would place Bremen at a disadvantage, as 'along this route, all news from middle and southern Germany would always only reach us through Hamburg, and would therefore be delayed'.[116] Constructing a shorter Bremen–Wunstorf line would also simplify matters, as it required negotiating with only one foreign government.

The necessity of government intervention in order to effectively defend these commercial interests through a process of interstate negotiation was therefore well recognized. Rather than turning to private initiative as local merchants had done in the past, Hermann Heye stated that 'the now almost universally followed principle, that telegraphs are more efficiently constructed by the state, under whose supervision and influence they are left, should also apply in this instance'.[117]

By December the Hanoverian government had agreed to the laying of a second wire along the Bremen–Wunstorf railway.[118] Regarding further connections, however, such as those to Prussia, Bremen was also dependent upon Hanover's attitude to the proposals put forward. The latter had already made concessions for Prussia to build a line to Cologne across its territory, and was reluctant to accept further encroachment into its jurisdiction.[119] Pushing for more action to be taken, the Bremen *Handelskammer* later called on the *Senat* to undertake direct negotiations with Prussia instead.[120]

The interests of the *Senat* and the *Handelskammer* representing the merchant community had traditionally been aligned, ensuring that strategic and economic concerns went hand in hand. As the telegraph presented new opportunities to connect to the German market, however, tensions began to emerge. So much so that, in 1850, when the *Senat*'s concern to defend Bremen's geopolitical position vis-à-vis its neighbours threatened to sabotage the construction of further telegraph lines, the *Handelskammer* wrote to emphasize their commercial value. While conceding that there were political and diplomatic issues at hand, it 'placed great value on the positive result of these efforts, in that it is convinced that considerations of less significance should be rebuffed [*zurückzuweisen*] in an enterprise whose use is so important, indeed indispensable for our commercial interests'.[121]

[116] Ibid. [117] Ibid.
[118] StAB, 2-R.15.b.3, 'Extract aus dem Senatsprotocolle', 7 Dec. 1849.
[119] StAB, 2-R.15.b.3, Duckwitz to Senat, 1 Dec. 1849.
[120] StAB, 2-R.15.b.3, 'Extract aus dem Senatsprotocolle', 1 May 1850.
[121] StAB, 2-R.15.b.3, Hermann Heye, Namens der HK, to Senat, 30 Apr. 1850.

Negotiating Bremen's accession to the emerging telegraph network had begun to reveal divisions within the city's traditionally united political and commercial elite. Their alliance had been based upon a firm strategic independence from other German states, and upon their ties to overseas markets, particularly in the United States. The emergence of new communications networks connecting the city state to German markets required a more direct engagement with neighbouring states, however, jeopardizing this strategic isolation. The telegraph therefore revealed the divergence of the city's commercial and political focal points, foreshadowing the disintegration of its 'cosmopolitan community' as it was tied into emerging German industries and markets.[122]

* * *

As the telegraph came into operation across Germany, the domestic pressures of the development process which appeared to have been resolved resurfaced in a new form. By early 1849, for instance, persistent complaints from the railway companies in Prussia led the government to reconsider the terms of the concessions which it had granted them. The original concessions, as the historian Wolfgang Löser noted, were redrafted as contractual arrangements, symbolizing the modest victory of liberal economic principles and the state's attempt to accommodate the forces of bourgeois capitalism after the events of 1847–9.[123] Even in Hessen, where the stringent concessions proposed by the state had led to the abandonment of trials along the *Friedrich Wilhelm Nordbahn*, 'the political events of recent times encouraged the management [of the railway company] to sue for damages'.[124] The process of technological innovation and implementation was not over, and it would continue to necessitate cooperation between its principal actors.

At the same time, public consumers of the service emerged, hinting at a new internal force with which state administrations would have to reckon. When Prussia's first telegraphic connection between Berlin and Frankfurt was opened in February 1849, it was intended exclusively for government use, but pressure had quickly mounted for the service to be made available to the public. In June, it was decided that the line would be progressively made accessible to individuals for the purposes of private correspondence, and by October the Frankfurt *Handelskammer* initiated negotiations to obtain the daily run of stock prices by telegraph.[125] In November, Bernhard Wolff established his *Telegraphisches Büro* in Berlin, delivering telegraphic news to the press, and, based on existing demand, the *Eisenbahn-Zeitung* estimated that private uptake in Prussia would soon cover the costs of the network's construction.[126]

In many ways, then, the events of 1848/9 had accelerated an ongoing process and laid the foundations for the future of telegraphic communication. They

[122] L. Maischak, *German Merchants in the Atlantic* (Cambridge, 2013), pp. 197–220.
[123] Löser, 'Die Rolle des preußischen Staates', p. 205. [124] *EBZ*, 11 Sept. 1848.
[125] *EBZ*, 9 Jul. 1849, 2 Oct. 1849. [126] *EBZ*, 17 Nov. 1849.

stimulated the construction of extensive lines for the purposes of government communication, forcing the resolution of many undecided questions in the development of the technology. As a result, however, they also required states to assume responsibility for the management of networks, as a process of interstate negotiation was unleashed which was necessary to the construction of extensive networks. For a while these negotiations revolved around the decisions being made in the National Assembly in Frankfurt. For as long as the 'Reich' seemed to be accruing credibility, a central authority appeared an effective means of coordinating a pan-German network. Once the *Centralgewalt* faded away in 1849, however, a system of multilateral agreements prevailed, foreshadowing the future establishment of the *Deutsch-Österreichischer Telegraphen-Verein*.

But the consideration given to communications infrastructure by the National Assembly, and the struggle of the *volkswirtschaftlicher Ausschuß* to establish a unified German economy under the authority of a Reich ministry, were a sign of things to come. From now on, the function of telegraphy was to be closely associated with the aim of promoting economic growth, rather than increasing state revenue. So while states across Germany had assumed for themselves a managerial position in matters of communication, they had also made themselves the target of future consumer demands. New actors had entered the scene, and as new local and regional connections were formed, the state found itself at the mercy of both internal and external pressures—a single cog in a complicated mechanism of technological development, implementation, and diffusion.

PART II

1850–1880

4
The Dawn of the Network Society

'Right from the cradle, our efforts are aimed at enabling us to communicate, to receive from others, to impart to others; these efforts, both great and small, presuppose a mutual exchange of the means of satisfying human needs. Like an instinct, it dominates Man's actions . . . Exchange is the bearer of all wellbeing, the vehicle of all progress.'[1] For the economist Karl Knies, writing in 1857, this elemental desire for human interaction was at the heart of modern developments in transport and communication. Praising recent technological advances, he looked with confidence to the future: 'the facilitation of communication is for our time not only a monument to what has been achieved, but also a magnet for our endeavours'.[2]

As Knies understood, by launching the construction of public telegraph networks in the wake of the 1848 revolutions, German governments had implicitly undertaken to satisfy a potentially insatiable appetite for communication across society. The circulation of information, Knies asserted, 'not only fulfils a felt need . . . but also evokes it in many places', and by implementing the very first telegraph lines, states had initiated a self-generating cycle of supply and demand.[3] Internal pressures, moreover, were compounded by the agreements which increasingly regulated the relations between state networks across Europe. 'Telegraph unions', Knies wrote, '. . . cannot stop at extending a friendly neighbourly hand . . . but must bring about a true commonality in the management and advancement of everything which concerns two countries simultaneously.'[4] In this domain, too, expansion was inevitable: '[E]ven the system of associations between groups of states cannot be the ultimate objective. The telegraph unions within our continent will become a telegraph union of all states on our continent. The seeds have not only been sown, their shoots can be seen above the ground.'[5]

This combination of internal and external pressures constituted a major challenge for German governments during the 1850s. The revolutions of 1848 had revealed the potential dangers of ignoring certain forces within society, from disenfranchised tradesmen to dissatisfied businessmen, and the limits of suppressing public opinion. Social and economic change, governments realized, was inevitable, and its consequences could only be managed by guiding, not resisting, the forces behind it. Constructing networks of telegraphic communication and

[1] K. Knies, *Der Telegraph als Verkehrsmittel* (Tübingen, 1857), p. 1. [2] Ibid., p. 2.
[3] Ibid., p. 64. [4] Ibid., p. 205. [5] Ibid., p. 205.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0006

placing them at the disposal of the public was part of their efforts to adapt to a post-revolutionary world, therefore; to structure and accompany the process of industrialization that was to characterize the second half of the nineteenth century in Germany; but it also tied them into an increasingly dense web of domestic and foreign relations.

What has traditionally been referred to as a decade of 'reaction', therefore, was in fact a period of dynamic change, accompanied by a 'revolution in government'.[6] In Prussia, Minister-President Otto von Manteuffel attempted to steer a middle course between the demands of ultraconservatives surrounding the king and liberal forces in parliament, while August von der Heydt, as minister of trade, heightened state involvement in the construction of railways and telegraphs.[7] In Bavaria, a new course was signalled with the abdication of Ludwig I in 1848 and the accession to the throne of his son, Maximilian II, in 1848.[8] Surrounding himself with intellectuals ranging from Leopold von Ranke to Wilhelm Heinrich Riehl, the new king sought advice on the 'tendencies of the times' and recognized that the forces of industrialization and capitalism must be managed so as to avoid dramatic upheavals.[9] Across the German *Mittelstaaten*, governments actively promoted the building of railway, telegraph, and postal networks, developed new educational policies, and replaced press censorship with an active propaganda strategy designed to strengthen citizens' loyalties to the state.[10] Even in notoriously unconstitutional Austria, Emperor Franz Joseph I undertook a programme of social and economic development.[11]

The telegraph lines built by German governments fuelled the circulation of information across networks which extended well beyond the borders of their own territory. They provided a new tool to administrators, diplomats, and police forces, but they also generated a nexus of finance, trade, and communication which helped fuel Germany's industrial 'take-off'.[12] They transformed the pace and extent of news reporting across Europe, strengthened existing networks of private banking, fuelled the emergence of the securities market, and introduced more rapid fluctuations in commodity prices which came to affect the fortunes of

[6] C. Clark, 'After 1848: The European Revolution in Government', *Transactions of the Royal Historical Society*, vol. 22 (Dec. 2012), pp. 171–97; on the characterization of the 1850s as a period of 'reaction', see T. S. Hamerow, *Restoration, Revolution, Reaction: Economics and Politics in Germany, 1815–1871* (Princeton, N.J., 1958), pp. 219–37.

[7] A. Ross, *Beyond the Barricades: Government and State-Building in Post-Revolutionary Prussia, 1848–58* (Oxford, 2019).

[8] N. Mayr, 'Particularism in Bavaria: State Policy and Public Sentiment, 1806–1906' (PhD Thesis, University of North Carolina, 1988).

[9] M. Hanisch, *Für Fürst und Vaterland: Legitimitätsstiftung in Bayern zwischen Revolution 1848 und deutscher Einheit* (Munich, 1991), pp. 94–148.

[10] A. Green, *Fatherlands: State-Building and Nationhood in Nineteenth-Century Germany* (Cambridge, 2001), esp. pp. 223–66.

[11] P. Judson, *The Habsburg Empire: A New History* (Cambridge, Mass., 2016).

[12] H.-U. Wehler, *Deutsche Gesellschaftsgeschichte* (5 vols., Munich, 1987–2008), iii, pp. 66–97.

manufacturers and agriculturalists.[13] They became the material support for the 'networks of means' underpinning the rise of a pan-European middle class.[14]

The technology thereby engendered a reconfiguration of the relations between state and society. It was in the very nature of the technology that it established a binary distinction between those included in and those excluded from the network, and throughout the period the hopes raised by the promise of instantaneous, long-distance communication were matched by anxieties at being deprived of access to the service. As the technology was diffused, it allowed certain groups and regions to communicate more rapidly than others, threatening to desynchronize society. Governments were therefore faced with the challenge of meeting demands for a reliable service from the public and neighbouring administrations while ensuring their own capacity to keep up with the growing pace of communication across society.

The culture which emerged during the period reflected this combination of expectations and frustrations. While telegraphs, like the railways, became a symbol of material progress, their deficiencies and limitations also became apparent. The 'annihilation of space' so often associated with the technology was only, if at all, perceptible where it was available and efficient. The very speed of communication, meanwhile, seemed to oversensitize users, businessmen in particular, to the fluctuations of telegraphic news, and to impinge upon the reliability of information in times of crisis. Acknowledging and responding to these changes, state and society made their first tentative efforts to come to terms with the reality of a networked modernity.

4.1 Establishing Priorities

By the early 1850s, the pressure exerted by the Austrian government upon its south German neighbours, and the opening of Prussia's main lines linking Berlin to Frankfurt and Aachen, had set in motion the construction of state telegraph lines across Germany. In Bavaria, the Munich–Salzburg line was already open to the public, providing a link to Vienna, and construction was underway on the Munich–Augsburg–Nuremberg–Hof line, which was to connect the capital, through Saxony, to Berlin.[15] A patchwork of connections was emerging throughout Central Europe, and the need soon arose to establish more formalized

[13] R. Michie, *The Global Securities Market: A History* (Oxford, 2006), pp. 83–118; cf. also Y. Cassis, *Capitals of Capital: The Rise and Fall of International Financial Centres, 1750–2009*, trans. J. Collier (Cambridge, 2010), pp. 41–73.

[14] J. Seigel, *Modernity and Bourgeois Life: Society, Politics and Culture in England, France, and Germany since 1750* (Cambridge, 2012), pp. 1–37.

[15] BHStA, MH 16802, Pfordten to Max II, 2 Dec. 1849; BHStA, MH 16799, Pfordten to Max II, 5 Feb. 1850.

blueprints for the future development of structured networks of communication. The new Bavarian minister-president, Ludwig von der Pfordten, twice brought the matter to the attention of the king, and his addresses summarized the issues facing most governments across Germany.

The 'indispensability' of the technology to the state, Pfordten believed, 'no longer need[ed] further elaboration'.[16] The urgency of constructing new telegraph lines, he added, became 'all the more apparent the further those lines extend which other states have at their disposal, and which can be used for private as well as government purposes'.[17] At this stage, smaller states such as Baden, Württemberg, and Hanover were struggling to meet the costs of building their own networks, but in light of Pfordten's emerging '*Triaspolitik*' (triad policy), which sought to establish Bavaria as the third leading power in Germany, it was crucial that they not fall behind. Added to these external pressures was the recognition that domestic demand for the service would inevitably grow, and that '[t]he necessity of a wider expansion of the telegraph network will later without doubt come into play'.[18]

From the outset, governments understood that much of this growth would come from the general public's use of the technology, a testament to the influence of liberal economic principles. The Bavarian king Maximilian II's advisors included Wilhelm Joseph Behr, Friedrich von Hermann, and Carl Joseph Kleinschrod, who adhered to an emerging German blend of Smithian ideas and diluted cameralism. Each from their own perspective, these advisors believed that the state's duty was to actively structure an otherwise independently functioning economy. The king himself had recognized that large-scale construction works might also stimulate employment and address the 'social question' which had surfaced during the recent disturbances.[19]

When Pfordten prepared a bill to present to the *Staatsrat* (State Council) and *Landtag* (Parliament), therefore, he described the government's objective as to 'envisage the entire telegraph network as it should be established for Bavaria', based on its recognized utility for private, commercial, as well as policing, strategic, and political purposes.[20] 'The more the telegraphic means of communication now comes into use in other states,' he once again emphasized, 'the more urgently our own country's interests require its introduction,' a fact recognized in both chambers of parliament.[21] Action had to be taken, Graf von Rechberg warned the *Kammer der Reichsräte* (Upper Chamber), 'as Bavaria could otherwise

[16] BHStA, MH 16799, Pfordten to Max II, 5 Feb. 1850.
[17] Ibid.
[18] BHStA, MH 16802, Pfordten to Max II, 2 Dec. 1849.
[19] I. Burkhardt, *Das Verhältnis von Wirtschaft und Verwaltung in Bayern während der Anfänge der Industrialisierung (1834–1868)* (Berlin, 2001), pp. 121–67.
[20] BHStA, Staatsrat 953, 'Gesetz-Entwurf, Herstellung eines Telegraphen-Netzes für Bayern betr.', 26 Mar. 1850.
[21] Ibid.

be impacted negatively in matters of trade and communication by neighbouring countries where this installation is already in place'.[22]

In Prussia, the minister of trade, August von der Heydt, had been behind the decision to open the telegraph network to the general public. Heydt's defence of government involvement in the construction of communications networks, including railways, reflected a similar recognition that support for the forces of trade and industry would generate benefits for the state as a whole. It was better to work with society than against it and, in response to the police president of Cologne's suggestion that all private telegrams be subject to censorship, Heydt emphasized that doing so would undermine the public's trust in the government. Austria, he explained, would soon be giving the public access to the telegraph, and there would be negative consequences for Prussian subjects if the network was open to commercial correspondence in other states but not their own. In this matter it was 'better to lead than to follow'.[23]

The salient problem for governments, however, was how to plan a network whose expansion would depend upon the whims of its users. As the case-handler for the matter in the Bavarian parliament explained, the telegraph was an object 'whose high importance for the development of the internal life of the state, as well as for the intercourse of states and peoples is not completely recognized nor fully comprehended'. He did have faith in the technology's potential, but it was based upon 'wonderful expectations' rather than any firm evidence.[24] Pfordten himself admitted that 'the real demand cannot yet be ascertained precisely', and it was therefore 'all the wiser only progressively to bring the telegraph network to completion, as further experience and new improvements are brought into use'.[25] Parliamentary deputies recognized that 'the more this institution is extended, the more its use will become possible and provide many inhabitants of our particular fatherland with significant advantages'.[26] This placed the state in a rather uncomfortable predicament—existing demand was not only impossible to estimate but would itself be generated by supplying the service.

It was in fact to deal with this unpredictable growth that some favoured establishing a state monopoly over the construction of telegraph lines. From the government's perspective, as Pfordten announced, it was without question that the state should finance the project.[27] Such a monopoly had a precedent in the postal system, which had been nationalized in Bavaria in 1808, but which King Ludwig I had unabashedly used as a source of revenue to fund his ambitious

[22] *VKR* (1850), 12 May 1850, p. 242; see also *VKA* (1849/50), 28 Apr. 1850, p. 453.
[23] GStA PK I. HA Rep. 77, Tit. 813, Bd. 2, Heydt to Manteuffel, 16 Mar. 1850.
[24] *VKA* (1849/50), 28 Apr. 1850, p. 453.
[25] BHStA, Staatsrat 953, 'Gesetz-Entwurf', 26 Mar. 1850.
[26] *VKA* (1849/50), 2 May 1850, pp. 736–7.
[27] BHStA, Staatsrat 953, 'Gesetz-Entwurf', 26 Mar. 1850.

construction projects during the 1840s.[28] For the liberal deputy and former minister Ludwig Fürst zu Oettingen-Wallerstein, therefore, the proposed legislation was nothing more than an 'indemnity bill', put forward to gain parliamentary approval for measures already taken by the state.[29] But new forces were at play, and besides fiscal considerations Graf von Rechberg argued that state involvement was necessary specifically 'because private industry will be hard put to take possession of this object, whose profitability is still very problematic'.[30]

The outline eventually followed by most states sought to balance newly recognized economic priorities with geopolitical considerations and more traditional concerns for the administration and security of the state. In the upper chamber of the Bavarian parliament, one member emphasized that it was 'necessary that the government, particularly in these agitated times, rapidly receive knowledge of all developments at the larger courts of Germany and Europe' as well as of internal occurrences.[31] Indeed, the *Reichsräte* added to the bill the requirement that 'the royal state government establish a connection with neighbouring states and a uniform tariff by means of treaties'.[32] In the end, the projected outline provided for lines to Salzburg in Austria, Lindau beside Lake Constance, Ulm in Württemberg, Frankfurt am Main, Hof towards Saxony and Prussia, and finally, upon the insistence of a member of the *Staatsrat*, Passau as both a fortress and a further point of contact with Austria.[33]

Internally, meanwhile, the priority was to connect Munich with the principal seats of local government, fortress towns, and what were termed the 'main channels' of trade.[34] The principal 'channel' in question was the arc running from the north, in Hof, to the south-west, along the border with Württemberg. Above all, the blueprint favoured existing routes of trade, the textile-producing regions of Schwaben and Oberfranken, as well as the incipient machine industry in Nuremberg—a network to which Munich was simply appended.[35] In this regard, the outline built upon the decentralized Bavarian postal network whose development, as Zef Segal has shown, followed these routes of traffic between north and south Germany.[36]

Some regions were neglected, notably the Oberpfalz—despite its significance for the mining industry—and, as was often the case, the Pfalz. The latter, situated on the left bank of the Rhine, was not even assigned a connection to the Bavarian heartland, of the kind Prussia had established with its Rhineland

[28] K. Amtmann, *Post und Politik in Bayern von 1808 bis 1850: Der Weg der königlich-bayerischen Staatspost in den Deutsch-Österreichischen Postverein* (Munich, 2006), pp. 230–44.
[29] *VKA* (1849/50), 2 May 1850, p. 737. [30] *VKR* (1850), 12 May 1850, p. 242. [31] Ibid.
[32] *VKR* (1850), 17 May 1850, pp. 364–76.
[33] BHStA, Staatsrat 953, 'Auszug aus dem Protokolle', 26 Mar. 1850.
[34] *VKA* (1849/50), Beil. CXXIX, 28 Apr. 1850, p. 453.
[35] Burkhardt, *Verhältnis von Wirtschaft und Staat*, pp. 32–9.
[36] Z. Segal, *The Political Fragmentation of Germany: Formation of German States by Infrastructure, Maps and Movement, 1815–1866* (Palgrave, 2019), esp. pp. 75–105.

provinces—which was all the more surprising given the popular revolts which had taken place there following the dissolution of the National Assembly in the summer of 1849, and which the government had struggled to put down.[37] The outline adopted, therefore, did not provide uniform coverage across the state. Rather, it strengthened the connections between existing economic, administrative, and militarily strategic centres.

The emerging Prussian network similarly reflected a mixture of strategic and commercial concerns. By 1 October 1849, telegraph lines had been built linking the capital city to Aachen, in the Rhineland, Frankfurt, the heart of the German Confederation, Hamburg, Germany's most active port city, as well as a connection between Düsseldorf and Elberfeld, at the core of the state's textile and mining industries. Two further lines would be opened by May 1850, connecting Berlin to the eastern border towns of Stettin and Oderberg.[38]

The majority of medium-sized German states introduced similar telegraph networks during the 1850s, forging internal and external links. In Saxony, the network initially prioritized both the internal Leipzig–Dresden connection and that to Hof and Görlitz, establishing a connection with Bavaria and Prussia.[39] Hamburg and Bremen, meanwhile, negotiated connections with Hanover and Prussia.[40] Baden, Württemberg, and Hanover had been slow to introduce the state networks, primarily for financial reasons. All three, however, were spurred to action by Bavaria, France, Prussia, Bremen, and Hamburg, which relied upon these struggling states' participation in order to connect to foreign territories further afield.[41]

This geography-induced mixture of interstate collaboration and coercion was formalized through the establishment of the *Deutsch-Österreichischer Telegraphen-Verein* (German-Austrian Telegraph Union, *DÖTV*) in July 1850. Initially composed of Austria, Prussia, Bavaria, and Saxony, these four engines of the German telegraph network soon drew in the remaining German states, generalizing technical norms and raising expectations for each member to live up to. The founding treaty required the service to be open to the public, for instance, and set the tariffs for communication between networks. It also encouraged their continuous expansion by linking the proportion of the *DÖTV*'s total

[37] J. Sperber, *Rhineland Radicals: The Democratic Movement and the Revolution of 1848–1849* (Princeton, 1991), pp. 414–66; H. Rall, 'Die politische Entwicklung von 1848 bis zur Reichsgrundung 1871', in Spindler (ed.), *Handbuch*, iv/1, p. 234; on popular political culture in the Pfalz during the *Vormärz*, see J. M. Brophy, *Popular Culture and the Public Sphere in the Rhineland, 1800–1850* (Cambridge, 2007).

[38] H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland* (Wiesbaden, 1983), p. 154.

[39] Ibid., p. 73. [40] Ibid., pp. 93, 98.

[41] R. Seidel, 'Verkehrsmittel Telegraph: Zur Geschichte der Telegraphie im 19. Jahrhundert bis 1866 unter besonderer Berücksichtigung des Raumes Hannover – Bremen' (PhD Thesis, University of Hanover, 1980), pp. 142–4.

revenue which each state received to the length of wires and volume of correspondence on their network.[42]

4.2 Policing the State

The telegraph's potential utility in ensuring state security had been repeatedly evoked during the 1840s, and the technology quickly became an essential tool for police forces across Europe. Reforms of the police service had been ongoing since the early nineteenth century, but they received renewed impetus following the insurgencies of 1848, and new means of communication strengthened the powers and efficiency of these ostensibly civilian forces which increasingly took over from the army as guardians of the social order.[43] This was, in many ways, a pan-European development, as the international character of the 1848 insurgencies and the generation of political exiles which they had dispersed across the continent highlighted the need for cooperation across state borders.[44] The quasi-instantaneity of telegraphy had obvious advantages for institutions such as the semi-official '*Polizei-Verein*' (Police Association) of German states established during the 1850s, and the networks of secret agents employed by the Prussian and Austrian authorities went some way to monitoring increasingly mobile subversives, although truly international policing associations would only emerge at the turn of the twentieth century.[45]

In the immediate aftermath of the mid-century upheavals, the telegraph offered a means of surveilling regions still simmering with unrest. In Aachen, the *Regierungspräsident* requested permission to communicate with police authorities across the border in Verviers, a connection which he considered important due to the 'social and industrial relations' of local 'factory cities', and because the Belgian town in question was rather close to the German border and 'entirely suited to all manner of gatherings and machinations of the politically dissatisfied'.[46] In Breslau, a senior official asked the government whether he might use the railway telegraph line in case of trouble, as there was no state-owned connection available.[47] In

[42] J. Reindl, *Der Deutsch-Österreichische Telegraphenverein und die Entwicklung des deutschen Telegraphenwesens, 1850–1871* (Frankfurt am Main, 1993), pp. 163–6.

[43] C. Emsley, *Policing and its Context, 1750–1870* (London, 1983); R. Evans, *Rereading German History: From Unification to Reunification, 1800–1996* (London, 1997), pp. 65–86; H.-H. Liang, *The Rise of Modern Police and the European State System from Metternich to the Second World War* (Cambridge, 1992), pp. 18–82.

[44] H. Pogge von Strandmann, '1848–1849: A European Revolution?', in *The Revolutions in Europe, 1848–1849*, ed. R.J.W. Evans and H. Pogge von Strandmann (Oxford, 2000), pp. 1–8.

[45] W. Siemann, *Deutschlands Ruhe, Sicherheit und Ordnung: Die Anfänge der politischen Polizei, 1806–1866* (Tübingen, 1985), pp. 242–459; M. Deflem, *Policing World Society: Historical Foundations of International Police Cooperation* (Oxford, 2002), pp. 45–77.

[46] GStA PK I. HA Rep. 77, Tit. 813, Bd. 2, Regierungspräsident Aachen to Westphalen, 11 Dec. 1851.

[47] GStA PK I. HA Rep. 77, Tit. 813, Regierungspräsident Breslau to Westphalen, 10 Apr. 1851.

Bavaria, the town of Ansbach was provided with a telegraph office specifically to enable the local government to monitor the political situation in nearby Nuremberg.[48]

In these places, the new technology gave the authorities a temporal advantage, allowing them to coordinate responses to an incident before it got out of hand. In particular, it enabled police forces to keep up with suspects' movements, an increasingly challenging task in the age of railway transportation. As the mayor of Augsburg stated, 'The use of the railway is no longer sufficient, because the criminal can make use of it too, and has already obtained a head start. The most reliable means of rapid pursuit is the electromagnetic telegraph.'[49]

Among the most avid users of the technology for the purposes of state security was Berlin's police president, Carl von Hinckeldey, who oversaw the restructuring of the Prussian police force and, enjoying the confidence of King Friedrich Wilhelm IV, was granted a considerable degree of autonomy. Hinckeldey was eager to use the telegraph in helping his officers to coordinate their activities, and he consistently fought for police telegrams to be considered '*Staatsdepeschen*' (state telegrams) and therefore free of charge. His zeal in doing so, however, led to repeated conflicts with the Prussian telegraph administration, and indeed Minister of Trade von der Heydt himself, who complained of the excessive burden placed upon the network by the police forces and insisted that they pay the full fee for the service.[50]

One of Hinckeldey's flagship initiatives was the development of a fire prevention telegraph network across Berlin which could also be employed for police purposes. The original idea was to connect the various firefighting services across the city, so that incidents might be reported and responded to more efficiently. In his 1851 report on the topic, however, Hinckeldey suggested extending this planned network to connect various buildings of the war ministry, the ministry of the interior, and each of the thirty-six police stations spread out across the city.[51] It was then suggested that the foreign ministry and the royal palace in Berlin should be similarly connected to the network.[52] In proto-Haussmannian style, the state was thus arming itself with a new means of managing the circulation of people and information across urban space.[53]

[48] StAN, Rep. 270/IV, Nr. 4, Draft of letter from Regierung Ansbach to HM, 14 Nov. 1850.

[49] Stadtarchiv Nürnberg, C 7/I, Nr. 2762, Erster Bürgermeister Augsburg to Magistrat Nürnberg, 30 Oct. 1850.

[50] A. Ross, *Beyond the Barricades: Government and State-Building in Post-Revolutionary Prussia, 1848–58* (Oxford, 2019).

[51] GStA PK I. HA Rep. 77, Tit. 1316, Nr. 1, Hinckeldey to Westphalen, 7 June 1851.

[52] GStA PK I. HA Rep. 77, Tit. 1316, Nr. 1, Berlin Magistrat to Westphalen, 6 Sept. 1851.

[53] Cf. Q. Deluermoz, *Policiers dans la ville: La construction de l'ordre publique à Paris, 1854–1914* (Paris, 2012).

Outside Berlin, meanwhile, the telegraph was being used to track down suspects moving across Germany and beyond. Cases varied from criminals seeking to flee the country via the port city of Bremen to a missing 16-year-old boy whose father believed he had run away to work on a ship.[54] The pursuit of these individuals required collaboration between the various state police and telegraph administrations, emphasizing the need for a collective regulation of practices. The '*Polizei-Verein*' established by Hinckeldey and his collaborators in Austria, Bavaria, and Saxony for the purpose of monitoring political suspects, in particular, required that the telegraph be used to notify the relevant authorities in case of necessity.[55]

The emerging surveillance network possessed a number of blind spots, however. In 1851, for instance, a Hungarian revolutionary was spotted near Bayreuth, and although warnings were sent from Munich to neighbouring Bamberg, the authorities in Bayreuth, being deprived of a telegraph office, were left unaware of this communication. When the suspect fled to Bohemia, the president of the regional government wrote to the minister of trade explaining that '24 hours earlier, warrants could have been sent out to capture [him] if it were possible to telegraph from Munich to here as well as Bamberg,—a loss of time which in such a case, and given the ease with which one can use the railways to escape police deployments, cannot be compensated for'.[56] As the president's complaint highlighted, the piecemeal introduction of the technology had begun to establish distinctions between those areas with access to the service and those without. In the process, it was interfering with administrative protocol by creating a temporal hierarchy. In this case, the *Stadt-Kommissar* in Bamberg had received information by telegraph ahead of the president himself, who now demanded that all such telegrams be forwarded to him with the next post.[57]

Outside the police forces, and despite the considerable enthusiasm which civil servants had expressed for the adoption of the technology, its use was not immediately widespread in the day-to-day workings of the bureaucracy. To be sure, the technology was of immediate utility in diplomatic circles, who had long depended upon extensive networks of communication, but its incorporation into practices of administration was rather slow.[58] Throughout Bavaria, for instance, only 459 state telegrams were sent during the first six months of 1851. When the regional government in Ansbach asked its subordinate departments to report on their potential use of the technology, the Nuremberg *Magistrat* replied that its use

[54] Stadtarchiv Wuppertal, Q II 61, Telegram Polizei-Commissair Elberfeld to Telegraphen-Station Bremen, 18 July 1873.

[55] W. Siemann (ed.), *Der 'Polizeiverein' deutscher Staaten: Eine Dokumentation zur Überwachung der Öffentlichkeit nach der Revolution von 1848/9* (Tübingen, 1983), p. 30.

[56] BHStA, MH 16799, Regierung Oberfranken to HM, 28 Apr. 1851.

[57] Ibid.

[58] D. Headrick, *The Invisible Weapon: Telecommunications and International Politics, 1851–1945* (New York, 1991), pp. 73–5; D. P. Nickles, *Under the Wire: How the Telegraph Changed Diplomacy* (Cambridge, Mass., 2003).

had thus far been so rare as to make an informed estimate impossible.[59] By the end of the decade, even in an important town such as Augsburg, an average of only one state telegram was either sent or received on a daily basis.[60]

Access to the telegraph, it would seem, had often been requested on a precautionary basis, to strengthen the confidence of the authorities in their ability to manage unexpected situations. The *Regierungspräsident* in Breslau who had asked for access to the telegraph to monitor local unrest, for instance, admitted that he had not once made use of the service. The office which had been opened in Ansbach for similar reasons later reported that its use had been uneconomically low. In fact, the telegraphist there expressed the desire 'to be kept busy with telegrams more often', and the local authorities were therefore encouraged to make more frequent use of the service.[61]

4.3 Confronting Demand

Beyond the state administration lay a vast pool of potential customers within society. Most German telegraph lines were open to the general public by 1850, and over the following decade the volume of traffic across German networks increased ten- to twentyfold. Between 1850 and 1860, the number of telegrams handled annually in Württemberg rose from 7,000 to 100,000; in Bavaria from roughly 10,000 to 200,000; and in much larger Prussia, from 35,000 to 600,000.[62] And by far the greatest share of these telegrams was private correspondence: of the 121,000 telegrams sent on Prussia's state lines in 1854, roughly 108,000 were '*Privat-Depeschen*'.[63] Network coverage across each state, on the other hand, remained rather limited. In 1855, there was one telegraph office for every 60,000–65,000 inhabitants in Saxony, 190,000 in Bavaria, 344,000 in Prussia, and 634,000 in Austria.[64] The earliest lines to be built, indeed, privileged existing channels of communication between the state's recognized administrative and commercial centres. Along these arteries, the volume of traffic developed rapidly, but as it did, it accentuated the disadvantage experienced by those excluded from the network.

[59] *Verordnungs- und Anzeige-Blatt für die K. Bayerischen Verkehrs-Anstalten* (1851), p. 290; StAN, Rep. 270/IV, Nr. 4, Circular, Präsidium Regierung Mittelfranken, 3 Feb. 1851; StAN, Rep. 270/IV, Nr. 4, Magistrat Nürnberg to Präsidium Regierung Mittelfranken, 3 May 1851.

[60] BHStA, GDVA 197, Telegraphen Station Kaufbeuren to Telegraphenamt, 5 Oct. 1857; BHStA, MH 16882, 'Übersicht der Ergebnisse des Telegraphen-Betriebs'.

[61] StAN, Rep. 270/IV, Nr. 4, Präsident Mittelfranken to von Zwehl, 24 Sept. 1852.

[62] F. Weber, *Post und Telegraphie im Königreich Württemberg* (Stuttgart, 1901), p. 239; *Rückblick auf das erste Jahrhundert der K. Bayer. Staatspost (1. März 1808 bis 31. Dezember 1908)*, ed. K. B. Staatsministerium für Verkehrsangelegenheiten (Munich, 1909), p. 253; F. Kilger, *Die Entwicklung des Telegraphenrechts im 19. Jahrhundert* (Frankfurt am Main, 1993), p. 48.

[63] *Zeitschrift des Deutsch-Osterreichischen Telegraphen-Verein*, vol. 2 (1855), p. 71.

[64] Knies, *Der Telegraph*, pp. 127–8.

A 'two-speed society' had thus begun to emerge and, as governments began to realize, the state's monopoly over the construction of communications networks came with a responsibility for the quality of the service provided. As early as 1850, the Prussian authorities had begun to receive complaints from the public regarding delays in communication, as well as requests for the introduction of the service in particular regions.[65] Over the following decades, German governments continually struggled to meet the growing demand for improvements to their networks. How the challenge was met depended upon the legal, financial, and governmental structures in each state, but on the whole demand persistently outpaced supply. Crucially, in addressing these issues, members of government and parliament were forced to reconsider and explicate the state's perceived obligations towards society.

* * *

In Bavaria, parliament had approved the law of 7 June 1850, which granted the government a total of 500,000 florins (*Gulden*) for the construction of the initial proposed lines. Between 1850 and 1854, the main branches of the network were rapidly constructed, and by 1855 the funds which had been devoted to the cause were exhausted. Across the state, railways were simultaneously equipped with their own telegraph lines, but the apparatuses they employed for signalling purposes could not be adapted to the needs of general correspondence. As a result, the number of public telegraph stations throughout the kingdom increased only slowly, with twenty-nine in operation in 1854, and forty in 1857.[66]

Along the sections of the network which had been planned, and where construction had begun, however, the public's expectations were raised. From 1850, requests for inclusion in the network were sent to the administration from towns such as Bayreuth, Kaufbeuren, Neuburg, and Erlangen, all of which were situated along the principal arc of communication which the government's blueprint had privileged, running from the south-west to the north.[67] This region constituted Bavaria's commercial heartland, and its dependency upon adequate means of communication was frequently evoked.

In 1854, former government minister Ludwig Fürst zu Oettingen-Wallerstein, now a vocal representative of an electoral district in industrious Schwaben, which was also the historic centre of his family's lands, stood in parliament to demand that a telegraph office be provided in Donauwörth and Nördlingen.[68] These towns, he explained, lay along 'the highly important Munich-Hof route', the former a

[65] GStA PK Rep. 77, Tit. 813, Heydt to Manteuffel, Oct. 1850. [66] *Rückblick*, p. 253.

[67] BHStA, GDVA 438, GDVA to Telegraphenamt, 10 May 1853; BHStA, GDVA 227, 'Bitte des Stadtmagistrats und der Gemeindebevollmächtigten der Stadt Neuburg', 23 Oct. 1853; BHStA, MH 16900, Regierung Schwaben und Neuburg, Kammer des Innern to Handelsministerium, 31 Oct. 1853.

[68] 'Oettingen-Wallerstein, Ludwig Fürst', Allgemeine Deutsche Biographie 40 (1896), pp. 736–47 (online version, accessed 22 Mar. 2017, at https://www.deutsche-biographie.de/gnd118589555.html#adbcontent).

'junction of railway and steam navigation', and the latter an industrial and haulage hub through which people and freight made their way from Württemberg to the Bavarian railway network.[69] Communications networks, he implied, were essential to commercial activities in the region.

Oettingen-Wallerstein's request sparked a series of debates in the Bavarian parliament regarding the shape and priorities of the telegraph network, and the state's ability to provide adequate communications infrastructure. They took place within a context of growing tension between the government and parliament, which had been dominated by a liberal majority since July 1849 and was wary of the king's attempts to backtrack on the reforms introduced during the revolution.[70] As chief minister in the 1830s, Oettingen-Wallerstein had promoted the construction of roads and railways—as well as the long-awaited *Ludwig-Main-Donau-Kanal*—until Ludwig I's government had taken a conservative turn which led to his dismissal in 1837.[71] His extensive study of communications routes in Bavaria remained a point of reference into the 1850s, and, now a committed liberal in parliament, he was eager to impress upon the government the priority of economic concerns.[72]

The public's use of the network, Wallerstein emphasized, ensured its utility and profitability. Taking neighbouring Württemberg and Switzerland as examples, he highlighted the need to construct more secondary branches so as to broaden public access to the technology and, crucially, to preserve the natural balance of competition between towns.[73] 'Where . . . the telegraphs are only available to a few exchange metropoles,' he asserted, 'trade and industry in other places are placed at a considerable disadvantage; their ability to offer sustained competition with the favoured towns becomes a clear impossibility.'[74] Oettingen-Wallerstein therefore requested that the telegraph network be extended to 'all important trading and commercial sites'.

For Oettingen-Wallerstein, the telegraph threatened to create imbalances within existing networks of communication and should instead be designed to allow fair and unhindered exchange and competition. His petition was presented on behalf of a region of western and south-western Germany traditionally associated with 'proto-industry' and a dispersed putting-out system, but for which he believed communication was essential.[75] Such a 'decentralized industrial order', as Gary Herrigel has proposed to view economic structures in these areas, was all the more dependent upon exchange, in order to coordinate the stages of production

[69] *VKA* (1853/5), Beil. XLIV, 16 Nov. 1854, p. 97.
[70] Rall, 'Die politische Entwicklung', pp. 243–5.
[71] M. Spindler, 'Die Regierungszeit Ludwigs I. (1825–1848)', in M. Spindler (ed.), *Handbuch der Bayerischen Geschichte* (4 vols., Munich, 1967–75), iv/1, pp. 175–6.
[72] H.-P. Schäfer, 'Bayerns Verkehrswesen im frühen 19. Jahrhundert', in C. Grimm (ed.), *Aufbruch ins Industriezeitalter* (3 vols., Munich, 1985), ii, pp. 308–22.
[73] *VKA* (1853/5), Beil. XLIV, 16 Nov. 1854, p. 97. [74] Ibid.
[75] Wehler, *Gesellschaftsgeschichte*, ii, pp. 87–9.

which were divided between workers and merchants scattered across the landscape.[76] The telegraph provided a 'modern' framework within which these 'traditional' methods could persist.

Oettingen-Wallerstein's emphasis upon free exchange between people and places was part of a broader liberal conception of social and economic order. Wilhelm Neuffer, an entrepreneur, and the head of the designated committee for the chamber of deputies, set out this view to his fellow deputies: 'Agriculture, industry and trade are the principal factors of human pursuits, and where they are equally carefully fostered and protected, social relations are also well ordered; but if one of these branches comes to a standstill, disturbances soon emerge, and like uneven rings in a chain, they rub until they disconnect, and so the neglect of the particular impacts the whole, and some progress, salutary in and of itself, creates a lacuna instead of exerting a beneficial influence on the entirety.'[77] All similar countries, he explained, 'are urgently pressed to develop their installations in this way and to strive for unity, particularly in everything which concerns exchange'.[78]

What concerned both the government and certain members of parliament, however, was the potentially spiralling cost of providing such a service, particularly as reports showed that the Bavarian network was running a growing deficit.[79] As Neuffer himself suggested, it was 'absolutely natural, that the slightest facilitation of exchange in any part of the country will also everywhere draw out the desire to become a part of it'. There was a justified sense of injustice, he believed, in the oldest provinces of Bavaria, whose tax burden was unchanged but who did not benefit from improved communications.[80] Even for left-leaning representatives, however, the financial consequences were potentially troubling. Gustav Freiherr von Lerchenfeld called for a limit to state involvement, complaining that '[i]n our country the state caters to everything, must do everything, must have civil servants, civil servants, and yet more civil servants for everything', which meant, of course, a bulging pensions budget.[81] David Morgenstern, a democrat and the first Jewish member of the Bavarian parliament, floated the idea of adopting a privately run system, as in England and the United States, though he accepted that, now the administrative structure was in place, they should work with the state for the time being.[82]

The discussion of Oettingen-Wallerstein's proposal resulted in an agreement in March 1855, which marked a victory for liberal proponents of a network structured around economic priorities. The two chambers agreed to press the government to extend the network to all commercial towns of the kingdom, within the

[76] G. Herrigel, *Industrial Constructions: The Sources of German Industrial Power* (Cambridge, 1996), esp. pp. 33–71.

[77] *VKA* (1853/5), Beil. XLIV, 4 Dec. 1854, p. 96. [78] Ibid.

[79] *VKA* (1855/6), Beil. XXII, 11 Nov. 1855, p. 392; during the 1851/2 financial year, aside from initial construction costs, the network had run a deficit of around 22,754 fl., rising to 39,304 fl. in 1852/3.

[80] *VKA* (1855/6), Beil. XXII, 11 Nov. 1855, p. 392. [81] *VKA* (1853/5), 20 Dec. 1854, p. 364.

[82] Ibid.; 'Morgenstern, David', *Neue Deutsche Biographie* 18 (1997), p. 108 (online version, accessed 22 Mar. 2017, at https://www.deutsche-biographie.de/gnd133577244.html#ndbcontent).

scope of the budget, and the ministerial commissioner recognized the validity of requests from Nördlingen, Donauwörth, Fürth, Kaufbeuren, Erlangen, and Immenstadt in particular—all situated along the state's central commercial channel, and most of whose claims had been raised in parliament.[83]

In Prussia, the outline of the projected network was not explicitly discussed in parliament, but similar concerns were expressed when, in 1854, the government proposed legislation to formalize the state's monopoly over the construction of telegraph lines. Such a monopoly did not exist in law—indeed it would not until the *Telegraphengesetz* of 1892—and thus far the government had relied upon agreements with various railway companies for the use of their lines.[84] But the suggestion that private corporations now be formally barred from contributing to the development of the network raised questions as to the state's ability to do so instead.

In the Prussian Chamber of Deputies, the merchant and moderate liberal Andreas Theodor Kruse led the affront. While praising Trade Minister von der Heydt's efforts to develop communications in Prussia and his decision to allow the public to make use of the telegraph, he pointed to the emphasis placed by a number of *Handelskammern* on the need for private telegraph installations. The state had achieved what it could with the funds at its disposal, he believed, but it could not cater to the growing demand across Prussia.[85] Heydt contested the extent of the support for private telegraph installations evoked by Kruse, but he himself acknowledged the work which remained to be done. In his response, he underlined the fact that the world of commerce was dependent upon a secure and reliable development of the telegraph network, and that the state was in the best position to fulfil these needs.[86]

In both Bavaria and Prussia, the state's exclusive right to construct telegraph lines was never seriously challenged. But the notion that the state had a duty to provide adequate infrastructure to support economic growth was gaining ground in government circles. This placed the burden of defining economic priorities upon the state, however, and made it a target for the complaints emerging from commercial forces in society. These were often drawn up by municipal authorities, regional chambers of commerce, or even individual businessmen—all now turned to the state as the provider of infrastructure.[87] In the Bavarian parliament, the state's priorities were openly questioned: 'I never asked for a telegraph on the Peißenberg', Oettingen-Wallerstein declared, 'but I did want one in Fürth, a town

[83] *VKA* (1853/5), 20 Dec. 1854, p. 367.

[84] F. Kilger, *Die Entwicklung des Telegraphenrechts im 19. Jahrhundert, mit besonderer Berücksichtigung der technischen Entwicklung* (Frankfurt am Main, 1993), p. 53.

[85] GStA PK I. HA Rep. 77, Tit. 813, Sitzungsprotokoll, 19. Apr. 1855, p. 771.

[86] Ibid., p. 772.

[87] See, for instance, BHStA, GDVA 227, 'Gesuch des Spediteurs Georg Riedel', 28 Oct. 1856; BHStA, MH 16876, 'Auszug aus dem Jahresberichte der Kreis- Gewerbs- und Handelskammer von Unterfranken & Aschaffenburg', 18 Jan. 1856; on the influence of local petitions in the construction of railways, see Green, *Fatherlands*, pp. 246–8.

which pays for 10 to 12 times as many telegrams as a single civil servant requires'.[88] If one discounted the telegraph offices built for administrative purposes, he stated, 'the number of national-economic and industrial telegraph offices is considerably limited'.[89] Marquard Adolph Barth, a Progressive, accused the government of judging the 'importance' of towns based on the size of their population rather than the extent of their industry and trade.[90] Why did Bavaria possess stations in Coburg, Meiningen, and Offenbach, Gustav von Lerchenfeld asked meanwhile, when Fürth, Donauwörth and other commercial towns did not?[91]

Part of the problem was that Bavarian telegraph lines were now part of a much larger, European network of exchanges. As an article in the *Neue Münchner Zeitung* revealed to the parliamentary representatives in 1855, the very small profit which the network was now generating derived primarily from international traffic—as per the arrangements of the *Deutsch-Österreichischer Telegraphen-Verein*.[92] In the agitated geopolitical context of the Crimean War, Bavaria had become a crucial nexus for communication across Europe—to the detriment, it seemed, of domestic exchanges. As Lerchenfeld complained in parliament, 'we only use the telegraphs to maintain a connection between London and Paris and the Crimea and heaven knows which other external locations'. The income from international traffic, as Ministerial Commissioner Brück explained, would of course fluctuate according to geopolitical circumstances, and so the state now found itself catering to both domestic and foreign demand. Lerchenfeld feared that the state would now be expected to 'install telegraph offices in all parts of the heavens'.[93]

A satisfactory compromise was reached in May 1856, on the basis of the very small declared profit.[94] By this stage, the government had clearly come to accept the priority of economic concerns. Despite the ongoing neglect of the agricultural region of the Oberpfalz and repeated requests from the Pfalz, for instance, Minister-President von der Pfordten insisted upon the need to connect the more commercially significant towns of Fürth, Erlangen, Kaufbeuren, Nördlingen, Donauwörth, and Straubing—all towns situated in the areas bordering Württemberg, the region of 'decentralized industrial order' alongside the main commercial route in Bavaria.[95]

No significant construction work could be carried out, however, without a further grant from parliament—a parliament which, in reaction to the growing power of left-liberals in the lower chamber, the king first suspended in 1856 and

[88] *VKA* (1855/6), 22 Nov. 1855, p. 253. [89] Ibid., p. 253. [90] Ibid., p. 254.
[91] *VKA* (1855/5), 6 May 1856, p. 151.
[92] *Neue Münchner Zeitung*, 3 Nov. 1855. 'International traffic' included telegrams sent both from or to Bavaria, and those simply 'in transit' across the network.
[93] *VKA* (1855/5), 6 May 1856, p. 151. [94] BHStA, MH 16799, Dyck, Erinnerung, 8 Dec. 1855.
[95] BHStA MH 16799, 'Kostenvoranschlag über die Ergänzung des Telegraphen-Netzes', 9 Dec. 1855; Herrigel, *Industrial Constructions*, pp. 33–71.

then dissolved in 1858.[96] The state now had to find a means of extending the service without increasing its expenditure, and so in 1857 the telegraph offices in railway stations, now better equipped to transmit ordinary correspondence, were opened to the public.[97] The Pfalz was initially excluded from the measure, but after repeated complaints from the regional *Handelskammer,* the local railways were permitted to transmit private correspondence in 1859.[98] In one fell swoop, the number of publicly accessible offices in Bavaria rose from 40 to 145, and the number of telegrams transmitted grew from 128,000 in 1857 to 207,000 in 1859.[99]

Prussia, too, was struggling to cope with the spiralling demand for services across the state, particularly in centres of trade and industry. The twin textile-producing towns of Elberfeld and Barmen, in the Wupper valley of the northern Rhineland, epitomized the 'two-speed economy' which the network had created. The establishment of a telegraph office in Elberfeld had been of great benefit to this emerging industrial district, as it had previously possessed no direct means of communicating with the principal nearby waterways—the Rhine and Ruhr. The town's banking network, which was at the heart of local investments in the railway industry, was also most likely decisive in procuring the service at an early stage.[100] But the inhabitants of nearby Barmen, who relied upon the same networks of trade and production, had not had such luck and were obliged to send their messages through the office in Elberfeld.

Those who had suffered most from this disparity, the trading establishments (*Handlungshäuser*) of Barmen, presented a petition to the minister of trade, von der Heydt.[101] The minister was himself from a merchant and banking family based in Elberfeld, a connection which had no doubt contributed to the town's early inclusion in the Prussian network. Time was being lost, the petitioners explained, sending telegrams to and from Barmen by post so that they might be forwarded from Elberfeld's telegraph station. As a result, 'the telegrams of competing establishments of this neighbouring town are given such a head start, which, in local transactions, can be extended to our disadvantage'.[102] The petition, containing fifty signatures, analysed the average time lost by telegrams in transit to

[96] Rall, 'Die politische Entwicklung', pp. 243–5.

[97] BHStA, MH 16864, 'Antrag, die Benützung der Bahnbetriebstelegraphen betr.', 11 June 1857; *Rückblick*, p. 162.

[98] BHStA, GDVA 227, 'Extract aus dem Jahresbericht der pfälzischen Gewerbs- und Handelskammer', 6 May 1857; BHStA GDVA 227, 'Extract aus dem Jahresbericht der pfälzischen Gewerbs- und Handelskammer für 1857', 13 Apr. 1858; BHStA GDVA 227, 'Antrag aus dem Jahresberichte der Pfälzishchen Gewerbs- und Handelskammer', 15 Jan. 1859; BHStA GDVA 227, v. Schrenck to HM, 5 May. 1859.

[99] *Rückblick*, p. 253.

[100] D. Ziegler, 'German Private Banks and German Industry, 1830–1938', in Y. Cassis and P. Cottrell (eds.), *The World of Private Banking* (Burlington, 2009), p. 161.

[101] Stadtarchiv Wuppertal, Q II 15, Vertreter der Handlungshäuser to von der Heydt, 23 Feb. 1856.

[102] Ibid.

and from the telegraph office in Elberfeld to Barmen, highlighting the financial cost of being relegated to a slower rhythm of business.[103]

The response from the Prussian government was becoming common policy: a telegraph office could be established in Barmen if some of its inhabitants agreed to underwrite the costs incurred.[104] Forty-five local establishments agreed to provide this guarantee, demonstrating both the perceived necessity of the connection and the state's acquiescence to a degree of self-management on the part of its production sector in light of the unmanageable growth of the network.[105] Indeed, during the 1850s even those new telegraph offices which were established by the Prussian administration were increasingly only provided with a 'limited daytime service' (*beschränkter Tagesdienst*), reflecting its limited means in dealing with demand.[106]

As in Bavaria, in 1858 the Prussian administration also allowed railway telegraph lines to transmit private correspondence, in order to cope with the increased traffic on its lines. The problem was in fact common to most German states: this policy had already been introduced in Saxony in 1853, to compensate for its difficulty in financing the network; it was discussed at a meeting of the *DÖTV*, and Austria implemented it in 1858.[107] The effect of this measure was double-edged, however. It satisfied some demands, while raising new ones from communities which had seen wires 'drawn before their eyes' and increasingly proposed to cover the costs of obtaining the service for themselves.[108]

The corollary to this rising demand was the stimulation, through forward and backward linkages, of numerous branches of industry. The construction of telegraph lines involved the production of apparatuses, iron and copper wires, insulators, and the wooden—later metal—poles on which to hang them. The potential benefit to regional industries was evident, and the Bavarian parliament initially insisted that these products be locally sourced.[109] Wires were ordered from manufacturers both near Nuremberg and in Ixheim, in the Pfalz, while the porcelain manufacture in Nymphenburg provided insulators.[110] In Prussia, Siemens & Halske's newly established workshop had specialized from the outset in apparatuses and cables, but across Germany craftsmen and manufacturers

[103] Ibid. [104] Wessel, *Entwicklung des Nachrichtenwesens*, p. 174.

[105] Stadtarchiv Wuppertal, Q II 15, Auszug aus dem Protokoll des Gemeinderaths von Barmen, 15 Apr. 1856.

[106] See the announcements from Heydt regarding the opening of telegraph stations over the years, in GStA PK, I. HA Rep. 77, Tit. 813.

[107] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 130–4; Landesarchiv NRW Abteilung Rheinland, BR 0005, Nr. 1534, MInn to Oberpräsident von Kleist-Retzow zu Coblenz, 14 Aug. 1858.

[108] BHStA, MH 16902, Jahresbericht der Kreis- G und HK von Oberpfalz und Regensburg für 1859, p. 21; see, for instance, the request from the *Handelsrat* in Marktbreit: BHStA, MH 16876, Handelsrat Marktbreit to HM, 19 May 1858.

[109] BHStA MH, 5 July 1850, Finanzminister.

[110] BHStA GD der VA 228, GD der VA to Telegraphenamt, 20 Dec. 1861.

turned their skills to the production of new materials.[111] Among the most important was the rope manufacturing firm of Felten & Guilleaume in Cologne, which swapped hemp for metal as it derived a growing proportion of business from the production of cables and wires.[112] Initially dependent upon foreign imports, by the 1850s the German wire industry had become self-sufficient.[113]

This transformation was by no means linear, however, shifting with the technology and demands of the market. Siemens initially monopolized the construction of the Prussian state's telegraph lines, but found that his own invention, the *Zeigertelegraph*, had been superseded and his workshop switched to the production of Morse, later Hughes, apparatuses. These were uncertain times for Siemens's business, particularly when the insulation on his underground cables deteriorated, lines were damaged, and the Prussian government cancelled their contracts with him in 1851, allowing other Berlin-based firms to step into the breach. This crisis turned into opportunity, in fact, as Siemens was asked to build the new Russian imperial telegraph network, before turning his attention to Germany once again after a few years.[114]

After the fiasco with Siemens's underground cables, most German states and railways decided to build their lines with overhead wires, but the incident also shone the spotlight on the broader entanglements of the industry. The insulation for Siemens's wires had been made from gutta-percha, now a generally forgotten substance similar to rubber that was extracted from trees in South East Asia. When prepared correctly, gutta-percha proved an ideal insulator for submarine cables, in particular, but its production was monopolized by a British company with imperial connections—Siemens had in fact first obtained a sample of the substance through his brother Wilhelm in London. Over the following decades, demand for the material would soar along with the construction of telegraph cables across the globe, as well as the decision to bury overhead wires into the ground once again. This was a dependency from which Germany could not extricate itself unless, it was hoped, an alternative source was found in colonies of its own.[115]

* * *

Back home, despite the growing chorus of anxious demands from different communities and the increasing volume of traffic over the network as a whole, statistics suggested that average local usage was remarkably low. Pfordten informed the Bavarian parliament that the offices opened between 1852 and

[111] Wessel, *Entwicklung des Nachrichtenwesens*, pp. 207–44.

[112] H. Vogt, *Die Überseebeziehungen von Felten & Guilleaume (1874–1914)* (Stuttgart, 1979), pp. 12–16.

[113] L. Hatzfeld, Der Anfang der Deutschen Drahtindustrie', *Tradition: Zeitschrift für Firmengeschichte und Unternehmerbiographie*, vol. 6, no. 6 (Dec. 1961), p. 250.

[114] W. Kirchner, 'The Industrialization of Russia and the Siemens Firm, 1853–1890', *Jahrbücher für Geschichte Osteuropas*, vol. 22, no. 3 (1974), pp. 321–57.

[115] H. Godfrey, *Submarine Telegraphy and the Hunt for Gutta-Percha* (Leiden, 2018).

1854 had received on average only 334 paid telegrams per year, a 'so noticeably small number, that one should bear in mind when it is claimed that one need only build more stations to ensure profitability'.[116] Experience began to show that even the stations spotlighted in the parliamentary debates had failed to cover their costs.[117] As the director of the *Telegraphenamt* Carl von Dyck explained, in these places 'only few, individual tradespeople or manufacturers might have an interest in using the telegraph here and there'.[118]

Statistics, where they are available or can be inferred at a local level, appear to confirm this observation. In its second year of service, for instance, the telegraph office in Nuremberg had been handed only 262 private telegrams, fewer than one per day.[119] In Kaufbeuren, where the service had been vigorously requested, only forty-eight private telegrams were sent over a period of three months in 1857.[120] Even in industrious Augsburg, towards the end of the decade, an average of eight private messages per day were handed in for transmission, a number, it was reported, which 'fully occupies neither a telegraphist nor a messenger'.[121]

Carl von Dyck's observation was therefore particularly revealing. The state had progressively acceded to the demands emanating from its commercial centres, but the requests to which it had been responding were those of a vocal minority. From a distance, the authorities beheld the spectacle of a pulsating, growing network, but it was beating to the rhythm of a privileged social stratum. Throughout Germany and Europe, the wiring of towns, regions, and states was primarily enhancing the support structure of a business community (see Figure 4.1).

4.4 The Telegraphic Sphere

The small class of individuals who were first drawn to the telegraph included news agents, newspaper editors, bankers, merchants, and, to a lesser extent, local manufacturers, whose business practices already relied upon long-distance communication. Statistics on the proportion of traffic generated by each group are sparse, but in Prussia, 45 per cent of the roughly 218,000 private telegrams sent in 1857 were 'trade' or 'business' telegrams; roughly 29 per cent were classed as '*Börsen-Depeschen*' (stock exchange telegrams); a further 4 per cent were newspaper telegrams; and under 25 per cent were 'family'-related.[122] As these figures suggest, although commercial users of the telegraph represented only a small

[116] *VKA* (1855/6), 22 Nov. 1855, p. 256.
[117] BHStA, GDVA 227, 'Erinnerung des Telegraphenamts-Vorstands', 4 Mar. 1858.
[118] BHStA, GDVA 227, 'Erinnerung des Telegraphenamts-Vorstands', 4 Mar. 1858.
[119] K. Wiesemeyer, 'Die Post als Verkehrsträger', in G. Hirschmann and W. Schultheiss (eds.), *Verkerhsentwicklung Nürnbergs im 19. Und 20. Jahrhundert* (Nuremberg, 1972), pp. 298–301.
[120] 5 Oct. 1857, Telegraphen-Station Kaufbeuren to Telegraphenamt, BHStA GD der VA 197.
[121] BHStA, MH 16882, GDVA to HM, 21 May 1859.
[122] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, p. 286.

Figure 4.1 Map of telegraph lines across Europe, produced by the Central Telegraph Office in Berlin, 1858. Reproduced with the kind permission of the Museumsstiftung Post und Telekommunikation.

proportion of each town's population, they dominated traffic on the network as a whole. These were the individuals for whom exclusion from the network bore the most severe consequences, and who were particularly vocal in advocating its introduction as a result.

They were also among the minority of the population who could afford what remained, in these years, a luxury. In the first year of the network's operation, for instance, a twenty-word telegram sent from Berlin to Hamburg was charged at a rate of 2 haler and 30 Silbergroschen, higher than the average weekly earnings of a worker employed in the crafts or industry.[123] Indeed, only a few wealthy individuals were likely at this stage to make use of the technology for purely personal reasons. Telegraph offices were called for in popular but exclusive holiday destinations during the 1850s, such as Bad Kissingen or Bad Reichenhall, and the technology enabled the aristocracy to keep track of their peregrinations.[124] These were the circles which could afford to make the technology a part of

[123] Ibid., pp. 70–1. [124] BHStA GDVA 227, MInn to MA, 17 Nov. 1856.

everyday practice, as when Duchess Alexandrine of Coburg messaged her husband from Frankfurt to announce that she had 'finally arrived. Very tired. Will leave again at 12.'[125]

4.4.1 News and Public Opinion

The telegraph's utility to the press was immediately evident. As early as December 1848, Robert Graßmann, editor of the *Norddeutsche Zeitung* in Stettin, had requested permission to establish his own private line to Berlin. 'The distribution of a daily paper depends principally and almost solely upon the speed (of news) and reliability of its messages. If a new means can be obtained, through which political news can be transmitted sooner than for other daily papers, then one will dominate the entire daily press, and no paper will be in a position to compete.'[126]

As Graßmann's request suggested, the technology could shift the balance of power between newspapers and, by extension, shape public opinion. Emphasizing his credentials as a 'conservative man', Graßmann proposed to rent and manage a telegraph line between Berlin and Stettin, which he would use to transmit news to private individuals, always prioritizing the information and views provided by the government. By obtaining news twenty-four hours ahead of his competitors in the province, the editor promised that his newspaper, and therefore also the government's perspective on current affairs, would soon come to dominate the local press.[127] Trade Minister von der Heydt, however, considered such an arrangement unacceptable, on the one hand because the state should not relinquish control over its network to a private citizen, and, crucially, on the other because 'the opposing party would, quite legitimately, raise the most vivid protests against such a demonstration of favour'.[128]

Heydt's opposition to such overt control of the press represented a major shift in government attitudes towards public opinion. A number of historians have now shown that the 'reactionary' policies of the 1850s, while going some way to counteract the freedom of the press introduced during the 1848 revolutions, were aimed at influencing, rather than controlling, public opinion—the *Vormärz* era of censorship, particularly pre-publication censorship, was definitively over.[129] In this regard, the telegraph presented both a challenge and an opportunity for governments, both enabling the rapid dissemination of potentially

[125] BHStA, GDVA 680, Telegram from Frankfurt to Coburg, 8 Sept. 1858.
[126] GStA PK, I. HA Rep. 77, Tit. 813, Bd. 1, Robert Graßmann to MInn, 16 Jan. 1849.
[127] Ibid. [128] GStA PK, I. HA Rep. 77, Tit. 813, Bd. 1, Heydt to Manteuffel, 25 Jan. 1849.
[129] Green, *Fatherlands*, p. 148; see also K. Koszyk, *Deutsche Presse im 19. Jahrhundert* (2vols., Berlin, 1966); R. Kohnen, *Pressepolitik des Deutschen Bundes: Methoden staatlicher Pressepolitik nach der Revolution von 1848* (Tübingen, 1995); Ross, *Beyond the Barricades*.

'harmful' news and providing a tool to more efficiently monitor the evolution of public opinion.

In a number of German states, new government departments were established to help produce articles, subsidize newspapers, and infiltrate editorial boards with a view to shaping the distribution of news as surreptitiously as possible. The most effective—and best endowed—of these were the *Centralstelle für Pressangelegenheiten* (often referred to by its former appellation, the *Literarisches Kabinett*) in Prussia, and the *Pressleitungskomitee* in Austria.[130] There were similar efforts to influence the press in Bavaria, Saxony, and Württemberg, though the means at these governments' disposal were more limited.[131]

Prussian Minister-President Otto von Manteuffel soon made the telegraph a central component of the information-gathering and distribution network centred on the *Literarisches Kabinett*. In 1850 he asked the presidents of all regional governments to report daily to the minister of the interior on the state of the local press and, conversely, to deliver the latest political news to selected newspapers. The aim, he explained, was 'to put the governmental press in a position always to distribute the latest political news and to act against the diffusion of false rumours through other papers'.[132] The policy was not without its issues, however, and led to conflicts within the administration itself. Von der Heydt, for one, was not pleased with Manteuffel's decision to consider telegrams sent for these purposes free of charge.[133]

Very quickly, however, many independent papers joined the race for the receipt and transmission of the latest news. The *Kölnische Zeitung* published its first telegrams on 5 October, with recent news from Vienna in particular.[134] In Berlin, one of the first editors to introduce the practice was Bernhard Wolff, whose newly established liberal *National-Zeitung* first promised its readers daily telegraphic updates in November 1849.[135] The *Allgemeine Zeitung*, a leading German newspaper published in Augsburg, took the initiative in Bavaria. Before the first line between Munich and Salzburg had even been completed, its subsidiary in the Bavarian capital wrote to the telegraph administration requesting a monthly subscription for regular updates on the course of the Vienna stock exchange.[136] Within a year, the *Allgemeine Zeitung* was also receiving regular news on the

[130] Kohnen, *Pressepolitik*; on the attitudes of the Austrian government to the press, see E. Dörfler and W. Pensold, *Die Macht der Nachricht: Die Geschichte der Nachrichtenagenturen in Osterreich* (Vienna, 2001).

[131] Green, *Fatherlands*, pp. 148–88; Hanisch, *Für Fürst und Vaterland*, esp. pp. 304–20.

[132] GStA PK I. HA Rep. 77, Tit. 813, Bd. 1, MInn to Oberpräsident von Schlesien, 11 Apr. 1850.

[133] GStA PK I. HA Rep. 77, Tit. 813, Bd. 1, Heydt to Manteuffel, 20 Mar. 1850.

[134] F. Fuchs, *Telegraphische Nachrichtenbüros: Eine Untersuchung über die Probleme des internationalen Nachrichtenwesens* (Berlin, 1919), p. 39.

[135] D. Basse, *Wolffs Telegraphisches Bureau 1849 bis 1933: Agenturpublizistik zwischen Politik und Wirtschaft* (Munich, 1991), p. 17.

[136] BHStA, GDVA 673, J.G. Cotta'sche Buchhandlung to Telegraphenamt, 11 Jan. 1850.

stock market from an agent in Frankfurt.[137] Further north, within a day of the telegraph's inauguration in Nuremberg the editors of the *Korrespondent von und für Deutschland* placed a request for a similar subscription.[138]

Besides stock prices, news reports also began to be exchanged telegraphically. Days after the Munich–Salzburg line's inauguration, the *Allgemeine Zeitung* began to obtain such reports from Vienna.[139] Further evidence suggests that the newspaper also made use of the telegraph offices in Aschaffenburg and Hof, presumably to receive news from correspondents in Frankfurt and Leipzig, respectively, or perhaps even Berlin.[140] In Würzburg, meanwhile, the *Neue Würzburger Zeitung* asked the administration for a reduction in tariff as it expected to receive telegrams of up to 100 words on a daily basis.[141] Notwithstanding the government's efforts to influence public opinion, therefore, state and society had come to share one and the same network of information circulation.

While individual newspapers could seek arrangements with state telegraph administrations, the cost of employing permanent correspondents in a variety of locations and requiring them to transmit reports by telegraph remained relatively prohibitive. Following the example of Charles Havas in Paris, therefore, in 1849 the owner of the *National-Zeitung*, Bernhard Wolff, began to sell the news he obtained telegraphically to other individuals and newspapers, thereby offsetting the costs incurred. This arrangement was eventually formalized, and *Wolffs Telegraphisches Büro* was established.[142] By collecting information and redistributing it to a number of regular subscribers, the costs of the telegraphic transmission were more easily offset.

During the 1850s, similar news agencies were formed across Germany, constituting nodes in a network of information distribution to which newspapers and individuals could themselves connect. Among the first was Reuters, initially established in Aachen (before moving to London), which collected news from the French and Belgian networks and transmitted it to German lines. Others included Bösmann's in Bremen, *Wagner's Correspondenzbureau* in Frankfurt, the *Süddeutsches Correspondenzbureau und Correspondenzbureau Hoffmann* in Munich, and Erwin Treiber's *Telegraphen-Agentur Süddeutsches Correspondenzbureau* in Stuttgart.[143]

[137] BHStA, GDVA 673, Literarisch-artistische Anstalt der J.G. Cotta'schen Buchhandlung to HM, 9 Dec. 1850.

[138] BHStA, GDVA 673, Institut des Correspondenten to Handelsministerium, 11 June 1850.

[139] BHStA, GDVA 673, J.G. Cotta'sche Buchhandlung to Telegraphenamt, 20 Jan. 1850.

[140] BHStA, GDVA 673, Dyck to Telegraphen-Station Hof, 15 July 1850; BHStA, GDVA 673, Expedition der *Allgemeine Zeitung* to Telegraphenamt, 19 Oct. 1850.

[141] BHStA, GDVA 673, Verlegerin der Neuen Würzburger Zeitung to Telegraphenamt, 28 Oct. 1850.

[142] Basse, *Wolffs Telegraphisches Bureau*, pp. 17–18.

[143] Fuchs, *Telegraphische Nachrichtenbüros*, pp. 72–96; see also C. Wunderlich, 'Telegraphische Nachrichtenbureaus in Deutschland bis zum Ersten Weltkrieg', in J. Wilke (ed.) *Telegraphenbüros und Nachrichtenagenturen in Deutschland* (Munich, 1991), pp. 23–85.

News agencies represented a new force in the shaping of public opinion and a new challenge for governments as a result. The success of an individual establishment depended upon the extent of its connections, the diversity of the news it obtained, the speed and reliability with which it was distributed, as well as a circle of regular, committed subscribers who constituted the principal source of income. Despite the range of agencies which emerged across Germany during the 1850s, therefore, the monopolistic tendency of the business slowly became clear. When a group of businessmen attempted to establish an independent news agency in Berlin in 1854, for instance, they were almost immediately forced to shut down operations due to competition with Wolffs.[144]

Indeed, by the late 1850s Wolff had established offices in Paris, London, Vienna, Hamburg, and Frankfurt, and, as will be explored in the following chapter, his agency was soon to dominate the distribution of news across Germany. In 1856, the agency first discussed the possibility of sharing stock market news with its major European counterparts, Havas in Paris and Reuters in London, and in 1859 the three firms signed the first in a series of formal agreements that established a European news cartel.[145] On the basis of the 1859 agreement, each agency was guaranteed a monopoly over the collection and distribution of information within its home country, but all telegrams were to be exchanged between the three firms free of charge. At this stage, Wolff's regional monopoly was still limited—Havas reserved the right, for instance, to send news to Augsburg, Stuttgart, Würzburg, and Vienna—but a 'national' press sphere had begun to emerge, within which a single source threatened to dominate the distribution of information.

This fact was not lost on the Prussian authorities, in particular. As early as 1850, the police president in Berlin had reached an arrangement with Wolff which reflected the government's efforts to influence the press. Wolff agreed to moderate the liberal views expressed in the *National-Zeitung* in exchange for news from the ministry of the interior.[146] After 1852, and until 1869, relations between the government and Wolffs then became rather more informal. But the importance which the authorities attributed to Wolff's influence was demonstrated in 1857, when a certain Eli Samter proposed to establish another news agency in Berlin. Competition in this industry, an official stated, could be 'damaging', in that it encouraged rivals to publish their news first, 'without taking the time, as duty imposes, to read the information whose further distribution could be of detriment to the government, or cause mischief among the public, and to subject it to

[144] GStA PK, III. HA Ministerium der auswärtigen Angelegenheiten II, Nr. 8117, Untitled document, Aug. 1857.

[145] A. Nalbach, '"Poisoned at the Source"? Telegraphic News Services and Big Business in the Nineteenth Century', *Business History Review*, vol. 77, no. 4 (2003), pp. 577–610.

[146] Ross, *Beyond the Barricades*, p. 190.

verification by a competent institution'.[147] Wolff's agency, on the other hand, had given adequate proof that it wrote its telegrams 'in keeping with Prussian interests'.[148] Wolff's influence on the interpretation of news was to become increasingly significant during and after the Crimean War, when the telegraph allowed Germans to follow in 'real time' the evolution of major geopolitical conflagrations.

Wolff's monopoly was as yet uncertain, however, and newspapers across Germany appear to have continuously relied, where financially possible, upon their own correspondents in the field. In fact, newspapers such as the *Vossische Zeitung*, which had direct connections to Wolffs, continued to do so through to 1919.[149] Moreover, as long as it remained costly and technically cumbersome to exchange lengthy messages, the greater part of the news reported telegraphically was the daily run of stock prices. Even in Berlin, Wolffs' primary function remained the distribution of financial information to its subscribers.[150] News agencies and newspapers had begun by plugging into the circulation of information upon which the business community depended, and they served as a further outlet for its distribution.

4.4.2 Business and Finance

The acceleration of information distribution both fuelled and inflected an ongoing transformation in the world of finance. The securities market in German-speaking Central Europe had received an impetus in the early nineteenth century with the trade in state bonds, in particular. After the Napoleonic Wars, Vienna and Frankfurt am Main, in particular, had established themselves as major centres of finance, but the progressive repayment of government debts and the emergence of the railway industry in the 1840s had stimulated a diversification in the stock market. Shares in companies were increasingly traded in smaller hubs such as Berlin, and, as Robert Radu has demonstrated, new practices had emerged which allowed a broader public to receive information on prices at different stock exchanges. Ever more regular '*Kursberichte*' had begun to circulate, allowing individuals to speculate on the market without depending upon brokers or bankers in the know.[151] The introduction of the telegraph was to accelerate these developments, allowing both for the concentration of capital in existing

[147] GStA PK, III. HA Ministerium der auswärtigen Angelegenheiten II, Nr. 8117, Untitled document, Aug. 1857.
[148] Ibid.
[149] J. Wilke, 'Die telegraphischen Depeschen des Wolff'schen Telegraphischen Büros (WTB)', *Publizistik*, vol. 49, no. 2 (June 2004), pp. 125–51.
[150] Ibid.
[151] R. Gömmel, Entstehung und Entwicklung der Effektenbörse im 19. Jahrhundert bis 1914', in *Deutsche Börsengeschichte*, ed. H. Pohl (Frankfurt, 1992), pp. 135–210; R. Radu, *Auguren des Geldes: Eine Kulturgeschichte des Finanzjournalismus in Deutschland, 1850–1914* (Göttingen, 2017).

centres of finance and for promoting the diversification and decentralization that characterized the German market.

The *Allgemeine Zeitung* became a crucial node in local and interstate banking and trading networks. In 1851, the banker Heinzelmann in Augsburg explained that the newspaper received the Vienna exchange rates every day between 1 p.m. and 2 p.m., and distributed them to all exchange houses in the town between 3 p.m. and 4 p.m. The benefits of this information were recognized across the border in Württemberg, where Heinzelmann's colleagues Gebrüder Benedict, bankers in Stuttgart, asked to be included in the news-sharing arrangement.[152] Catering to changing investment practices, the *Allgemeine Zeitung* requested different stock listings from Vienna, swapping updates on *Hofkammer* bonds for railway shares, Vienna Bank shares, and the exchange rate of silver in 1850, for instance.[153] Within a couple of years, the editors were pressurizing the Bavarian government to establish a direct connection to Frankfurt.[154] News agencies and newspapers were thus links in a chain connecting bankers within and beyond individual states, thickening the network of individuals drawn into the world of finance. They did so in conjunction with a raft of new journals offering both news and advice on the stock market, including the *Berliner Börsen-Zeitung* (1855) and the *Frankfurter Handels-Zeitung* (1856).[155]

In the *Allgemeine Zeitung*'s home base of Augsburg, the telegraph provided an opportunity to reposition the town on international financial markets. After the end of the Napoleonic Wars, Augsburg's bankers, too, had primarily traded in government debts but had struggled to adapt to the changing financial environment. The situation had worsened when the Bavarian king Ludwig I had chosen to establish the Bayerische Hypotheken- und Wechselbank—exceptionally, as a joint-stock bank—in Munich rather than Augsburg, in 1834.[156] Now, Augsburg's elite were given an opportunity to recover the town's status as a second-tier financial centre. One of the town's principal bankers, Paul von Stetten, for instance, acted as an intermediary between the Königlich Württembergische Hofbank and the Bavarian telegraph administration, requesting stock market updates on behalf of his colleagues.[157] The aforementioned Heinzelmann, meanwhile, proposed to establish a weekly subscription to stock market updates, which would be exchanged between Vienna, Augsburg, and Stuttgart.[158] Both von Stetten and Heinzelmann were leading figures in the local protestant elite, whose capital

[152] BHStA, GDVA 673, Banquier Heinzelmann to Telegraphenamt, 2 June 1851.

[153] BHStA, GDVA 673, Literarisch-artistische Anstalt der Cotta'sche Buchhandlung to Telegraphenamt, 17 July 1852; BHStA, GDVA 673, Literarisch-artistische Anstalt der Cotta'sche Buchhandlung to Telegraphenamt, 28 Jan. 1856.

[154] BHStA, GDVA 673, Expedition der Allgemeine Zeitung to Telegaphenamt, 23 Oct. 1852.

[155] Radu, *Auguren des Geldes*, p. 61.

[156] F. Möller, *Bürgerliche Herrschaft in Augsburg, 1790–1880* (Munich, 1998), pp. 137–50.

[157] BHStA, GDVA 673, Paul von Stetten to Telegraphenamt, 5 July 1851.

[158] BHStA, GDVA 673, Heinzelmann to Telegraphenamt, 2 June 1851.

had supported the early stages of industrialization in Augsburg by investing in the Munich–Augsburg railway line, and large mechanized textile manufactures.[159] Now, the telegraph allowed them to take part in a larger, changing investment market.

The Bavarian network did not initially provide a direct connection to Frankfurt, and the telegraph office which opened in Hanau in 1852 became its closest link to the city. Immediately, one of Frankfurt's leading bankers, Andreas Grunelius, warned the new telegraph station that it would 'often' be receiving telegrams from his correspondent in Vienna, via an agent in Munich, and asked that they be forwarded from Hanau to Frankfurt 'by railway, or if necessary, immediately by express post'.[160] Another member of Frankfurt's banking elite, Benedikt Hayum Goldschmidt, meanwhile, was sent a complimentary overview of the *DÖTV*'s state lines, as the person who, through the station in Hanau, had 'used the Bavarian state lines and those of the *DÖTV* the most for his extensive private correspondence'.[161] The telegraph administration's dependence upon these users was highlighted when its director, Carl von Dyck, emphasized that 'one should always favourably accommodate the depositors of telegrams, and in particular those trading houses which often use the state telegraph for their correspondence, and show them the greatest facilitation'.[162]

Outside these hubs, a broad constellation of individuals emerged who similarly relied on telegraphic news of price fluctuations. The Hypotheken- und Wechselbank and the banker Salomon Rau in Munich, the merchants Roth & Sohn in Meiningen, and the banker Frank Hirsch in Landau, for instance, all sought to establish subscriptions with the telegraph administration for regular updates on the Vienna and Frankfurt stock exchanges.[163] Similar subscriptions were negotiated with larger representative bodies, such as the *Handels-Gremium* in Munich, the *Handelskammer* in Frankfurt, and the *Handelsvorstand* in Würzburg, illustrating the broader business community's growing attentiveness to the vagaries of the stock market.[164] The *Landshuter Zeitung*, meanwhile, requested a weekly update on cereal prices, hinting at the growing dependency of producers and merchants in agricultural regions upon cycles of supply and demand in other markets.[165] There were also more spontaneous, sporadic users of the telegraph, whose presence is often revealed by their complaints to the

[159] Möller, *Bürgerliche Herrschaft*, pp. 148–50.
[160] BHStA, GDVA 673, Grunelius to Telegraphenbureau Hanau, 17 Apr. 1852.
[161] BHStA, GDVA 673, Dyck to Banquier B. H. Goldschmidt, 4 Mar. 1852.
[162] BHStA, GDVA 673, Dyck to Telegraphenstation Hanau, 17 May 1852.
[163] BHStA, GDVA 673, Dyck to Handelskammer Frankfurt, 27 Oct. 1854; BHStA, GDVA 673, Handels-Vorstand Würzburg to Telegraphenamt Würzburg, 19 Dec. 1854; BHStA, GDVA 673, Telegraphenamt to Banquier Rau, 5 Mar. 1856; BHStA, GDVA 673 Kaufmann Roth & Sohn to Telegraphenamt, 28 Jan. 1856.
[164] BHStA, GDVA 673, Dyck to Cotta'sche Buchhandlung, 9 Feb. 1851.
[165] BHStA GDVA 673, Expedition der Landshuter Zeitung to Telegraphenamt, 18 Dec. 1854.

administration. These range from a Bayreuth-based merchant, to the Main-Dampfschifffahrts-Gesellschaft, which sent around thirty telegrams per year.[166]

Mirroring their effect upon industry, telegraph networks thus both strengthened existing structures of finance and reconfigured its extensions. Frankfurt's '*Effectensocietät*' had long depended upon methods of enhanced communication—such as a pigeon-carrier service to Madrid and Paris—and the telegraph built upon such channels.[167] Many of the names which appear in the sources as early users of the technology, meanwhile, from Gebrüder Benedikt to B. H. Goldschmidt and Salomon Rau, also hint at the significance of networks of communication within the elite of the Jewish community which had long enabled them to mobilize financial resources.[168] The point should not be overemphasized, however, as many other private bankers clearly depended upon similar means.[169] Elsewhere, on the other hand, stock exchanges would only appear later, once the technology had been introduced—in Dresden in 1857, Stuttgart in 1860, and Düsseldorf in 1874.[170]

Indeed, the telegraph maintained and enhanced the decentralized structure of financial markets in Germany.[171] Unlike in Britain and France, a 'merchant banking' centre such as Hamburg was placed alongside Frankfurt, which specialized in trading government debt, as well as Vienna, Berlin, and Munich, where railway shares were favoured, while Augsburg, which had shown little interest in securities trading, now functioned as a junction between southern financial hubs. The modern framework of communication provided by the telegraph network could thus give renewed vigour to traditional areas of investment—Frankfurt's connectedness enabled it to profit from the American Civil War, for instance, having been chosen as the market for the listing of the Northern States' bonds.[172]

The telegraph's first major effect was thus to transform, though not necessarily to revolutionize, finance and trade. In conjunction with the press, the technology allowed the prices of stocks and merchandize to be distributed more widely and with greater regularity across Germany, and indeed beyond. The influence of financial markets was thus extended and business practices arguably democratized, as information circulated to a broader audience. But it also established and strengthened connections between old and new centres of finance, between 'traditional' private banking and 'modern' stock trading. Indeed, despite the

[166] BHStA, GDVA 673, J. N. Oberndörffer to Handelsministerium, 25 Feb. 1850; BHStA, GDVA 673, Telegraphen-Station Würzburg to Telegraphenamt, 29 Sept. 1852.

[167] C.-L. Holtfrerich, *Frankfurt as a Financial Centre: From Medieval Fair to European Banking Centre* (Munich, 1999), p. 161.

[168] Seigel, *Modernity and Bourgeois Life*, pp. 376–410; see also W. Mosse, *Jews in the German Economy: The German-Jewish Economic Elite, 1820–1935* (Oxford, 1987), pp. 34–68; G. Kurgan-van-Hentenryk, 'Jewish Private Banks', in Cassis and Cottrell (eds.), *The World of Private Banking* (Burlington, 2009), pp. 213–30.

[169] See, for example, M. Körner, 'Protestant Banking', in Cassis and Cottrell (eds.), *The World of Private Banking* (Burlington, 2009), pp. 231–46.

[170] R. Michie, *The Global Securities Market: A History* (Oxford, 2006), p. 96.

[171] Ibid., pp. 96–7.

[172] Holtfrerich, *Frankfurt as a Financial Centre*, p. 148.

influence of new practices, the period 1830–80 has been described as the 'heyday' of private banking.[173] Its perceived impact, however, was more ominous. The Prussian government was concerned, for instance, that allowing the construction of private telegraph lines would 'throw the gates wide open to harmful stock market games'.[174] Whether or not the fear was justified, it served as a reminder that the state had an important regulatory role to play in an increasingly liberal but connected economy.

4.4.3 Rhythms of Communication

The business community's use of the telegraph was fuelled by and in turn accentuated its dependency upon the timely and reliable receipt of information. From the outset, news distributors, bankers, and chambers of commerce sought to establish '*Abonnements*', or subscriptions, with telegraph administrations in order to ensure a regular influx of specific types of news. The subscription model had been exemplified in Hamburg and Bremen in the 1840s, where a regular service was introduced announcing the arrivals and departures of ships further downstream in Bremerhaven and Cuxhaven—initially, by semaphore. Local merchants and shipowners paid a monthly or yearly fee to receive this information, which was often delivered to the city's *Börse*.[175]

The telegraph encouraged the standardization of such practices across Germany. Announcements and stock prices received by telegraph were displayed at exchanges, where businessmen congregated and increasingly expected updates from other markets at particular times. Only in 1851, after the introduction of the telegraph, for instance, did the Frankfurt *Effectensocietät* begin to provide an official listing of stock prices to be transmitted to other markets. Telegraph administrations, meanwhile, urged their customers to use standardized tables, or '*Blanquette*' when communicating such information.[176] It was thus also the need for speed and ease in transmission that fuelled the rationalization and integration of financial markets.

The synchronization of commercial activities within these privileged circles required a process of adjustment, however. Delays in the receipt of information could render a transaction redundant if the stock market on which it was to take place had closed, or if prices had by then significantly shifted. The Augsburg banker Heinzelmann, for instance, wrote to the telegraph administration to

[173] D. Ziegler, 'German Private Banks and German Industry, 1830–1938', in Y. Cassis and P. Cottrell (eds.), *The World of Private Banking* (Burlington, 2009), pp. 159–76.

[174] GStA PK I. HA Rep. 77, Tit. 813, Heydt to Westphalen, 28 Nov. 1854.

[175] See Chapter 2, p. 59.

[176] Holtfrerich, *Frankfurt as a Financial Centre*, p. 161; BHStA GDVA 673, Telegraphenamt to Banquier Heinzelmann, 3 June 1851.

inquire whether they might send the exchange rates which he received through the *Allgemeine Zeitung* to his colleagues in Stuttgart directly. Otherwise, he would have to forward them himself by depositing them once again at the telegraph office: 'it would be 4pm or 5pm before the telegraph office here receives our telegram, and its content would reach Messrs Gebrüder Benedict so late that they could not achieve their purpose'.[177] Similarly, when the *Landshuter Zeitung* asked for weekly notices on cereal prices, it was insisted that they should not be sent if they would arrive after 5 p.m., at which point they had lost all value.[178] Business was increasingly dominated by the tempo of communication across the telegraph network, and falling out of sync came at a price.

The extension of business hours and the acceleration of trading cycles began to interfere with other long-established social rhythms too. In Frankfurt, when a telegram was 'handed to the Israelite banking house E.M. Vrane on Friday . . . at 7:50 pm, after the Sabbath had begun', the addressee refused to sign the delivery receipt because it was 'forbidden by his religious statutes', and asked that it be brought to him after 9 p.m. on Saturday.[179] As the local chief engineer pointed out, this was often the response among Jewish bankers, namely the Rothschilds, Grunelius, Goldschmidt, and Weiller.[180] Only since the early nineteenth century had the Jews of Frankfurt been allowed to engage in commodity and loan trading, and this particular issue arose in 1854, the year in which Jews were finally granted full political rights by the city. The observation suggests some of the 'modern' pressures being exerted upon the community to adapt to the city's secularizing schedules.[181]

Across the network itself, distinctions soon emerged between the speeds of communication enjoyed by users in different locations, particularly when the volume of traffic on the lines was high. This was demonstrated during the Crimean War, when political leaders communicated with commanders on the battleground, journalists visited and reported on the conflict, and Russia's telegraph network was expanded.[182] With business, news, and diplomatic exchanges competing for bandwidth along the same wires, traffic began to jam the rather limited lines traversing the European continent, and state and society engaged in a battle over time. Newspaper editors were informed that their connection would suffer delays because of 'the extraordinary piling up of telegraphic correspondence, due to political circumstances, not only from the government but also private telegrams on the line from Vienna, through Munich . . . to Paris'.[183]

[177] BHStA, GDVA 673, Banquier Heinzelmann to Telegraphenamt, 2 June 1851.
[178] BHStA GDVA 673, Expedition der Landshuter Zeitung to Telegraphenamt, 18 Dec. 1854.
[179] BHStA, GDVA 673, Telegraphen-Station Frankfurt to Telegraphenamt, 4 May 1854.
[180] Ibid., note from engineer Saifert. [181] Holtfrerich, *Frankfurt as a Financial Centre*, p. 120.
[182] Nickles, *Under the Wire*, p. 33; R. H. Davison, 'The Advent of the Electric Telegraph in the Ottoman Empire', in R. H. Davison (ed.), *Essays in Ottoman and Turkish History, 1774–1923: The Impact of the West* (London, 1990), pp. 133–65.
[183] BHStA, GDVA 673, Dyck to Redaktion der Pfälzer Zeitung, 9 Apr. 1854.

When the Frankfurt *Handelskammer* complained that news of the Vienna exchange rates was arriving late, it was explained that traffic along the Munich–Vienna line 'upon which at this time the entire oriental correspondence to France and England, and vice versa to the Orient, is moving at a rate of a few hundred telegrams a day'.[184]

Friction between the administration and its principal customers derived not only from the inconvenience of the delays they suffered but also from the temporal hierarchy which it established between state and private correspondence. According to the regulations, state telegrams were prioritized, and private telegrams were then to be sent according to the order in which they had been handed over.[185] Telegrams were handled sequentially, according to the neutral standard of time, but when traffic overburdened the lines, the priority given to government and administrative correspondence was translated into a temporal advantage.

As the decade progressed, the growing volume of traffic on the telegraph network increased the frequency of delays, and the sequential procedure was called into question. In 1861, in response to the Prussian government's recent reduction in tariffs, the *Neue Frankfurter Zeitung* produced an article criticizing the way in which the administration was managing the network. In a text echoing the terms of current debates on 'network neutrality', the newspaper complained that, however cheap the use of the telegraph had become, the fact that two-thirds of correspondence came with a note stating 'delayed due to accumulation' was unacceptable. Time and promptness were more important for the principal users of the technology, the article insisted, and 'if [a telegram] arrives in the hands of the addressee too late, then it is too expensive [even] if it only costs one Kreuzer; if it is handed over to the addressee quickly, then it often has great value'.[186]

According to the *Neue Frankfurter Zeitung*, a blanket reduction in the cost of the telegraph service failed to account for the varying value which different users placed upon rapid communication. Since 1859, it reported, increases in use of the telegraph had been registered at 92 per cent for financial news, 33 per cent for commercial telegrams, 65 per cent for newspaper reports, and only 21 per cent for family news. This increase, however, had not been matched by an improvement in Prussian infrastructure. Cost was of secondary importance to 'those who use the telegraph most . . . namely the commercial estate and newspaper editors', the author insisted, and they should be given the option of paying more to ensure the priority of their correspondence.[187] 'Barely 15 of the telegrams deposited here

[184] BHStA, GDVA 673, Handelskammer Frankfurt to Telegraphen-Direction München, 30 Mar. 1855; BHStA, GDVA 673, Dyck to Redaktion der Landshuter Zeitung, 30 Sept. 1855.
[185] BHStA, GDVA 673, Dyck to Redaktion der Pfälzer Zeitung, 9 Apr. 1854.
[186] BHStA, GDVA 674, *Neue Frankfurter Zeitung*, 25 July 1861. [187] Ibid.

reach the stock exchange in Berlin on time', the article continued, and it was therefore 'unjust to increase the number of useless telegrams being sent by reducing the tariff'.[188] As the newspaper made clear, lowering the cost of telegraphing would encourage its practice among those for whom cost was the main concern, and thereby further burden the network. For the principal users of the telegraph, however, the time gained by using the telegraph, rather than the money spent upon a telegram, was of greater value.

Within and across states, the telegraph network had begun by distinguishing between included and excluded localities, between those tuned in to a faster pace of life and those left behind. Already, however, the limited bandwidth available had begun to interfere with relations even among those connected to the network, not only towns and villages but states too. The archives are replete with examples of attempts by the telegraph administration to discern the true source of delays, tracing back their origin across Europe.[189] Blame for these disruptions was passed from one state administration to another, as the material deficiencies of different lines came to impact individuals' and governments' relations with one another.

* * *

By 1860, there were already 7,270 kilometres of telegraph lines in Prussia, 12,822 kilometres in Austria–Hungary, 2,030 kilometres in Bavaria, and 1,023 kilometres in Saxony.[190] In that year, around 250,000 telegrams were sent within the territories of northern Germany,[191] almost 500,000 in Austria–Hungary, 100,000 in Bavaria, and 37,000 in Württemberg.[192] Around 354,000 telegrams were sent and received in international correspondence in northern Germany, 222,000 in Austria–Hungary, 98,000 in Bavaria, and 37,000 in Württemberg.[193] The telegraph's tentacles were now reaching out beyond the continental landmass, moreover, as submarine cables were laid across the Mediterranean, and a first (unsuccessful) attempt to establish a transatlantic connection was made in 1858.[194] With this expansion came new connections and divisions, new distinctions between the telegraphically privileged and the disadvantaged, and new challenges for the state and society.

[188] Ibid.

[189] See, for example, BHStA, GDVA 680, Directeur général de l'administration des lignes télégraphiques to Telegraphenamt, 10 Oct. 1854; BHStA, GDVA 680, Dyck to KK General-Direction der Communication, 30 Mar. 1853. Many more examples are located in BHStA GDVA 680, 682, 683, 684.

[190] Reindl, *Der Deutsch-Österreichische Telegraphenverein*, pp. 262–5.

[191] According to the statistics of the International Telegraph Union, the heading 'northern Germany' comprised the future states of the *Kaiserreich* of 1871, excluding Baden, Württemberg, and Bavaria.

[192] *Statistique générale de la télégraphie dans les différents pays de l'ancien continent* (Bern, 1871), pp. 26–7, 'ITU Historical Statistics' (accessed 22 Mar. 2017, at http://www.itu.int/en/history/Pages/HistoricalStatistics.aspx).

[193] *Statistique générale de la télégraphie* (1871), pp. 32–3.

[194] *Statistique générale de la télégraphie* (1871), pp. 74–5.

4.5 The Ambiguities of Progress

During the *Vormärz* years, scientists, businessmen, bureaucrats, and the press had set high expectations for the future of telegraphic communication, and there was no shortage of praise for its achievements following its implementation. In 1853, an article in *Die Gartenlaube*, the leading publication in the new field of family illustrated journals, announced that 'distance is no more!'[195] Developing a well-established trope, the article proclaimed the success of the new technology in overcoming the obstacles of time and space, and over the following years the journal continued to report upon heroic developments in the field.

Telegraph lines, like the railways, became a symbol of modernity and progress. Although the inauguration of telegraph offices, far more modest than railway stations during this period, presented few opportunities for pomp and circumstance, descriptions of the latest developments in the field were a means for journals such as *Die Gartenlaube* to promote liberal values of exchange, communication, and material progress.[196] The 'bonds of friendship' represented by the planned transatlantic cable between Britain and the USA, for instance, were contrasted with the 'wall of enmity' of the recently completed harbour in Cherbourg.[197] As shown in Figure 4.2, the satirical Berlin newspaper *Kladderadatsch* caricatured conditions in the notoriously backward state of Hessen—while armed forces seek to halt a mass exodus by train, two workers appear to be stealing the telegraph cables they have been employed to lay.[198]

At the same time, however, experience had begun to reveal the peculiarities of telegraphic communication, the exclusionary logic of the network, and the technical and logistical constraints on its use. It became increasingly clear, for instance, that the corollary to the 'death of distance' proclaimed by *Die Gartenlaube* was the victory of time. The technology allowed for dematerialized communication—for the first time, information could circulate faster than goods themselves. The telegraph had, in the words of James Carey, 'invented the future as a zone of uncertainty, and a new region of practical action'.[199] This was not lost upon Gustav Freytag, whose bestselling novel *Soll und Haben* (1855) described a world where 'railways and telegraphs bind a land's shores to its interior, and every merchant in the coastal towns has his goods sold in the heart of the country, almost before they reach the harbour'.[200]

[195] 'Keine Entfernung Mehr!', *Die Gartenlaube* (1853), no.7, p. 74.
[196] On the subtle promotion of liberal values in family illustrated journals, see C. Richards, 'Pages of Progress: German Liberalism and the Popular Press after 1848', (PhD Dissertation, University of Pennsylvania, 2013).
[197] 'Cherbourg und der atlantische Telegraph', *Die Gartenlaube* (1858), no. 37, p. 531.
[198] *Kladderadatsch*, 17 Dec. 1854.
[199] J. W. Carey, *Communication as Culture: Essays on Media and Society* (London, 1989), p. 218.
[200] G. Freytag, *Soll und Haben: Roman in Sechs Büchern*, 7th edn., 2 vols. (Leipzig, 1858), i, pp. 54–5.

Figure 4.2 'A Village Story from Hessen': 'Now tell me, old friend, how are things going in the countryside?' 'Well now, as regards our job, we can't complain, but those who want to move forwards, they're in trouble!' *Kladderadatsch*, 17 Dec. 1854. Universitätsbibliothek Heidelberg, https://digi.ub.uni-heidelberg.de/diglit/kla1854/0233, CC-BY-SA 3.0.

Businessmen, as we have seen, were indeed particularly dependent upon the speed and reliability of telegraphic communication, a time sensitivity which often came to be seen as pathological. This made them a subject of predilection for the satirical paper *Kladderadatsch*. In 1853, a cartoon depicted a businessman clutching a copy of the latest stock prices and holding his ear to a telegraph wire leading into town, with a caption stating, 'The latest stock exchange technique to receive telegraphic dispatches yet another hour earlier than the others' (see Figure 4.3).[201] Always seeking to remain one step ahead of developments, businessmen characterized much of the anxiety associated with the pace of modern life.[202] With the telegraph, then, emerged the image of the nervous entrepreneur which would later epitomize Germany's struggle with the pressures of modernity.[203]

It was the fluctuations of the stock market, in particular, that stimulated the anxieties of businessmen and traders. The value of shares had now come to

[201] *Kladderadatsch*, 27 Mar. 1853.

[202] R. Wenzlhuemer, '"Less than No Time". Zum Verhältnis von Telegrafie und Zeit', *Geschichte und Gesellschaft*, vol. 37 (2011), pp. 591–613., esp. pp. 606–13.

[203] M. Cowan, *Cult of the Will: Nervousness and German Modernity* (University Park, Pa., 2008), pp. 24–31.

Figure 4.3 'The latest stock exchange technique to receive telegraphic dispatches yet another hour earlier than other people.' *Kladderadatsch,* 27 Mar. 1853. Universitätsbibliothek Heidelberg, https://digi.ub.uni-heidelberg.de/diglit/kla1853/0060, CC-BY-SA 3.0.

depend upon the quasi-instantaneous diffusion of news through a network which spanned the European continent and would eventually extend across the globe. Economic responses to geopolitical changes, it was understood, were all the more rapid as a result. In 1853, for instance, as uncertainty reigned regarding the outbreak of war in the Crimea, *Kladderadatsch* produced a caricature of 'Stock Exchange Physiognomies'. The illustration juxtaposed the visible excitement of businessmen upon receipt of a telegram announcing that peace was likely secured with their anger and despondency when a new dispatch announced that the ultimatum was rejected and that the Russians could be expected to invade the principalities of the Danube. Crucial to the depiction in both cases was the uncertainty of the news to which the businessmen reacted so vividly: neither had peace been guaranteed, nor had the Russians in fact begun their offensive. The telegraph brought news of probable, not real, events (see Figure 4.4).[204]

The Crimean War triggered the construction of numerous telegraph lines in the region and illustrated the capacity for the speed of communication to upset the

[204] *Kladderadatsch*, 3 July 1853.

Figure 4.4 'Stock Exchange Physiognomies'. A telegraphic dispatch from Constantinople announcing good prospects for peace in the region produces elation. A second telegram suggesting a Russian invasion of the Danubian Principalities is imminent produces anger and despondency. *Kladderadatsch*, 3 July 1853. Universitätsbibliothek Heidelberg, https://digi.ub.uni-heidelberg.de/diglit/kla1853/0124, CC-BY-SA 3.0.

traditional conduct of warfare, journalism, and international relations.[205] For the first time, diplomats, but also military commanders, received a rapid succession of direct orders from a distance, impeding their ability to adapt to conditions on the ground, often with bewildering consequences.[206] War correspondents—most famously William Howard Russell—now reported directly from the zone of conflict, and although by no means all dispatches were sent by telegraph, the rapid circulation of news hindered the capacity for governments to manage the

[205] K. Beauchamp, *History of Telegraphy* (London, 2001), 103–8; R. H. Davison, 'The Advent of the Electric Telegraph in the Ottoman Empire', in Roderic H. Davison (ed.), *Essays in Ottoman and Turkish History, 1774–1923: The Impact of the West* (London, 1990), pp. 133–65; on the influence of telegraphy and international relations upon one another, see Headrick, *The Invisible Weapon*.

[206] D. P. Nickles, *Under the Wire: How the Telegraph Changed Diplomacy* (Cambridge, Mass., 2001), pp. 33, 92–6, describes the impact of the speed of telegraphy upon the diplomatic exchanges leading to the outbreak of war and the confusion produced by telegrams sent to military commanders. On the use of telegraphy by the Prussian and German armies, see S. Kaufmann, *Kommunikationstechnik und Kriegsführung 1815–1945: Stufen telemedialer Rüstung* (Munich, 1996), esp. pp. 69–169.

public perception of developments.[207] On the one hand, the general public was forced to accept delays in their personal correspondence as the to and fro of diplomatic telegrams across Europe jammed the wires; on the other hand, the speed of information circulation sparked concerns as to the quality of the news which was published. In particular, the spread of 'fake news' became a subject of satire in *Kladderadatsch* when a 'telegraphic hoax' wrongly announced the fall of Sebastopol in 1854.[208] In both the conduct and the representation of the Crimean War, the purported and desired simultaneity of telegraphic communication often proved illusory and highlighted the distinct temporalities in which events and their reporting took place.[209]

The 'lies' spread by the telegraph became the subject of a number of satirical pieces in *Kladderadatsch*, which soon linked the problem to the speed of communication. Picking up on the potential public mistrust of telegraphic news, it described telegrams as 'these wire-borne lies, this mendacious hoax-post . . . these couriers of reprehensible curiosity, which hurry faster than the winds and often are nothing more than wind'.[210] As the primary victims of this oversensitivity to telegraphic news, businessmen became the 'Pharisees of the Stock Exchange', who lent too much credence to the 'treacherous' telegraph.[211]

The potential dangers of telegraphic communication highlighted during the Crimean War reached their climax in the stock market crash which followed. Indeed the 'Panic of 1857', though undoubtedly milder in its economic effects than its successor, provoked reactions which foreshadowed those later stimulated by the *Gründerkrach* of 1873. Having begun in the United States and made its way through London and Hamburg to Germany within a couple of months, this (arguably) 'first truly global economic crisis in history' illustrated the role of the telegraph in binding together financial markets—at the very least across Europe and North America.[212] This fact was not lost on Karl Marx, whose *Grundrisse*, written in response to these events, highlighted the scramble that crises provoked among individuals to gain access to new, faster sources of information, which in turn played into the fluctuations of the market.[213]

[207] P. Knightley, *The First Casualty: The War Correspondent as Hero and Myth-Maker from the Crimea to Kosovo* (London, 2000), esp. pp. 1–17; A. Lambert and S. Badsey, *The War Correspondents: The Crimean War* (Stroud, 1994).

[208] *Kladderadatsch*, 8 Oct. 1854.

[209] G. Maag, W. Pyta, and M. Windisch (eds.), *Der Krimkrieg als erster europäischer Medienkrieg* (Berlin, 2010). On the 'telegraphic hoax' and its place within an early modernist culture of ephemeral media, see E. S. Cutler, *Recovering the New: Transatlantic Roots of Modernism* (Hanover, N.H., 2003), pp. 65–93.

[210] *Kladderadatsch*, 19 Nov. 1854.

[211] *Kladderadatsch*, 2 Dec. 1855.

[212] H. Rosenberg, *Die Weltwirtschaftskrise von 1857–59* (Stuttgart, 1934), p. 8. Most historians emphasize Germany's rapid economic recovery from the 1857 crisis: Wehler, *Gesellschaftsgeschichte*, iii, pp. 94–5; Blackbourn, *History of Germany*, pp. 190–1; H. Kiesewetter, *Industrielle Revolution in Deutschland: Regionen als Wachstumsmotoren* (Stuttgart, 2004), pp. 73–5.

[213] K. Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (London, 1973), p. 161: '[I]nstitutions emerge whereby each individual can acquire information about

This capacity for the technology to rapidly spread news of the impending disaster was illustrated through a poem in *Kladderadatsch*: 'how they run and flee with a startled look / before the spectre of the day, "Panique"! / It's coming! It's coming!—its steed, the telegram / From Hamburg now, and now from Amsterdam! . . . How they change with every dispatch / their colours and, if they could, their clothes! / How the goose bumps on their skin arise / when upon the telegram they set eyes.'[214] As Janine Murphy has shown, these anxieties were part of a broader liberal intellectual climate which recognized the ambiguity of the changing social, industrial, and commercial landscape and, after 1848, no longer predicted that an impending 'crisis' would be necessarily political but, rather, economic.[215]

* * *

It is within this context that Karl Knies wrote *Der Telegraph als Verkehrsmittel* (1857), investigating and predicting the effects of telegraphic communication. Conventionally associated with the 'older' historical school of economics, Knies shared with many contemporary intellectuals a desire to investigate the foundations of 'classical' liberal economic theory, as derived from the works of Adam Smith and the British tradition which it spawned. Having already written on the subject of railways, Knies turned to the telegraph as one of the principal modern means of communication, in order better to understand the laws of exchange upon which this theory was based.[216] Acutely aware of both the advantages and material limitations of telegraphic communication, however, his work reflected an effort to come to terms with the potentially socially divisive consequences of a new technology.

The term 'historical school' is somewhat misleading. The rather loose grouping of writers to which it refers, which included Wilhelm Roscher and Bruno Hildebrand, is often characterized as having rejected the universal laws of economic interaction adhered to by British and French thinkers in favour of a more holistic, historical understanding of the evolution of individual societies—a model seen as peculiarly German.[217] To be sure, since the 1840s the tenets of classical

the activity of all others and attempt to adjust his own accordingly, e.g. lists of current prices, rates of exchange, interconnections between those active in commerce through the mails, telegraphs etc. (the means of communication of course grow at the same time). (This means that, although the total supply and demand are independent of the actions of each individual, everyone attempts to inform himself about them, and this knowledge then reacts back in practice on the total supply and demand . . .).'

[214] *Kladderadatsch*, 29 Nov. 1857.

[215] J. Murphy, 'Treating Revolutionary Sickness: Crisis and the Formative Years of German Liberalism (1834–1866)' (forthcoming).

[216] K. Knies, *Die Eisenbahnen und ihre Wirkungen* (Braunschweig, 1853).

[217] Y. Shionoya, *The Soul of the Historical School: Methodological Essays on Schmoller, Weber and Schumpeter* (Boston, 2005), p. 1; K. Tribe, *Governing Economy: The Reformation of German Economic Discourse, 1750–1840* (Cambridge, 1988), p. 205; G. Stavenhagen, *Geschichte der Wirtschaftstheorie* (Göttingen, 1969), p. 196; D. Lindenfeld, *The Practical Imagination: The German Sciences of State in the Nineteenth Century* (Chicago, 1997), p. 152; Erik Grimmer-Solem has raised a similar criticism against the term 'younger Historical School' in *The Rise of Historical Economics and Social Reform in Germany, 1864–1894* (Oxford, 2003), pp. 19–34.

economics had been placed under increasing scrutiny, most notably by Friedrich List, who questioned Adam Smith's cosmopolitanism in *Der nationale System der politischen Ökonomie* (1841). Others, such as Bruno Hildebrand, Lorenz Stein, and of course Karl Marx, had since turned their attention to the 'social question' and begun to question the natural order which was supposed to derive from the 'invisible hand' of the free market.[218]

Despite these critiques, however, the foundational axiom of Smithian theory was in fact widely accepted in Germany, namely that the striving to satisfy each individual's material needs by means of exchange was fundamentally constitutive of an autonomous realm of economic interaction. What the founder of the 'historical school', Wilhelm Roscher, had called for in the early 1840s, in fact, was not a jettisoning of Smith's ideas but a more thoroughgoing inquiry into its details, working upwards from the individual to the universal laws of economic interaction which Smith appeared to have identified.[219] The principal concern for German writers in doing so was how to accommodate the emergence of a dynamic, independently growing, realm of social and economic activity without reducing it to a mere assemblage of individuals driven by egotistical needs.[220]

Knies's inquiry into the telegraph 'as a means of exchange' (*als Verkehrsmittel*) was an attempt to address these concerns. He proceeded from the assumption that economic life was driven by the human desire to satisfy material needs and by the social interactions through which this was achieved: '[T]o live actively is nothing other than to live in intercourse [*im Verkehr leben*],' he wrote.[221] Communication, he believed, was a human necessity, and its objective was both economic and intellectual: 'Is the spiritual, the ethical need for communication weaker than the economic?' he asked.[222] In this regard, he shared with Marx the belief that ideas, the 'spiritual' life of individuals, were intimately related to their material, economic interactions.[223]

Telegraphy, Knies believed, was merely a further tool in human efforts to communicate as broadly as possible—a catalyst for an ongoing process of social transformation. Newspapers, in his view, had already contributed to this process by enabling the widespread distribution of information across an increasingly literate society. Latent needs for communication were thereby being released, and the result was to allow populations to share in a 'common destiny', an early assertion of the power of print-based 'imagined communities'.[224] The telegraph had its limitations, however. 'The telegraph is a winged messenger equipped with

[218] Lindenfeld, *Practical Imagination*, pp. 180–5.
[219] Stavenhagen, *Geschichte der Wirtschaftstheorie*, p. 195.
[220] Tribe, *Governing Economy*, p. 150.
[221] Knies, *Der Telegraph*, p. 1.
[222] Knies, *Der Telegraph*, p. 3.
[223] H. Hardt, *Social Theories of the Press: Constituents of Communication Research, 1840s to 1920s*, 2nd edn. (Lanham, 2001), p. 23.
[224] Knies, *Der Telegraph*, p. 63; B. Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (London, 1983).

the speed of lightning,' Knies wrote, 'but he only ever bears one letter.'[225] Trains could carry bundles of letters at once, but telegraph wires could only bear a limited load and transmit messages sequentially.[226] Indeed, as we have seen, this had already become the source of delays and frustrations, as a growing number of individuals competed for bandwidth on the network. As a result, Knies believed that '[o]nly time-sensitive, important messages can and should be sent by telegraph. It is not the means of transport for extended discussion of sentimental outpourings [*gemüthlichen Ergießerungen*]'. For the latter, the letter remained the most appropriate medium.[227]

The very nature of telegraphic communication, therefore, made it suited to particular forms of interaction, and it was not adequate as a means of individualized communication. Knies recognized that the technology was of especial utility for commercial purposes, but as experience had shown, this too could lead to the privileging of certain groups. Instead, therefore, Knies insisted that the telegraph should be combined with the press to transmit, reproduce, and widely distribute telegrams of 'general interest'. In this respect, he was echoing Friedrich List's assertion, twenty years earlier, that the telegraph would provide news of utility to the '*intérêt général*' and the '*chose publique*', to be published for the benefit of all.[228]

Knies proposed that telegraphic news be shared by 'associative consumption'.[229] This practice, based on the kinds of arrangements made at the Bremen *Börse*, involved group subscriptions to news, as a healthy means of spreading the cost of telegrams and maximizing the utility of each individual message.[230] In promoting this means of 'consumption', Knies was drawing upon the theme of association which was seen by other writers and indeed politicians as a crucial social intermediary between the individual and the state.[231] The technical constraints which he had identified in the technology—namely, its inability to transmit multiple messages at once—had thereby been turned into a means of reinforcing a sense of community.

With these material limitations of the technology in mind, Knies was able to conceive of a state telegraph network as the 'nerves' of the body politic, or '*Staatskörper*'.[232] In doing so, he drew upon a discourse of nervous stimulation derived from the emerging discipline of organic physics, or physiology, propounded by academics such as Hermann Helmholtz, who had himself closely followed the development of telegraphy.[233] He also thereby contributed to the diffusion of an organic metaphor which many intellectuals were using as a means

[225] Knies, *Der Telegraph*, pp. 206–7. [226] Ibid., pp. 206, 212. [227] Ibid., p. 208.
[228] See Chapter 1, p. 33. [229] Knies, *Der Telegraph*, p. 215. [230] Ibid., p. 215.
[231] Lindenfeld, *Practical Imagination*, p. 182. [232] Knies, *Der Telegraph*, pp. 243–4.
[233] L. Otis, *Networking: Communicating with Bodies and Machines in the Nineteenth Century* (Ann Arbor, 2001), pp. 11–48.

to reconcile the individual, society, and the state as a system of interdependent organs.[234]

Crucially, Knies used the analogy with nerves to emphasize that the network would not simply foster communication between all individuals—as it was technically unfeasible to do so, he thought—but instead distribute identical information to and, crucially, from every nerve ending, enhancing the sense of commonality within a nation. As the telegraph served to satisfy a natural human propensity to communicate, and could be used to enhance the feeling of a 'community of destiny' within society, it was natural that the state should maintain its monopoly in order to best evaluate how and where to establish the technology. Within the space of the network, however, communication should be allowed to take place freely.[235] The representation of the telegraph network as a 'national' nervous system was thus not simply a useful and convincing analogy. It was a response to the challenge of maintaining social unity in light of the material realities of networked communication.

[234] Lindenfeld, *Practical Imagination*, pp. 176–80.

[235] Knies, *Der Telegraph*, p. 247.

5
Staying Ahead, Falling Behind

At 6.40 a.m. on 13 April 1859, a telegram was received at the railway station office in Augsburg, addressed to Ernst Freiherr von Lerchenfeld, *Regierungspräsident* (president of the regional government) for the district of Schwaben and Neuburg: 'His Majesty wishes that you present yourself upon his passage through the station, exceptionally in civilian dress, for a brief discussion.'[1] The king was due to arrive at 7.35 a.m., so time was pressing.[2] At 6.48 a.m., the telegram was handed over to the messenger who was to deliver it to Lerchenfeld's home, 1.6 kilometres away in town. He arrived twenty minutes later, but was unable to hand the message to the *Regierungspräsident* personally and waited a further ten minutes before the delivery confirmation slip was returned to him, signed by another person, and indicating an approximate time of receipt.[3] It was now around 7.20 a.m., and only fifteen minutes remained before the king was due to arrive at the railway station on the outskirts of town.

It is unclear who warned Lerchenfeld directly of the king's imminent arrival and at what time, but he was able to make the appointment. Indeed, the monarch's train was late. Returning home after his meeting, Lerchenfeld was appalled to find that the telegram announcing the visit had supposedly been delivered to his home at 7.30. Had the king arrived as planned, he later complained, he would barely have reached the station in time, and 'would have appeared negligent in the eyes of His Majesty, and disobedient to his orders'. This was not the first incident of the kind, he added; telegrams were often delivered at least an hour after their arrival at the telegraph office. In future, such urgent messages would have to be delivered immediately, a service for which he was willing to pay any delivery fee which might be applied.[4]

The details of this minor incident in Augsburg illustrate the two paradoxical facets of the communications revolution. The telegraph facilitated the precise, coordinated management of movements and exchanges between individuals, but the growing complexity of the interactions which it produced became a new source of friction. As this chapter highlights, during the 1860s these possibilities

[1] BHStA GDVA 680, Telegram from Munich to Augsburg, 13 Apr. 1859.
[2] BHStA GDVA 680, Lerchenfeld to Oberpostmeister, 13 Apr. 1859.
[3] BHStA GDVA 680, Telegraphen-Station Augsburg to Telegraphenamt, 26 Apr. 1859.
[4] BHStA GDVA 680, Lerchenfeld to Oberpostmeister, 13 Apr. 1859. On the experience of waiting in the age of railways, see O. Zimmer, "Die Ungeduld mit der Zeit: Britische und deutsche Bahnpassagiere im Eisenbahnzeitalter', *Historische Zeitschrift*, vol. 308, 1 (Feb. 2019), pp. 46-80.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0007

and tensions were multiplied as German governments expanded their webs of transport and communication, weaving new relations of interdependence between society, economics, and politics. Speed was the defining characteristic of these relations between a diversifying range of actors, and competition emerged for pole position.[5]

The preceding decade had witnessed the rising confidence of the capitalist and industrial *Wirtschaftsbürgertum* and its political counterpart in the liberal movement across Germany.[6] Prince Wilhelm's accession to the role of regent in Prussia in 1858 had marked the beginning of the so-called 'New Era', raising hopes of economic and political reform among liberals who came to dominate parliament there, as well as in Bavaria, Baden, and Württemberg.[7] In Bavaria, parliamentary opposition to the conservative government led to the dismissal of chief minister Ludwig von der Pfordten in 1859 and the appointment of a new cabinet under a more moderate Karl von Schrenck.[8] Resistance to change in states such as Hanover and Kurhessen was to some extent counteracted by the establishment of supra-state organizations such as the liberal, pan-German *Nationalverein*, whose advocacy of a parliamentary German nation state was taken up by the various 'Progress' parties which emerged during the 1860s.[9] The appointment of Bismarck as minister-president in Prussia in 1862 appeared to put an end to the 'New Era' in the realm of politics, but everywhere the rising power of the *Wirtschaftsbürgertum* was felt.

Whether reluctantly or enthusiastically, German governments now recognized the importance of stimulating trade and industry, prioritizing economic growth over fiscal stability. In Prussia, businessmen's needs increasingly came to inform policies aimed at promoting railway development.[10] In Saxony, a state-driven process of industrialization was energetically pursued by Ferdinand Beust, and in Württemberg the government now sought to make up for decades of economic backwardness.[11] Even in Bavaria, whose economy relied on agriculture and textile production, a 'diminished industrialization' was able to take hold, as spinning and

[5] For a focused discussion of the impact of telegraphy on concepts and experiences of speed, space and time, see: J-M Johnston, 'The Telegraphic Revolution: Speed, Space and Time in the Nineteenth Century', *German History*, vol. 38, 1 (Mar. 2020), pp. 47–76.

[6] J. Sheehan, *German History, 1770–1866* (Oxford, 1989), pp. 730–852.

[7] W. Siemann, *Gesellschaft im Aufbruch. Deutschland 1849–1871* (Frankfurt am Main, 1990), pp. 190–4; W. Siemann, *Vom Staatenbund zum Nationalstaat: Deutschland, 1806–1871* (Munich, 1995), pp. 35–70, 157–73.

[8] H. Rall, 'Die politische Entwicklung von 1848 bis zur Reichsgrundung 1871', in M. Spindler (ed.), *Handbuch der Bayerischen Geschichte* (4 vols., Munich, 1967–75), iv/1, p. 245.

[9] Sheehan, *German History*, pp. 878–88; Siemann, *Vom Staatenbund*, pp. 235–50.

[10] J. M. Brophy, *Capitalism, Politics, and Railroads in Prussia, 1830–1870* (Columbus, 1998).

[11] R. Bazillion, *Modernizing Germany: Karl Biedermann's Career in the Kingdom of Saxony, 1835–1901* (New York, 1990); A. Green, *Fatherlands: State-Building and Nationhood in Nineteenth-Century Germany* (Cambridge, 2001), esp. pp. 223–66; H. Kiesewetter, *Die Industrialisierung Sachsens: Ein regional-vergleichendes Erklärungsmodell* (Stuttgart, 2007); B. Ashton, *The Kingdom of Württemberg and the Making of Modern Germany* (London, 2017), pp. 85–103.

weaving were mechanized, guild restrictions were relaxed, and capital was invested in heavy industry.[12] King Maximilian II specifically asked his advisers 'upon which classes to establish oneself', and some respondents praised, others regretted, but all acknowledged the importance of the bourgeoisie. The '*Bürgerstand*', Ludwig von der Pfordten conceded before his dismissal, was now at the heart of state life, and priority should be given to manufacturing, trade, and municipal self-government.[13]

The principle was accepted by most German governments during the 1860s, and the provision of wide-reaching communications infrastructure was a crucial means of achieving it. Throughout the *Deutsch-Österreichischer Telegraphen-Verein* the construction of new lines was now prioritized over the improvement of existing connections—greater network coverage, in other words, was the principal objective, as the pool of telegraph users expanded to include manufacturers and agriculturalists alongside bankers and traders. Across Western Europe, in fact, 'secondary branches' were privileged in both telegraphy and railway construction;[14] not only in Germany and France, where the state had long been omnipresent, but in Britain too, where the 1868/9 Telegraph Acts ended the private sector's domination of the industry, on the understanding that national and economic interests could be mutually sustaining.[15]

The age of circulation had arrived and, in telegraphy as in other economic matters, this decade witnessed the rise of state-sanctioned (and state-governed) 'free trade', under the auspices of liberal internationalism. Expansive telegraph networks were to place all sectors of the economy on an equal footing; Time was to be standardized across all lines of communication, streamlining relations between society and the economy; the German capital market was diversified as new centres of finance emerged; information was disseminated more freely, as press regulations were relaxed; and a 'national' German telegraphic news sphere emerged, fed through European and, from 1866, transatlantic cables. All these changes were to be regulated by agreements between governments through new administrative structures such as the International Telegraph Union (ITU), aimed at facilitating the international circulation of information.[16]

But the expansion of telegraph networks introduced a new element of competition into the relations of interdependence which they created. To the logic of inclusion in and exclusion from the network was now added a concern for one's

[12] K. Bosl, 'Die "geminderte" Industrialisierung in Bayern', in C. Grimm (ed.), *Aufbruch ins Industriezeitalter* (3 vols., Munich, 1985), i, pp. 22–39.

[13] M. Hanisch, *Für Fürst und Vaterland: Legitimitätsstiftung in Bayern zwischen Revolution 1848 und deutscher Einheit* (Munich, 1991), pp. 124–6.

[14] Siegfried Weichlein suggests that '*Flächenausbau*' became the priority in the later 1870s, though the policy had clearly taken hold at least a decade earlier: S. Weichlein, *Nation und Region: Integrationsprozesse im Bismarckreich* (Düsseldorf, 2004), pp. 85–6.

[15] S. Fari, *Victorian Telegraphy before Nationalization* (Basingstoke, 2015), pp. 161–204.

[16] Cf. E. Hobsbawm, *The Age of Capital, 1848–1875* (London, 1977), esp. pp. 82–8.

position within it: not all people and places were equally served, some apparently forging ahead while others fell behind. The vision of free and unhindered communication within and between states, therefore, easily gave way to a clash of ideologies, as negotiations within associations such as the ITU revealed diverging interests among the governments involved and came to reflect the changing balance of geopolitical power in Central Europe and the weight of the Prusso-Austrian dualism. The spread of telegraph lines across oceans and continents, meanwhile, heralded the 'anxious triumph' of global capitalism, the 1860s witnessing a crucial shift in trade flows, particularly after the end of the American Civil War.[17] Competition was inherent to this process too, and German states appeared increasingly sidelined, as they struggled to influence the shape of international communications infrastructure and to find their place in a connected world.

This competitive mechanism elicited a variety of responses. The considerable cost and logistical complexity of catering to growing public demand for faster, better, and more widely sourced news led agencies such as Wolffs to turn to the state for assistance in establishing a much-needed monopoly over the industry, something which the Prussian government was only too eager to provide in its effort to manage rapidly fluctuating public opinion. Temporal hierarchies emerged within the bourgeois, telegraphic elite itself, as state administrations struggled to accommodate the different rhythms of communication in various sectors of the economy, and the distribution of telegraph offices in towns and cities became a reflection of local privilege. Not only the economy but, increasingly, politics too appeared to be subject to the fitful impulses of telegraphic news. Hopes for a streamlined, efficient, and networked society were thus confronted with a far more multilayered reality which users and administrators alike sought in vain to homogenize—it was a sign of things to come.

5.1 The Subtle Triumph of Liberalism

During the 1850s, attempts to find economical ways of expanding the Bavarian telegraph network had revealed crucial deficiencies. In particular, the decision to open the railways' telegraph lines to private correspondence had only had a limited effect. The measure had been imposed upon state railways, but neither of the two private companies operating in the Pfalz, nor the Ostbahn-Gesellschaft serving the eastern parts of Bavaria, had acceded to the government's wishes on this point. Yet these were the very regions which had been excluded from the initial network outline, those which lay outside the commercial and

[17] D. Sassoon, *The Anxious Triumph: A Global History of Capitalism* (London, 2019); S. Beckert, *Empire of Cotton: A New History of Global Capitalism* (London, 2014).

manufacturing heartland of the state, and which were most severely affected. As a result, many towns in Niederbayern, Oberpfalz, and the Pfalz remained outside the telegraph network.

By February 1861, this neglect had become a matter of concern in parliament, where the liberal deputy Franz Peter Buhl complained that 'Bavaria takes the first rank among those countries which has done the very least for an institute which is of the greatest significance for the development of state-economic relations'.[18] Indeed, despite an initial flurry of activity, during the preceding decade the government had been reluctant to invest further in communications infrastructure—the state-funded *Ostbahn*, for instance, had been privatized.[19] Of course, some members of parliament had themselves been emphasizing the need to prioritize the profitability of the telegraph network so as to avoid a tax hike.[20] Now, however, parliament emphasized the importance of expanding the service, notwithstanding the cost. As Ludwig Römmich put it, 'Private companies must question whether the undertaking produces a profit, but the state has the duty to cater to every economic need, even if the revenue doesn't correspond entirely to the expense, or if a profit from the revenue is not to be expected.'[21]

After repeated requests from regional authorities, chambers of commerce, and parliament itself, the Bavarian government took action. In 1861, the new minister-president Karl von Schrenck passed legislation designed to plug 'the remaining gaps in particular parts of the country', by building lines through the hinterland of the Pfalz to the west and through the no man's land between Amberg and the border with Bohemia to the east.[22] The king himself supported the extension of the service to manufactories, despite little evidence that they would make any use of it, but on the understanding that demand from this sector might grow in the future.[23]

In Prussia, there had been a clearer policy of state intervention in matters of transport and communication since the 1850s, driven by the minister of trade, August von der Heydt.[24] Yet even here, when the minister evoked the spiralling costs of the telegraph network in 1860, the Rhineland industrialist and parliamentary deputy von Diergardt complained that too many places remained excluded from the network and demanded that the state cease to operate the service as a source of income.[25] Time and again over the following years, the Prussian government's representatives insisted that telegraphy was not being

[18] *VKA* (1859–61), 7 Feb. 1861, p. 115.
[19] D. Götschmann, *Wirtschaftsgeschichte Bayerns: 19. und 20. Jahrhundert* (Regensburg, 2010), p. 110.
[20] *VKA* (1859–61), 7 Feb. 1861, p. 117. [21] Ibid.
[22] BHStA, Staatsrat, 1076, 'Protokoll der Sitzung des Staatsrats', 8 Mar. 1861; see also BHStA, GDVA 227, 'Nachtrag zum Kostenvoranschlag über Ergänzung des Telegraphen-Netzes', 8 Feb. 1861.
[23] Ibid. [24] See A. Ross, *Beyond the Barricades*.
[25] *Stenographische Berichte über die Verhandlungen des Preußischen Hauses der Abgeordneten* [*VPHA*] (1860), 5 Mar. 1860, p. 377.

treated as a '*Finanzquelle*' (financial resource), and that it was doing its best to cater to the ever-growing demand.[26] The problem, as in Bavaria, was that the network needed both new wires along existing lines and an extension into deprived, poorly served (or '*verkehrsarme*') regions.[27]

In this regard, state attitudes to communication diverged from developments in the railway sector during the period. In Prussia, the replacement of August von der Heydt by Heinrich Friedrich von Itzenplitz as minister of trade in 1862 signalled the retreat of government involvement in railway construction in favour of private investment—by 1865, the railway network was dominated by private companies.[28] A similar movement was taking place across Germany, in fact, such that by 1871 the *Kaiserreich* was to inherit a patchwork of public and private networks.[29] In telegraphic matters, however, the role of the state was rarely questioned; indeed, it was considerably enhanced during the period. Even after von der Heydt's departure, for instance, the Prussian government insisted that it was expanding the network to the benefit of the economy as a whole. '[E]very year', Itzenplitz told parliament in 1866, 'the most important centres, whether of trade or industry, are identified, and that is where new telegraphs are laid.'[30]

One of the major differences between railways and telegraphs was quite simply their cost. Clearly, despite recurring complaints on all sides in this regard, the laying of electric wires was considerably cheaper than the construction of thousands of kilometres of heavy iron or steel railway tracks. As a result, however, the construction of railways had necessitated a delicate balancing act between the state, industrialists, and investors. In Prussia, for instance, the state's retreat from the railway sector during the 1860s was partly a means of accommodating these businessmen's needs and the investment practices of a capitalist economy. The emerging giants of the telegraph industry, on the other hand—Siemens & Halske and the cable manufacturer Felten & Guilleaume—depended upon government contracts for their business, which, moreover, they were also increasingly developing abroad. Nor were they publicly listed, thereby eschewing the added pressure from shareholders that other companies bore.[31]

Staunch opponents to increased government expenditure, such as Freiherr von Lerchenfeld, held firm, but their views were increasingly drowned out by the voices arguing that profitability was to be sidelined, and that statewide access to the telegraph was a necessity. Gustav von Schlör, a liberal deputy who sat on the board of directors for the *Ostbahn* and would later take over as minister of trade, highlighted the issues at stake: 'It is principally to be asked in this matter whether,

[26] See, for example, the discussions surrounding the 1863 budget: *VPHA* (1862), Aktenstück No. 133, 'Etat der Telegraphenveraltung', p. 1403.
[27] *VPHA* (1864), Aktenstück No. 16, 'Etat der Telegraphenverwaltung', p. 44.
[28] Brophy, *Capitalism, Politics and Railroads*, pp. 135–64.
[29] Weichlein, *Nation und Region*, pp. 100–2.
[30] *VPHA* (1866), 12 Dec. 1866, p. 1087.
[31] Brophy, *Capitalism, Politics and Railroads*.

on the one hand, a consideration of the general need, or on the other hand the possibility of financial success justifies the bill in question.'[32] The 'general need' or 'common good' had thus come into play, explicitly distinguished from state fiscal considerations, and implicitly associated with economic activity instead. As another deputy stated, 'as long as the countryside does not participate in the telegraph network, this important contemporary invention has not become common property of the nation'.[33]

Indeed, parliamentary discussions in Prussia and Bavaria revealed the insatiable appetite for the new technology. 'Even the smallest town', Prussian Minister of Trade von Itzenplitz remarked, 'would like a telegraph . . . '.[34] 'Almost every day', the case-handler for the Bavarian Upper Chamber asserted, 'we read petitions for new railway lines; the desire for telegraph lines is equally vivid, perhaps even greater, as the costs of construction are smaller, and every individual would like to have the telegraph as close as possible to his house.'[35] Among the towns whose requests were put forward in parliament, for instance, were Sankt Ingbert, Bergzabern and Pirmasens in the Pfalz, and Vilshofen and Neuburg along the Danube near Passau—these were all situated outside the state's economic heartland.[36] The circle of telegraph users was evidently expanding and diversifying, and according to one deputy, it now comprised three major categories. The first, which he viewed somewhat cynically, comprised traders of government bonds and stocks. The second encompassed those engaged in the trading of fruit and agricultural products, who needed prompt updates on price fluctuations. The third was composed of industrialists: production, he emphasized, also entailed distribution and therefore trade.[37]

The policies and pace of construction implemented to cater to this growing demand varied from state to state. Prussia led the way, outpacing its neighbours during the period and increasing its expenditure on the network from roughly 350,000 thaler in 1860 to over 750,000 thaler in 1865.[38] In the space of those five years, its network was doubled in size from 7,000 to 14,000 kilometres of lines.[39] Baden, on the other hand, benefited from a much more concentrated territory and continued the relatively stable expansion which had taken place since the early 1850s.[40] Both Württemberg and Hanover had only begun to build their networks in the middle of the preceding decade, though both now intensified their efforts. From 1856, Württemberg established new connections to Switzerland, Austria, and Bavaria, expanding its network from 600 kilometres of lines in 1860 to almost 1,900 kilometres by 1866, while Hanover multiplied the number of offices open to

[32] Ibid., p. 352. [33] Ibid., p. 350. [34] *VPHA* (1866), 12 Dec. 1866, p. 1087.
[35] *VKA* (1859–61), 19 June 1861, p. 467. [36] *VKA* (1859–61), 29 Apr. 1861, pp. 348–60.
[37] Ibid.
[38] Wessel, *Entwicklung des Nachrichtenwesens*, p. 175; Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, p. 125.
[39] Wessel, *Entwicklung des Nachrichtenwesens*, p. 161. [40] Ibid., p. 71.

the public from 60 in 1854 to over 650 by 1867.[41] In Bavaria, meanwhile, the funds granted by the law of 1861 allowed the administration to build over 1,000 kilometres of new lines, bringing its total to 3,100 kilometres.[42]

To a certain extent, this expansion was tied to the growth of the railway network, whose telegraph lines could now be used for public correspondence. In Prussia, all private and public railway offices were opened to private correspondence in 1866 (a total of around 700, up from 275 in 1858).[43] In Bavaria, the *Ostbahn* finally agreed to transmit private correspondence in 1864, though other companies resisted for longer.[44] The growth of the Saxon telegraph network, meanwhile, was closely related to the expansion of its railways which took off in 1864, after a few years of stagnation.

Government efforts to accede to the growing demand from towns and villages also called for new logistical arrangements. In Bavaria, King Maximilian II had suggested using railway and post personnel to run the telegraph service in small localities as a cost-saving measure, and the proposal was brought up in the *Kammer der Abgeordneten*.[45] Combining postal and telegraph services in particular, it was explained, would obviate the cost of establishing individual telegraph offices in very small localities whose usage would not cover the expense. If this had been achieved in Baden, one deputy asked, why not in Bavaria too?[46] This practice was eventually introduced across the *Deutsch-Österreichischer Telegraphen-Verein*, and by 1867 70 per cent of all offices in Prussia provided a combined post and telegraph service.[47]

These measures helped to alleviate the burden which the expansion of the network placed upon state finances. As before, it was not only internal demand but also external pressures which called for more state intervention. During the 1860s, it became clear that Bavaria's income from the *DÖTV* was in decline—as revenue from communication between and through the states of the union was divided according to the length of lines which each possessed, Bavaria's relative inactivity in the construction of new connections had financial consequences. It was for this reason that the 1861 bill proposed extending the south-western line to Switzerland, to avoid correspondence being diverted through Württemberg.

The war of 1866 then caused a further reconfiguration of the German network, with states such as Bavaria relinquishing a number of profitable telegraph hubs—Frankfurt, in particular—to Prussia.[48] Certain deputies in the Prussian parliament, in fact, expressed their concern at the growing demand and cost of running a

[41] Ibid., pp. 47–53, 107. [42] Ibid., p. 26. [43] Ibid., pp. 177–8. [44] Ibid., p. 33.
[45] BHStA, Staatsrat, 1076, 'Protokoll der Sitzung des Staatsrats', 8 Mar. 1861.
[46] *VKA* (1859–61), Beilage XLVII, 8 Apr. 1861, p. 516.
[47] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 132–4.
[48] *Rückblick auf das erste Jahrhundert der Kgl. Bay. Staatspost (1.3.1808 bis 31.12.1908)*, ed. Kgl. Bay. Staatsministerium für Verkehrsangelegenheiten (Munich, 1911), p. 319.

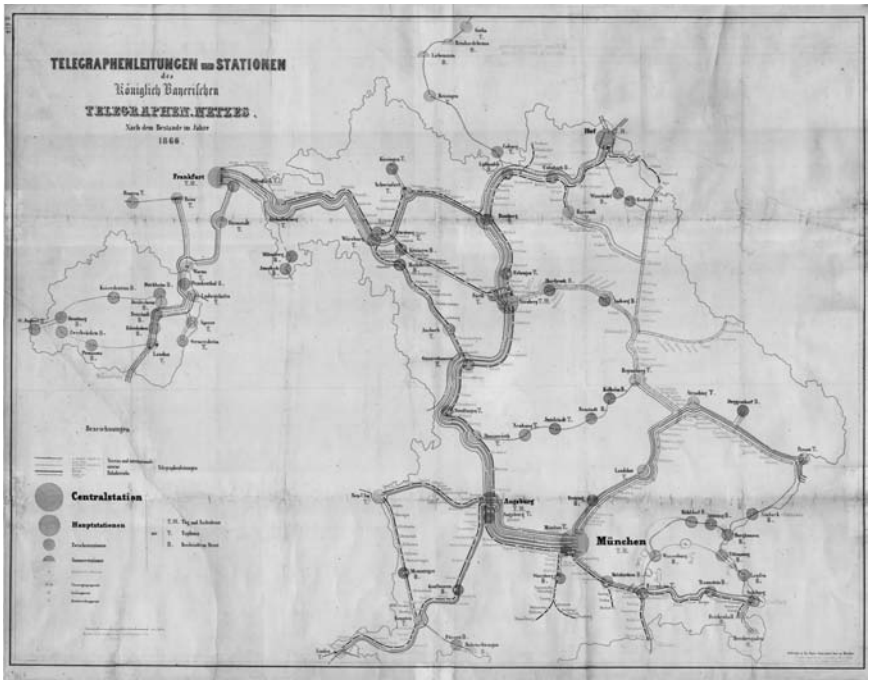

Figure 5.1 Map of telegraph lines in Bavaria, 1866. Reproduced with the kind permission of the Museumsstiftung Post und Telekommunikation.

network which had expanded to include the lines in Saxony and Hessen.[49] Within a year, the Bavarian minister of trade, Gustav von Schlör, presented parliament with a new bill requesting 1.8 million florins, nine times the previously agreed amount, to expand the telegraph network. The deputies brought the figure down to around 1.35 million florins but recognized that it was now unfeasible to list every place requiring a connection, and left the decision to the government (Figure 5.1 shows the Bavarian network in 1866).[50]

The 1867 law in Bavaria confirmed the new direction of government policy in economic matters, a liberalization of the barriers to economic growth reflected in its new *Gewerbeordnung* of 1868. 'From the financial standpoint', the director of communications and transport admitted, 'an extension of the telegraph network for internal correspondence . . . would not be justifiable', but there was now 'a certain moral duty for the state, whose monopoly the telegraph is, to render this means of communication equally accessible to all countrymen'.[51] On the other hand, the aim was not to let loose economic forces but, rather, to

[49] *VPHA* (1870), 5 Nov. 1869, pp. 355–9. [50] Ibid.
[51] BHStA, MH 16799, Gumbart, 'Bericht, Erweiterung des bayerischen Telegraphen-Netzes betr.', 15 Apr. 1867.

liberate them in a controlled manner, without unduly promoting industrialization and urbanization—a notion also reflected in Bavaria's somewhat more conservative policy with regard to *Heimatrecht*.[52] The extension, the director specified, was not 'about making the telegraph accessible to a new stratum of the population . . . rather much more about providing that portion of the trading and industrious public which lives far from the railways with the possibility of using the telegraph; . . . in one word, at least to contribute something to preventing the mercantile and industrial depopulation of entire regions'.[53]

When the minister of trade presented his bill a few months later, however, he also implied that the network might soon assume more than purely economic functions. 'Initially only serving individual strata of the population, besides the state itself,' he asserted, 'the telegraph institute, due to the reduction in tariffs and the increase in the number of telegraph offices, has completely changed its original character; it has now become as indispensable a need to the exchanges of all circles as the postal service, whose most important complement it constitutes.'[54] Although some places would make little use of the technology, Schlör explained, 'a single such instance in a small location, for a person there, can have the most significance'.[55] Presaging the future of the technology, he even suggested that it might soon be used to warn of 'fire outbreaks, floods, ice-drifts and family events'.[56] Whatever the network's functions, Schlör was now adamant that there was 'a certain moral duty, to make this means of communication, with its deeply penetrating advantages, as accessible as possible to all areas of the country'.[57]

5.2 Connections and Complications

The development of widespread and unhindered communication implied, of course, the cultivation of each state's external relations. During the 1860s, telegraphic transmissions across much of Central Europe continued to be managed through the regular conferences of the *Deutsch-Österreichischer Telegraphen-Verein* (*DÖTV*), at which the representatives of member states discussed possible means of streamlining communication across Germany. These meetings, however, also served to highlight the diverging interests of the states involved, an issue further complicated by parallel initiatives to develop an even broader European

[52] I. Burkhardt, *Das Verhältnis von Wirtschaft und Verwaltung in Bayern während der Anfänge der Industrialisierung (1834–1868)* (Berlin, 2001), pp. 200–8.
[53] BHStA, MH 16799, Gumbart, 'Bericht, Erweiterung des bayerischen Telegraphen-Netzes betr.', 15 Apr. 1867.
[54] BHStA, Staatsrat 1148, 'Protokoll der Sitzung des Staatsrats', Beilage V, 'Motive zum Gesetzentwurf', 12 Oct. 1867.
[55] Ibid. [56] Ibid. [57] Ibid.

framework of communication, as well as the incipient globalization of the telecommunications industry, from which Germany appeared to be excluded.

The member states of the *DÖTV* agreed on a number of pragmatic policies designed to facilitate communication across Germany and Austria. The removal of commutation stations at state borders, for instance, raised few objections.[58] On other matters, however, particularly questions of finance, the delegates to the *DÖTV* conferences did not see eye to eye. Since the 1850s, states had received a proportion of all income generated across the network relative to the length of the telegraph lines which they possessed, a principle which naturally favoured the larger states of Austria and Prussia: in 1860, they received 72 per cent of the DÖTV's total income, despite handling only around half of all telegrams transmitted. At Bavaria's suggestion, therefore, the formula was changed in 1863 to take account of the volume of traffic handled, but states were then soon accused of seeking to divert traffic to their own lines.[59]

Some of the financial questions addressed at the *DÖTV* were intertwined with the changing balance of power in Central Europe more broadly. Since the late 1850s, Prussia's representatives had been pushing for a reduction in the baseline cost and a reform of the tariff zones according to which telegrams were priced, primarily in order to bring the *DÖTV* in line with the West European Telegraph Union (WETU) established in 1855 by France, Belgium, Sardinia, and Switzerland. In general, the WETU charged less for long-distance communication and favoured the implementation of uniform tariffs for communication across Europe, an outward-looking policy which Prussia increasingly supported, and which matched its efforts to establish international free-trade treaties. Prussia's efforts to introduce a similar strategy within the *DÖTV*, however, was hindered by other states, including Saxony and Austria, whose representatives feared that this would reduce their income, increase traffic, and overburden their lines.[60]

This reluctance to liberalize tariff policies was also a reaction to the leading role which Prussia was seeking to take in negotiations with western neighbours. In 1865, Napoleon III invited representatives of the *DÖTV* to Paris to meet with delegates from Spain, Russia, Belgium, and Denmark, among others, and discuss the establishment of an international treaty on telegraphic communication. Prussia suggested that it attend the conference on behalf of the *DÖTV* as a whole, but this option was vigorously opposed by Bavaria, and the various German states concerned instead sent their own delegates.

The International Telegraph Union which resulted from these meetings was the largest international organization of the period, designed in some ways to apply

[58] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 111–39. [59] Ibid., pp. 164–6.
[60] J. Ahvenainen, 'The International Telegraph Union: The Cable Companies and the Governments', in Bernard Finn and Daqing Yang (eds.), *Communications under the Seas: The Evolving Cable Network and its Implications* (Cambridge, Mass., 2009), pp. 61–77.

the principles of free trade to the field of telecommunications.[61] Implementing these regulations within the *DÖTV*, however, was problematic. The ITU's ultimate objective was to treat all states as homogeneous price zones, but these were only progressively introduced across Germany. Prussia's proposal to establish new, rational zones of communication across the region met with a counterproposal from Bavaria for more 'organic' zones, and an outright refusal to reduce tariffs on the part of Austria. At one conference intended to decide the issue, the Bavarian delegate complained confidentially that 'Prussia repeatedly demonstrated its attempt to become the Union's leader'.[62]

* * *

Beneath these discussions and negotiations, the geopolitical balance of power in Central Europe was indeed shifting. And once again, in matters of strategy, new means of communication held the potential to divide as much as to unite. In 1855, for instance, state representatives in Frankfurt had expressed the intention to provide the Confederation's fortresses (*Bundesfestungen*) with telegraphic connections, part of a broader attempt to revitalize the *Bund*'s military system and paving the way for something akin to a regional defence structure.[63] At the same time, however, the technology was being developed for military purposes by a number of individual German states, adding a weapon to the arsenals which they would exploit during the wars of unification. An order had been issued for its introduction in Prussia in 1856, and mobile field telegraphs were deployed when the army was temporarily mobilized during the Austro-Italian War of 1859, at which point the Bavarian military authorities also began to consider its development.[64]

The successful application of new technologies, by some accounts, played a determining role in the outcome of the wars of unification—the Prussian army's use of the breech-loading rifle, in particular, has been credited for Austria's defeat at Königgrätz in 1866.[65] If we are to believe Theodor Fontane, who was dispatched as a correspondent to report on these wars, the telegraph was also one such innovation. During the Schleswig-Holstein War of 1864, he wrote, '[d]ay and night, the telegraph office was in operation, and gave shining proof of how the art of war had learnt to make use of the latest inventions'.[66]

[61] Ibid. [62] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 193–4.

[63] D. Showalter, *The Wars of German Unification*, 2nd edn. (New York, 2015), pp. 45–84; see the discussions in GStA PK I. HA Rep. 75 A, Preussische Gesandschaft.

[64] BHStA, GDVA 285, Pfordten to Telegraphenamt, 6 June 1855; H. A. Wessel, *Entwicklung des Nachrichtenwesens*, p. 180; S. Kaufmann, *Kommunikationstechnik und Kriegsführung 1815–1945: Stufen telemedialer Rüstung* (Munich, 1996), p. 87; BHStA, MH 16793, Kriegsministerium to HM, 12 Apr. 1859.

[65] Ashton, *The Kingdom of Württemberg*, p. 133.

[66] T. Fontane, *Der Schleswig-holsteinische Krieg im Jahre 1864* (Berlin, 1866), p. 184.

This technology's influence on the conflicts of the 1860s is difficult to assess, however. Helmuth von Moltke, the Chief of the Prussian General Staff who came to dominate the military scene in these years of unification, remained sceptical as to the technology's utility. He resented the idea of officers going into battle with a 'telegraph wire in the back', insisting upon the need to grant commanders on the ground a degree of independence.[67] It was not until the late 1860s, therefore, that telegraph detachments were assigned a greater role within the Prussian army, and not all of these were ready by the time of its war with France in 1870.

Often, it was the existing state networks which were of most utility during these conflicts. These were the lines used by the Prussian army when it first entered the duchies of Schleswig-Holstein in 1864, for instance, rather than mobile field telegraphs. During the Austro-Prussian War two years later, General Moltke used the state network to coordinate troop movements from his headquarters in Berlin, not least by facilitating the organization of railway transportation.[68] In general, however, following mobilization Moltke limited himself to the transmission of occasional last-minute decisions, primarily using the technology as a source of information rather than control.[69] In this regard, Prussia does indeed appear to have held an advantage—during the 1866 conflict, the commander of the Austrian imperial army, General Ludwig von Benedek, and the Austrian Kaiser himself were poorly informed of developments taking place on the battlefield.[70] After the Prussian victory, *Kladderadatsch* was able to joke that a petition had circulated through Austrian villages, complaining of the 'damaging impact of the telegraph . . . whose miasmas are purportedly the main cause of a disease ravaging the vines'. In a number of high places, the paper was able to confirm, certain telegrams, from Königgrätz in particular, had indeed produced sour grapes.[71]

In many ways, the Austro-Prussian conflict of 1866 had a greater influence on the changing balance of power in the German telegraphic sphere than vice versa. The war effectively ended in a '*telegraphisches Königgrätz*', which helped determined the future shape of communications networks in Germany and Prussia's predominance.[72] Although the *DÖTV* was maintained, the North German Confederation's telegraph administration absorbed the networks of Hanover, Hamburg, Hessen-Nassau, and Saxony, and threatened the future of Bremen's privately owned *Bremer Telegraphen Verein*.[73] The consequences of the conflict

[67] D. Showalter, 'Soldiers into Postmasters? The Electric Telegraph as an Instrument of Command in the Prussian Army', *Military Affairs*, vol. 37, no. 2 (1973), pp. 48–52.

[68] Ibid.

[69] Wessel, *Entwicklung des Nachrichtenwesens*, p. 182; Showalter, 'Soldiers into Postmasters?'.

[70] E. Dörfler and W. Pensold, *Die Macht der Nachricht: Die Geschichte der Nachrichtenagenturen in Osterreich* (Vienna, 2001), p. 166.

[71] *Kladderadatsch*, 13 Jan. 1867.

[72] Siegfried Weichlein proposes the idea of a 'postalisches Königgrätz' in *Nation und Region: Integrationsprozesse im Bismarckreich* (Düsseldorf, 2004), p. 108.

[73] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 194–7.

were also tangible in Bavaria, a number of whose northern telegraph stations were lost to Prussia, among which were Frankfurt am Main, Mainz, Worms, Darmstadt, and Gotha—the income from the dynamic financial hub of Frankfurt, in particular, was sorely missed.[74] Both Austria and Bavaria considered leaving the *DÖTV* after 1866, and matters were not improved when in 1868 the director of the Prussian Telegraph Administration, Colonel Chauvin, called for a new treaty between the North German Confederation and southern Germany which would exclude Austria.[75]

* * *

The reconfiguration of Germany's networks and the emergence of a Prussian-dominated telegraphic sphere took place within an increasingly global framework of communication. One major effect was to further complicate relations between members of the *DÖTV* and the ITU. In 1865, Britain had been excluded from the conference establishing the ITU because its telegraph network was privately owned, and it could not therefore empower a state representative to reach agreements with its neighbours. The nationalization of the British network in 1868/9 removed this obstacle, but the regulation of telegraphic communication now also involved accommodating the growing number of large-scale, multi-national corporations that were funding the construction of landlines and sub-marine cables across the world.

Another crucial effect of this telegraphic globalization was to spotlight its reliance upon an alliance of private investment and imperial connections which was lacking in Germany. British entrepreneurs had initiated the process by funding the laying of a submarine telegraph cable across the English Channel in 1851, and by linking London and Denmark in 1859. That same year, the French government established a connection to its colony in Algeria. The Austrian and Russian governments, meanwhile, embarked on a number of large-scale construction projects of their own, in an effort to integrate the disparate regions of their empire.[76] The most significant achievement of the following decade, of course, was the laying of a transatlantic cable between Europe and North America in 1866, a project launched by the British cotton merchant John Pender and the American businessman Cyrus Field. Until the late nineteenth century, the combination of British imperial interests and power, and Anglo-American finance, led to the English-speaking world's domination of global communications.[77]

Prussia's rise to power, therefore, was matched by a diminution in Germany's relative influence on the world telegraphic stage. Lacking the imperial

[74] *Rückblick auf das erste Jahrhundert der Kgl. Bay. Staatspost (1.3.1808 bis 31.12.1908)*, ed. Kgl. Bay. Staatsministerium für Verkehrsangelegenheiten (Munich, 1911), p. 319.

[75] Reindl, *Der Deutsch-Österreichischer Telegraphenverein*, pp. 194–212.

[76] K. Beauchamp, *A History of Telegraphy* (London, 2001), pp. 144–5.

[77] S. M. Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks* (New York, 2016).

connections, coastal landmass, and the corresponding motivations for investors and governments to participate in such large-scale construction projects, German governments remained focused on the development of regional communications networks. There were a few minor exceptions: the Schleswig-Holstein War had allowed the Prussian government to obtain control of the cable between Britain and Denmark, for instance, and in 1865, it co-funded the establishment of a connection between Stralsund and Christiania with the Swedish government. But it was Reuters that obtained a concession to connect Britain and Hanover, while the 'Vereinigte Deutsche Telegraphengesellschaft' established in 1869 to lay a cable between Germany and the USA was primarily funded by British investors, and never got further than Ireland. That same year, meanwhile, the Russian government explicitly objected to any German involvement in the establishment of the Great Northern Telegraph Company, a Danish, Norwegian, British, and Russian consortium.[78]

In a culture that celebrated the advent of *Weltkommunikation*, therefore, negligibly few of the telegraphic tentacles extending outwards from Europe were German. The incipient process of globalization did, however, provide opportunities for well-connected individuals and firms that were able to position themselves at the intersection of technological innovation, global business, and international relations. Chief among them was Werner Siemens. During the 1860s, Siemens continued to work for a range of European states and railway companies, always closely following geopolitical developments which might stimulate new business—the possibility of hostilities in Persia, for instance, or Austria's efforts to expand its network into Greece and Turkey.[79] In general, however, he felt that 'the telegraph business is now becoming very ordinary and unprofitable . . . There is no recognition of true progress, nor profit to be made in it. The customers are, with the exception of England, all [state] administrations, and for them the matter itself is always a minor issue.'[80]

The military applications of telegraphy appeared to simulate some business: when the director of the Prussian Telegraph Administration began to show an interest in developing a military telegraph, Siemens hoped that 'if Prussia, which currently determines the fashion in military technology, adopts the matter, then it will be used a lot'.[81] Despite General von Moltke's apparent reluctance to employ

[78] K. Jacobsen, 'Small Nation, International Submarine Telegraphy, and International Politics: The Great Northern Telegraph Company, 1869–1940', in Bernard Finn and Daqing Yang (eds.), *Communications under the Seas: The Evolving Cable Network and its Implications* (Cambridge, Mass., 2009), pp. 61–77.

[79] Werner to Carl, 27 Dec. 1856, in C. Matschoß, (ed.), *Werner Siemens: Ein kurzgefasstes Lebensbild nebst einer Auswahl seiner Briefe* (2 vols., Berlin, 1916), i, p. 121; Werner to Wilhelm, 19 Jan. 1858, in Matschoß, *Werner Siemens*, i, p. 127.

[80] Werner to Carl, 22 May 1857, in Matschoß, *Werner Siemens*, i, p. 122.

[81] Werner to Wilhelm, 9 Dec. 1864, in Matschoß, *Werner Siemens*, i, p. 233.

field telegraphs, during the Austro-Prussian War of 1866 Siemens's business seemed to be thriving as he struggled to produce cables quickly enough to cover the rapid advance of Prussian troops.[82] Nevertheless, Siemens believed that the field of telegraphy was experiencing 'a tragic stagnation'.[83] Expanding state networks, indeed, required little innovation, simply involving a large-scale implementation of existing techniques which were now being formalized in a specialized branch of engineering.[84] '[E]very mechanic without capital and intelligence can present strong competition,' Siemens lamented.[85] 'The internal market', he added, 'has therefore been lost to us.'[86]

Innovation was the key to business, as Werner Siemens well knew, and the most exciting developments were taking place in the field of submarine telegraphy.[87] In 1858, Siemens had collaborated with a British firm to begin laying cables across the Mediterranean, from Sardinia to Bona in Algeria, and he had then set his sights on a transatlantic project, though he would not be the first to successfully complete one.[88] Throughout his expeditions, Siemens used his experience to rethink some of the electrical principles underlying the telegraph industry, sharing and publishing his observations in various circles, contributing to the broader exchange of knowledge between science and technology that was shaping the field of physics. It was through his brother Wilhelm in London, however, that Werner Siemens was able to tap into the emerging global telegraph industry. Settled at the heart of the British Empire, Wilhelm appeared to have 'the world's traffic in his hands', with access to a larger pool of investors and a wide network of commercial relations.[89] In 1865, as the transatlantic cable project launched by John Pender and Cyrus Field got underway, the London branch of Werner's firm was therefore restructured under the new name of Siemens Brothers, from which point the entire company underwent transformation.[90]

In 1868, the London and Berlin branches of the business formed the Indo-European Telegraph Company, marking Siemens's accession to the ranks of the multinational corporations which were to shape the future of global

[82] Werner to Wilhelm, 2 July 1866, in Matschoß, *Werner Siemens*, i, p. 255.

[83] Werner to Wilhelm, 30 Dec. 1861, in Matschoß, *Werner Siemens*, i, pp. 187–8.

[84] The Prussian *Repertorium der technischen Literatur* listed 190 articles on telegraphy published between 1823 and 1853, but between 1854 and 1868 the figure rose to 923. Among those, 185 were drawn from the *Zeitschrift des Deutsch-Österreichischen Telegraphen-Vereins* (*ZDÖTV*) alone, compared with 158 from the French *Annales télégraphiques*: B. Kerl (ed.), *Repertorium der technischen Literatur, die Jahre 1854 bis einschliesslich 1868 umfassend* (2 vols., Leipzig, 1873), ii, pp. 452–77.

[85] Werner to Wilhelm, 3 Jan. 1861, in Matschoß, *Werner Siemens*, i, p. 172.

[86] Ibid.

[87] Werner to Wilhelm, 29 Feb. 1864, in Matschoß, *Werner Siemens*, i, p. 223.

[88] Werner to Wilhelm, 29 Sept. 1858, in Matschoß, *Werner Siemens*, i., p. 137; Werner to Wilhelm, 21 Sept. 1858, in Matschoß, *Werner Siemens*, i, pp. 136–7.

[89] Werner to Carl, 4 Nov. 1863, in Matschoß, *Werner Siemens*, i, p. 218.

[90] W. Feldenkirchen, *Werner Siemens: Inventor and International Entrepreneur*, ed. K. A. Kerr and M. G. Blackford (Columbus, 1994), pp. 76–83; J. Kocka, 'Unternehmensverwaltung und Angestelltenschaft am Beispiel Siemens 1847–1914: zum Verhältnis von Kapitalismus und Bürokratie in der deutschen Industrialisierung' (Stuttgart, 1969), pp. 117–20.

telecommunications.[91] Although Siemens would later initiate large-scale submarine cable projects, this company was in fact constituted to build a landline across Europe and the Middle East, which could compete with Britain's submarine connections to India. Like other large-scale projects, the Indo-European line depended upon modern means of financing, and despite Siemens's attempt to reach an agreement with private bankers, including the Rothschilds, he soon realized that the only viable option was to create a public limited liability company.[92] At this stage, he even reluctantly considered converting not only the Indo-European Telegraph Company but the entire Siemens enterprise into a publicly listed company—a decision not ultimately made until 1890.[93]

The Indo-European telegraph project highlighted the political and economic complexity of an international construction project. Siemens's landline was to pass through a number of countries on its way from London to Calcutta and required concessions from multiple states—unlike many of the British submarine cables, it could not pass through a succession of imperial possessions. Yet Siemens also insisted that the line should have 'an international character, independent of local governments', and should be managed by a single administration. This freedom from regional influences, he believed, was needed to ensure the 'the capitalists'' peace of mind.[94] Siemens's first foray into the global telegraph industry thus gave international renown to his firm, but it also underscored the awkward position which German businesses occupied in an increasingly imperial world, and which modern, multinational corporations had to negotiate, caught in a nexus of governments, investors, and entrepreneurs.[95]

5.3 The Telegraphic Sphere

5.3.1 Finance, News, and Government

As the extent and capacity of telegraph networks expanded, they tightened the connections between finance, politics, and news distribution. The cost of telegrams decreased as transmission speeds increased, allowing individuals to send longer messages from a growing range of locations, and newspapers to accompany the stock listings they distributed with news on the latest domestic and international political developments. The privilege of what seemed like 'instant'

[91] Feldenkirchen, *Werner Siemens*, p. 93.
[92] Werner to Carl, 5 Apr. 1867, in Matschoß, *Werner Siemens*, i, p. 266; Werner to Wilhelm, 12 May 1867, in Matschoß, *Werner Siemens*, i, p. 270.
[93] Werner to Carl, 16 July 1867, in Matschoß, *Werner Siemens* , i, p. 273; Feldenkirchen, *Werner Siemens*, p. 154.
[94] Werner to Wilhelm, 9 Mar. 1867, in Matschoß, *Werner Siemens*, i, p. 265.
[95] As discussed by Simone Müller in *Wiring the World*.

notification, formerly the preserve of diplomatic circles, was extended to the broader public, whose appetite for news grew in light of the major geopolitical conflagrations of the decade, from the American Civil War to the German wars of unification. The synchronization of economics and politics presented new opportunities and challenges for the actors involved.

The 1860s witnessed the expansion and streamlining of the German capital market. The process of monetary unification which had taken place in northern and southern Germany in the first half of the nineteenth century was given renewed impetus with the adoption of a conventional currency for the region in 1858.[96] The growing need for investment in industry across the region, meanwhile, further stimulated the proliferation of stock exchanges which had begun in the 1850s—the Stuttgart *Börse* was established in 1860, for instance—and shifted the balance of influence between them.[97] Through communications networks, a city like Munich, which had never constituted a major trading centre, overtook Augsburg and Nuremberg as a financial hub.[98] The Berlin stock exchange was connected to the telegraph network in 1863 and, following Prussia's victory over Austria in 1866 and its incorporation of Frankfurt, began its rise to financial dominance. The tempo and range of capital circulation across Germany were amplified, fuelling public participation in the flurry of joint-stock company creations during the period.

The public's demand for 'instant' updates on politics and economics, and the increasingly rapid diffusion of information, increased the volatility of markets and of public opinion, posing a challenge to governments and businesses. While stock exchanges were increasingly provided with their own direct telegraphic connections, the beating hearts of the network were in many ways the telegraphic news agencies pumping news to businessmen, officials, and newspapers across Germany. These agencies, too, however, were beginning to struggle under the pressures of public demand, as the costs of sourcing greater volumes of information from across Europe and beyond began to soar. They were to find an ally in governments increasingly concerned about the impact of telegraphic news upon the stability of politics and the economy.

The most radical rapprochement took place in Austria where, on 1 January 1860, Joseph Tuvora's nominally private, but government-influenced, *Oesterreichische Korrespondenz* was turned into the world's first formal state news agency, the *K. K. Telegraphen-Korrespondenz-Büro*.[99] Though extreme in form, this alliance was characteristic of the deepening ties between the state and

[96] T. Pierenkemper and R. Tilly, *The German Economy during the Nineteenth Century* (Oxford, 2004), pp. 34–8.

[97] R. Michie, *The Global Securities Market: A History* (Oxford, 2006), p. 96.

[98] R. Gömmel, 'Der Aufstieg zum führenden bayerischen Finanzplatz (1860er Jahre bis 1914)', in *Geschichte des Finanzplatzes München*, ed. H. Pohl (Munich, 2014), pp. 91–140.

[99] Dörfler and Pensold, *Die Macht der Nachricht*, p. 141.

the 'fourth estate' across Europe. In France too, for instance, an agreement was reached between the government and Havas, guaranteeing the latter's cooperation in exchange for the exclusion of competing agencies.[100]

Funding was at the heart of the matter, and such alliances were mutually beneficial. The smaller agencies established in the 1850s suffered under the strain of growing demand, and even the giants of the industry needed a cash injection. In 1865, for instance, as the laying of a new transatlantic cable was underway, Reuters was reconstituted as a joint-stock company (renamed Reuter's Telegram Company), providing funds which enabled it to dominate the distribution of American news in Europe.[101] Despite the professed independence of the press in Britain, from this point onwards Reuters benefited from privileged relations with the higher echelons of finance and government, becoming, in the words of one historian, a 'semi-official body', a 'national and imperial institution'.[102]

In response to this move, the director of Wolffs directly addressed the Prussian king, requesting support for the establishment of a similar company in Prussia. The king's response was clear: 'I cannot but grant you my full recognition for your plan to give your telegraphic institute, as a joint-stock company, the same expansion which an English joint-stock company is currently in the process of achieving, and would be very glad if proven patriotic men of finance, such as Messrs. von Oppenfeld, von magnus, Bleichröder, might unite with you in the businesses in question. It seems very important to me, and necessary, that a similar institute be established in Prussia, in order to be able to counter the English one.'[103] As a result of this encouragement, in 1865 Wolffs was reconstituted as a limited liability company (renamed the *Continental-Telegraphen-Compagnie [CTC]*), funded by the very bankers proposed by the king, and sealing here too an alliance between finance, government, and the state's primary news distributor.[104]

This alliance was to prove decisive for the future of news distribution across Germany. Indeed, while smaller German states lacked the means to support (and influence) their local agencies, Wolffs was able to meet the pressures of the modern age. During the 1860s, the constellation of more or less independent offices established across Germany was slowly reshaped into a network centred on Wolffs in Berlin. The agency came to control *Wagners Correspondenzbureau* in Frankfurt, the *Correspondenzbureau Hoffmann* in Munich, and Erwin Treiber's *Süddeutsches Correspondenzbureau* in Stuttgart. A branch of the

[100] A. Nalbach, '"The Ring Combination": Information, Power, and the World News Agency Cartel, 1856–1914' (PhD Dissertation, University of Chicago, 1999), p. 107.
[101] Nalbach, 'Ring Combination', p. 108.
[102] D. Read, *The Power of News: The History of Reuters* (Oxford, 1999), p. 67.
[103] GStA PK, I. HA Rep. 89, Nr. 29921, Wilhelm to Dr. Wolff, 4 Mar. 1865.
[104] D. Basse, *Wolffs Telegraphisches Bureau 1849 bis 1933: Agenturpublizistik zwischen Politik und Wirtschaft* (Munich, 1991), pp. 28–30.

agency was established in Breslau, and an agreement reached with *Bösmanns* in Bremen.[105] Not only did this development secure Wolffs's monopoly over news distribution across Germany, it also allowed the agency to bypass the multiple tariffs applied to telegraphic communication between the states of the Confederation, creating a more or less homogeneous 'national' telegraphic sphere. Through an agreement reached with the Austrian *Korrespondenz-Büro* in 1861, Central Europe was thereby divided between two regional monopolies.[106] Austrian newspapers came to rely on Wolffs (or the '*CTC*') for news emanating from western and northern Europe, while the *Korrespondenz-Büro* became the principal source of 'oriental news' for the emerging news cartel.

The Austro-Prussian War of 1866 temporarily damaged relations between the two news blocs, both Wolffs and the *K. K. Korrespondenz-Büro* supporting the interests of their home countries.[107] Crucially, however, it sealed the alliance between the Prussian government and its favoured agency. Wolffs had proven its patriotism during the war, and thereby won the Prussian government's support when, only a year later, Reuters initiated a campaign to infiltrate the German news market, threatening the agency's monopoly. Before the war, in 1865, the British-German entrepreneur Paul Reuter had reached an agreement with George V of Hanover, conceding the former rights for a submarine telegraph cable between England and the North Sea island of Norderney.[108] Following Hanover's incorporation into the North German Confederation in 1867, Reuter sought a guarantee of the validity of his prior agreement, and permission to establish a branch there, as well as in Frankfurt am Main. The move, it was believed, was intended 'to gain terrain in the West and the South of Germany'.[109]

'Attempts are constantly being renewed, either directly or through agents, to come to establishments in Germany, even to establish an office in Prussia,' the director of Wolffs complained in March 1867, asking that such attempts be rebuffed, and that the government's support for his agency be made public.[110] The minister of trade, von Itzenplitz, described his take on the matter to the king: '[Wolffs'] competition against the Reuter enterprise in London . . . is by its nature commercial, though it cannot be ignored that the ways in which this business is undertaken can contribute to political orientations, and that while the company here pursues government-friendly tendencies, the Reuter office in London at least until last year has been active in an anti-Prussian sense.'[111]

[105] F. Fuchs, *Telegraphische Nachrichtenbüros: Eine Untersuchung über die Probleme des internationalen Nachrichtenwesens* (Berlin, 1919).
[106] Dörfler and Pensold, *Die Macht der Nachricht*, pp. 146–50.
[107] Ibid., p. 170.
[108] Nalbach, 'Ring Combination', p. 117.
[109] GStA PK, I. HA Rep. 89, Nr. 29921, anonymous, copy of a note, 24 Feb. 1867.
[110] GStA PK, I. HA Rep. 89, Nr. 29921, T. Wimmel to HM, 23 Mar. 1867.
[111] GStA PK, I. HA Rep. 89, Nr. 29921, Itzenplitz to Wilhelm, 11 Apr. 1867.

The matter had become one of national interests, as Reuter's prior agreements with the deposed Hanoverian king linked him to agitation for the Guelph cause. Yet, as Itzenplitz emphasized, in purely legal terms there was nothing the government could do to prevent Reuter's expansion: 'any private individual and all other private enterprise is entitled to engage in the commercial collection and sale of news'.[112] The king's support for Wolffs was not therefore made public, but the threat from Reuters remained a source of concern. In addition to Hanover and Frankfurt, the British company employed a former official from the Prussian embassy in London to establish a subsidiary (*Filiale*) in Berlin itself, and then opened a new *Süddeutsches Korrespondenz Bureau* in Munich.[113] The aim, clearly, was to break its dependency upon Wolffs and source news from Germany for itself.

The Prussian government's concerns were fuelled by police intelligence which suggested that Reuter was being funded by the former King of Hanover himself, as well as other enemies of Prussia.[114] Over the course of the year, Reuters and the Prussian administration confronted one another with a string of legal loopholes, identifying the various means by which the agency might be allowed or forbidden to establish itself in northern Germany.[115] In a counter-attack, meanwhile, Bismarck's investigator Wilhelm Stieber was sent to London in the attempt to found a branch of Wolffs to counter Hanoverian propaganda.[116] The competition extended beyond Germany, as Reuters and Wolffs fought for control over Scandinavia. Despite the British agency's best efforts to thwart the alliance, Wolffs was able to maintain a close relationship with the Danish agency Ritzau, encouraging the company to open offices in Sweden and Norway too.[117]

In 1868, the directors of Wolffs once again turned to the government, complaining of Reuter's efforts to establish subsidiaries across Germany and Scandinavia. It emphasized the benefits to the government of possessing an ally against the 'political parties', and suggested that, if Reuters could not legally be prevented from operating in Germany, the loyal Prussian institute at the very least obtain preferential treatment. At this point, Bismarck himself intervened, emphasizing the importance of controlling the source of news distribution:

> One cannot ignore the fact that, particularly in times of war, as well as during domestic political struggles, the government could face great dangers if political news with hostile intentions, either entirely false, or tendentious, is distributed too quickly. Correcting or denying after the event cannot erase the first

[112] Ibid. [113] GStA PK, I. HA Rep. 89, Nr. 29921, Eulenburg to Wilhelm, 5 Sept. 1867.
[114] GStA PK, I. HA Rep. 89, Nr. 29921, Undated (September), note from an 'Agent'.
[115] While it was possible to refuse Reuter's agent permission to establish a subsidiary on the grounds that it constituted a foreign '*Gewerbebetrieb*', for instance, the government was at a loss when the agent—a Prussian subject—sought to establish his own, nominally independent, telegraph agency.
[116] Nalbach, 'Ring Combination', pp. 129–30.
[117] Fuchs, *Telegraphische Nachrichtenbüros*, p. 84.

> impression created by the news. It is therefore important for the government to strictly monitor, or even entirely to suppress, false Bureaux. A danger which must not be underestimated is the impact of political and stock market telegrams from such agencies on the business world, particularly on the state of the stock exchange, even when this news is not directly related to the policies of the government. False information regarding the death of a monarch, a change in ministry, a business' bankruptcy . . . can ruin many people, make some rich, others poor.[118]

In the absence of a state telegraphic news agency such as that in Austria, Bismarck proposed an agreement which was adopted in February 1868. By the terms of this arrangement, Wolffs telegrams were given a privileged status, in exchange for which they would always pass first through the hands of government officials.[119] The conflict between Reuters and Wolffs continued for another year, exacerbated when Havas too joined the contest for Central Europe, playing the Prussian agency off against the Austrian *Korrespondenz-Bureau*.[120] For a while, the latter chose to obtain news from the Reuters subsidiary in Berlin, though this proved of poor quality. When Reuter's agent in Berlin spread news over the worsening situation between Belgium and France, contradicting the Prussian ambassador's own sources, Bismarck believed that both Havas and the British agency were being manipulated by Napoleon III.[121]

Given the evident importance of controlling Wolffs, when Reuter threatened to buy the Prussian agency in 1869, a formal contract was established with the government. The terms were, once again, mutually beneficial. On the one hand, the government provided financial and logistical support for Wolffs' operations, ensuring its economic viability and priority in the transmissions of its messages. On the other hand, the agency agreed to submit all political telegrams to the ministry for approval before distribution, and as reports on the company suggested, the agreement gave the government access to Wolffs' forty-seven permanent correspondents in the North German Confederation, as well as to the sixty-one 'most read' newspapers which subscribed to its services.[122]

The 1869 treaty put an end to Reuter's 'invasion' plans, strengthening both Wolffs' and thereby the Prussian government's hold over the circulation of news across Germany and beyond. When the Prussian ambassador in Stuttgart emphasized the need for a publicist to act on their behalf in Württemberg, for

[118] GStA PK, I. HA Rep. 89, Nr. 29921, Bismarck to Wilhelm, 10 Feb. 1868.

[119] The policy's implementation is referred to a few years later by Colonel Meydam: GStA PK, I. HA Rep. 89, Nr. 29921, Meydam to Geheimer Cabinetsrath Wilmonski (?), 21 July 1873.

[120] Nalbach, 'Ring Combination', p. 145.

[121] E. Naujoks, 'Bismarck und das Wolffsche Telegraphenbüro', *Geschichte als Wissenschaft und Unterricht*, vol. 14 (1963), pp. 605–16.

[122] GStA PK I. HA Rep. 77, Min. Inn., Tit. 845, Nr. 51, Bd. 1, 'Abschricht des Vertrags', 10 June 1869.

instance, he specifically proposed that a subsidiary of Wolffs be established there.[123] At an international level, meanwhile, a cartel treaty signed between Reuters, Havas, and Wolffs in January 1870, later joined by the USA's Associated Press, created a new global oligopoly in the news industry. The treaty recognized each company's sphere of influence, with Wolffs maintaining its hold over news from and to Germany, Scandinavia, St Petersburg, and Moscow. Reuters, meanwhile, wound up its operations in Central Europe. Tellingly, Austria's *Korrespondenz-Bureau*, as a state-owned agency, was reduced to primarily national significance.[124]

By 1870, the powers that would come to dominate the 'age of empires'—Britain, France, Germany, and the United States—were buttressed by their respective 'national' news agencies. Telegraphic news, it seemed, would constitute an additional dimension in the diffusion of Western European influence across the globe. But the businesses engaged in the international circulation of information could not forever be bound to national economic interests, driven as they were by a competitive and connected market for news. The relationship between Wolffs and the Prussian government, as will be shown in Chapter 6, would soon come under pressure from the multidirectional forces of globalization.

5.3.2 Public Opinion

'What an extraordinary influence the telegraph agencies thus possess!' the historian Heinrich Wuttke wrote in 1866. 'They have the means of directing public opinion before it even obtains knowledge of things. They are able to exert pressure on the entire exchange of thoughts among a population. If they take a party—and that they have taken sides is not to be doubted—how much damage they may then cause!'[125] Wuttke was a particularly ardent critic of the influence of finance and state authorities on the press, but his concerns were shared by many of those in direct contact with news agencies. The *K. K. Korrespondenz-Bureau*, as an official mouthpiece of the Austrian government, was predictably viewed with great suspicion by the German press.[126] But reactions were similar even where state influence was more subtle. For despite the general relaxation of press regulations across Germany during the 1860s, as the case of Wolffs suggested, governments were finding new ways of gaining indirect influence over public opinion by controlling the news at its source.[127]

[123] GStA III MauswA II Nr. 8117, Rosenberg to Bismarck, 14 Oct. 1869.
[124] Nalbach, 'Ring Combination', p. 155; Dörfler and Pensold, *Die Macht der Nachricht*, p. 191.
[125] H. Wuttke, *Die deutschen Zeitschriften und die Entstehung der öffentlichen Meinung: Ein Beitrag zur Geschichte des Zeitungswesens* (Hamburg, 1866), p. 138.
[126] Dörfler and Pensold, *Die Macht der Nachricht*, pp. 143, 146.
[127] Green, *Fatherlands*, pp. 148–88; K. Koszyk, *Deutsche Presse im 19. Jahrhundert* (2 vols., Berlin, 1966), ii, pp. 229–50.

As a result, Reuters' efforts to establish itself on German territory, it seems, was welcomed in some quarters. Indeed, the British agency's hold was particularly strong in the mercantile city states with long traditions of independence, such as Frankfurt am Main and Hamburg.[128] The latter, of course, also had strong commercial ties to England, where Reuters was based, and even after the conclusion of the 1870 cartel agreement the company was allowed to maintain its office in the Hanseatic city state. When the Prussian government forcibly shut the Reuters subsidiary in Frankfurt, meanwhile, the local *Handelskammer* wrote to complain of its negative impact upon trade.[129] In both cases, reactions to Wolffs' growing monopoly were coloured by local resentment towards Prussia's expansion.

Given the deepening ties between politics and economics, editors were well aware of the impact which the news they received could have upon commercial activities. In 1867, when a debate emerged over Prussia's decision to close the casinos in recently annexed Homburg and Wiesbaden, *Kladderadatsch* used the opportunity to denounce the government's attempts to control everyday life. Drawing a comparison between gambling in casinos and risk-taking at the stock exchange, the satirical newspaper pointed out 'that stock market games do not depend upon chance, rather upon Wolff in Berlin and Havas in Paris, which, for their telegraphic news, receive word from a higher providence, just as it can be calculated that the ball in a game of roulette is heavier'. After all, the author joked, '[a] good government must eliminate all instances which might endanger a person's life . . . '.[130]

Both the politicization and the monopolization of news distribution posed a challenge to the industry as a whole. Heinrich Wuttke's remark was part of a broader analysis of the German press, in which he denounced many of the practices that were hindering the emergence of a truly free public sphere, from the 'officious' newspapers to the official press offices which ensured that the government's opinions were duly reflected in newspapers. Despite Bismarck's insistence that his influence was strictly limited to the official *Staatsanzeiger*, Wuttke pointed to the 'melodic chorus [which] emerged from the forest of newspapers: who couldn't know that a hidden conductor was beating the rhythm . . . [?]'.[131]

Telegraphic news agencies, Wuttke believed, were equally nefarious to the public sphere. Reuters was a 'cosmopolitan business, a great power', while Havas was entirely dependent upon the French government. 'It is very important to know of this relationship,' he wrote, 'as most news regarding Spain and Italy come to us first through French telegrams.'[132] As for Wolffs, Wuttke highlighted

[128] Nalbach, 'Ring Combination', pp. 129–30.
[129] GStA PK, I. HA Rep. 120 B II 1, Nr. 74, Eulenburg to Itzenplitz, 20 Dec. 1867.
[130] *Kladderadatsch*, 25 Aug. 1867.
[131] Wuttke, *Die deutschen Zeitschriften*, p. 102.
[132] Ibid., pp. 126–7.

the fact that its founder was 'former assistant in the Berlin press office' who had consistently been 'careful in party matters'. The newly established *Continental Telegraphen-Compagnie*, he warned, and just like its British and French counterparts, was 'aiming for monopolization'. Of the three agencies together, he noted that, '[b]efore the world they work beside one another, but there is a secret agreement between them'. In theory, each agency was alone responsible for delivering telegrams within its respective country: 'this is indeed how it happens, but it only happens thus before the world, because of the world, so that it believes in the independence of the businesses'. In fact, as he suggested, every message transmitted by one of these agencies had been checked by the cartel as a whole.[133]

As we have seen, Wuttke's accusations were not unfounded. Wilhelm Stieber, Bismarck's ruthless police director, himself considered the restructuring of Wolffs in 1865 to have marked the beginning of state influence over daily news.[134] How did the public think that these agencies obtained important information so quickly, the historian asked. 'Whisperings from the ministries—one need not state it explicitly—are never obtained without dependency.' As such whisperings were then distributed to the agency's subscribers across the country, the result was a predictably monotonous chorus of political discourse. Defending the good intentions of many editors, Wuttke pointed out that these were often reluctant to subject themselves to this system, but were driven by the reading public's insatiable appetite for telegrams.[135] And '[t]us', he concluded, 'state telegraphy threatens to become a shackle on intellectual intercourse'.[136]

The influence of this new technology upon the press became the subject of discussions at the *Journalistentage* which, beginning in 1863, sought to establish a structure for the emerging profession of journalism. The association included a number of liberal writers and publishers such as Karl Biedermann, Ernst Brockhaus, Max Wirth, and Leopold Sonnemann, and although, as Jörg Requate has shown, the association remained limited in scope and political influence during this period, it contributed to the elaboration of a new self-understanding among journalists regarding their role in society.[137] By the early 1870s, government efforts to establish a fully fledged state telegraphic news agency would evoke vigorous criticism from this group, but at the first official *Journalistentag* in Eisenach, its attention turned to the ways in which the speed of telegraphic communication was altering the very meaning of news and the concept of authorship.

[133] Ibid., p. 130. [134] Nalbach, 'Ring Combination', p. 112.
[135] Wuttke, *Die deutschen Zeitschriften*, p. 132. [136] Ibid., p. 136.
[137] J. Requate, *Journalismus als Beruf: Entstehung und Entwicklung des Journalistenberufs im 19. Jahrhundert: Deutschland im internationalen Vergleich* (Göttingen, 1995), pp. 222–9; J. Retallack, 'From Pariah to Professional? The Journalist in German Society and Politics, from the Late Enlightenment to the Rise of Hitler', *German Studies Review*, vol. 16, no. 2 (May 1993), pp. 175–223.

Discussions came to focus on the 'reproduction' (*Nachdruck*) of information in newspapers and journals, for which a new law was being drafted by the Confederation. The proposed legislation would allow any newspaper to reproduce information found in another publication, so long as the original source was clearly stated. The rule was to apply to any material, whether editorials, simple reports, or telegrams. In the first two cases, Dr Braunfels explained, this law was justified—newspapers, after all, needed to extract information from a variety of sources. Telegrams were another matter. 'It is in the public's greatest interest', he explained, 'always to receive important news as fast as possible, that is to say, by telegraph. Newspapers could not could cover the costs of this if there were no telegraph agencies; the public therefore has the greatest interest in their existence.'[138] The press, in other words, shared the cost of obtaining information by subscribing to updates from telegraphic agencies, a system which would be undermined if an editor could simply wait until important dispatches had been printed in a local newspaper and reproduce them immediately.

The lively debate which followed highlighted the ways in which the speed of telegraphic communication altered the concept of 'news' itself. Braunfels, for instance, proposed that a twenty-four-hour embargo on the reproduction of telegrams be imposed, preserving the value of their timeliness. In Britain, it was pointed out, *The Times* imposed such a restriction, though it was limited to twelve hours.[139] At what point was news no longer new? It was also objected that smaller newspapers, whose publication was crucial to developing an informed public in the provinces, often could not afford the subscription costs. In the end, the *Journalistentag* proposed an amendment to the proposed legislation which allowed each publication to decide whether or not it would allow the reproduction of its content.[140]

Though not evoked at this meeting, the matter at hand also had political implications. While newspapers depended upon reliable and rapid updates on events and economic fluctuations to cater to the public's demands and preserve a loyal readership, the concentration of telegraphic news distribution in the hands of Wolffs made them dependent upon the agency and therefore the government's goodwill. In 1870, for instance, the *Landdrost* of Hildesheim used the bribe of priority transmissions from Wolffs to gain the allegiance of a local National Liberal newspaper to the government. The decision was supported by Interior Minister Friedrich zu Eulenburg, who agreed to make the transmissions free of charge.[141] In the race for time, the advantage of speed threatened to become a factor of political opinion.

The importance of the connection between the telegraph and the press had broader public resonance. It is no surprise, for instance, that Johann Strauss the

[138] K. Biedermann, *Bericht über den ersten Deutschen Journalistentag, gehalten zu Eisenach am 22. Mai 1864* (Leipzig, 1864), pp. 19–22.
[139] Ibid., pp. 22–3. [140] Ibid., p. 23.
[141] GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Draft reply Eulenburg to Landdrost Hildesheim 13 Apr. 1870.

Younger dedicated a series of waltzes composed in 1867 and entitled '*Telegramme*' to the Viennese association of authors and journalists, Concordia.[142] The editors of *Kladderadatsch*, meanwhile, closely watched the involvement of the authorities in the distribution of news. Caricaturing conservative perceptions of the influence of news on the course of politics, the paper announced that the 'true causes of our disputes' were: 'The Press; for it didn't print everything straight away, nobody would find out about it; the evil men at the Dönhofsplatz; for if they didn't uncover all that is rotten in the state, nobody would worry about it; the Telegraph; for if it didn't always spill the beans on everything straight away—that would be nice!' (see Figure 5.2).[143] The technology, it seemed, had upset the harmony of a political system based on the state's power to regulate the circulation of information, and its efforts to regain control became the object of satire.

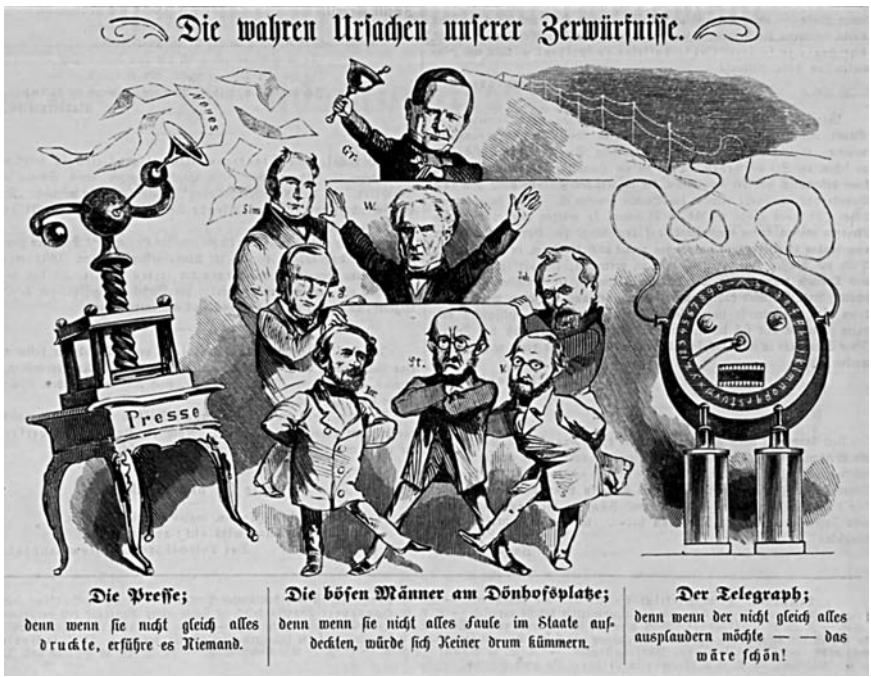

Figure 5.2 'The true causes of our disputes.' 'The Press; for if it didn't print everything straight away, nobody would find out about it. The evil men at the Dönhofsplatz; for if they didn't reveal that which is rotten in the state, nobody would worry it. The Telegraph; for if it didn't always spill the beans on everything straight away—that would be nice!'. *Kladderadatsch*, 15 Mar. 1863. Universitätsbibliothek Heidelberg, https://digi.ub.uni-heidelberg.de/diglit/kla1863/0048, CC-BY-SA 3.0.

[142] A. Bonea, 'Telegraphs, Electromagnetic Polkas and the Vienna New Year's Day Concert', 9 Jan. 2015 (accessed 11 Dec. 2018, at https://diseasesofmodernlife.org/2015/01/09/telegraphs-electromagnetic-polkas-and-the-vienna-new-years-day-concert/)..

[143] *Kladderadatsch*, 15 Mar. 1863.

Another satirical piece, 'particularly suited to be printed in small conservative provincial papers', asserted that the speed of communication was incomprehensible, and '[t]hat is why all telegraphic dispatches must be corrected and properly rewritten by entirely reliable civil servants'.[144]

5.4 Administering Time and Space

In 1867, the Bavarian director of transport and communication Heinrich Gumbart compiled a range of statistics on the volume of traffic on the state's telegraph network, in preparation for a bill on the expansion of the service. The volume of correspondence, it revealed, fluctuated at different times and in different places. In international traffic, for instance, the number of telegrams sent from Bavaria was at its lowest between December and February (around 6,500 per month), but it could reach as high as 11,000 per month in the periods March to June and August to October. These variations in the volume of traffic had a marked impact on the speed of transmission: whereas a telegram from Munich to Berlin would take an average of 81 minutes in January, this increased to 186 minutes in September.[145]

Similar variations occurred on a daily basis at the central office in Munich. Telegrams began to trickle in for transmission around 7 a.m., the greatest number being handed over between 11 a.m. and 12 p.m., during which an average of 110 to 120 telegrams were handled, declining to around 24 at midnight, then a few more, before dying out completely at 4 a.m.[146] These changing rhythms of traffic across each year, month, and day, moreover, were geographically variable. There were natural 'hubs' of activity, between which traffic was most intense, and smaller localities which would produce only infrequent and low-intensity exchanges. Telegraphic traffic, administrators could now observe, varied from place to place and from hour to hour—it had a life cycle of its own.

In order to deal with the growing demand for telegraph offices throughout the state, therefore, the Bavarian director of communications and Minister-President von Schlör began to refer to the 'organic structure of the network'.[147] Connecting every town and village in the state involved distinguishing between more or less heavily 'trafficked' lines, in order to avoid causing delays. Central channels connecting the important hubs of communication would be crossed by 'transversal' lines; smaller channels would link second-tier towns to those hubs; and

[144] *Kladderadatsch*, 24 May 1863.

[145] To Paris, the figures were 137 minutes and 354 minutes, respectively: BHStA, MH 16799, Gumbart, 'Bericht, Erweiterung des bayerischen Telegraphen-Netzes betr.', Beilage VI, 15 Apr. 1867.

[146] BHStA, MH 16799, Gumbart, 'Bericht, Erweiterung des bayerischen Telegraphen-Netzes betr.', Beilage VII.

[147] Ibid.

'individual blood vessels' would in turn connect those towns to the smallest localities.[148]

Eventually, every town and village could thus potentially be contacted by telegraph. Every organ in the telegraphic body, so to speak, was connected to the vital flow of information circulating within it. But those places making only infrequent use of the service were not to be placed along the 'arteries' between major towns, as to do so would excessively 'populate' the line and limit its capacity, or bandwidth.[149] These smaller localities needed fewer lines and wires to provide them with an adequate service. Some channels would experience a continuously amplified volume of traffic, while others would receive less traffic, less often.

The nervous metaphor used by Karl Knies in 1857 to describe a national network had thus given way to an imagery of blood circulation and fluctuation. The analogy remained within the field of bodily metaphors which cut across science, politics, and culture during the nineteenth century, of course, but the shift was significant.[150] Knies's analogy had implied that all parts of the network could receive, or 'feel', as well as send impulses simultaneously—a single stimulus would activate each and every nerve ending. The circulatory metaphor, on the other hand, accounted for the rhythmical and spatially variegated flow of information. It required the coordination, rather than mere connection, of heavily 'trafficked' arteries with the lesser veins of the telegraphic body. It is interesting to note, in this regard, that Hermann Helmholtz had succeeded in measuring the speed of nervous impulses in the 1850s, identifying a time lag between the moment a nerve was stimulated and its effect upon a given organ.[151] In the body, as in society, instantaneity was proving elusive, and communication was subject to the material limitations of its medium.[152]

Time provided the necessary framework within which to manage these rhythms of communication, to synchronize the traffic flowing at different rates through the larger and smaller channels of the network. As early as 1854, the regulations of the *DÖTV* had specified that the clocks of all telegraph offices under one and the same government were to be set to the standard time of its capital

[148] Ibid.

[149] BHStA, MH 16799, Gumbart, 'Erinnrung zum Vortrag des Abgeordneten Stauffenberg', 29 Feb. 1868.

[150] D. Lindenfeld, *The Practical Imagination: The German Sciences of State in the Nineteenth Century* (Chicago, 1997), pp. 176–80.

[151] K. M. Olesko and F. L. Holmes, 'Experiment, Quantification and Discovery: Helmholtz's Early Physiological Researches, 1843–50', in *Hermann von Helmholtz and the Foundations of Nineteenth-Century Science*, ed. D. Cahan (Berkeley, 1993), pp. 50–108. L. Otis, *Networking: Communicating with Bodies and Machines in the Nineteenth Century* (Ann Arbor, 2001), pp. 11–48.

[152] A. Friedrich, 'Metaphorical Anastomoses. The Concept of "Network" and its Origins in the Nineteenth Century', in B. Neumann and A. Nünning (eds.), *Traveling Concepts for the Study of Culture* (Berlin, 2012), pp. 119–43.

city.[153] Within each German state, telegraph offices, the railway stations with which they were often associated, and the connections between them now constituted homogeneous time zones which were distinct from the surrounding environment. The clock in the telegraph office in Fürth, for instance, was set to Munich time every morning, but differed from those in the city by a few minutes.[154] In Augsburg, the town clocks 'very often' differed from the standard clock in the telegraph office and the railway station by five to ten minutes.[155]

Within the space of the network itself, on the other hand, a single 'standard time-orientation', or frame of reference, prevailed.[156] In each state, at any given moment the clocks in every telegraph office showed the same time, allowing individuals to plan their exchanges—and measure delays—with greater precision. This was of particular significance, of course, for the businessmen executing transactions by telegraph and keeping up with the fluctuations of the market, which required that news be sent and received within specific time frames. The Munich *Handelsverein*, for instance, insisted that it receive telegrams from Vienna in time for the '*Börse*' which it held between 10 and 11 a.m. and 5.30 and 6.30 p.m.[157] The *Filialbank* in Bamberg, on the other hand, complained that stock prices from Frankfurt were arriving after 8 p.m., too late to process any purchases or sales at the stock exchange.[158]

Telegraphy thus fostered a culture of timeliness in certain circles, but it also highlighted the position which individuals or localities occupied in the overall network, placing certain districts ahead of others. The small but industrializing town of Neumarkt in northern Bavaria, for example, complained that it 'must often fight for hours to send . . . a telegram' through much larger Regensburg and Nuremberg.[159] Even these larger centres were not permanently accessible, as telegraphists in Frankfurt discovered on one occasion, when 'during the whole night, Nuremberg wouldn't listen . . . and it was impossible even for the offices of Bamberg and Munich to wake Nuremberg up'.[160] In Bremen, where the rhythms of maritime trade defied diurnal cycles, an alarm was installed in the telegraphist's

[153] *Zeitschrift des Deutsch-Österreichischen Telegraphen-Vereins*, 1 (1854), p. 5; on the multi-layered process of time standardization and its effects, see O. Zimmer, 'One Clock Fits All? Time and Imagined Communities in Nineteenth-Century Germany', *Central European History*, vol. 53, 1 (Mar. 2020), pp. 48–70.

[154] BHStA, GDVA 674, Telegraphen-Station Fürth to Telegraphenamt, 23 Dec. 1856.

[155] BHStA, GDVA 674, Telegraphen-Station Augsburg to Telegraphenamt, 26 Jan. 1860.

[156] E. Zerubavel, 'Timetables and Scheduling: On the Social Organization of Time', *Sociological Inquiry*, vol. 46, no. 2 (1976), p. 88.

[157] BHStA, GDVA 676, Vorstandschaft des Münchener Handelsvereines to Telegraphenamt, 29 Apr. 1869.

[158] BHStA, GDVA 676, Königl. Filial Bank Bamberg to Telegraphenamt Bamberg, 21 July 1869.

[159] BHStA, GDVA 676, Telegraphen-Station Neumarkt to Telegraphenamt, 3 Oct. 1869.

[160] BHStA, GDVA 674, TelegraphenStation Frankfurt am Main to Telegraphenamt, 7 Nov. 1861.

bedroom to ensure that he could receive news of ships or other telegrams arriving from Bremerhaven during the night.[161]

Office opening hours determined the level of access to the network available in each location, and by 1858 three categories of service existed, roughly similar in all German states. Offices with 'full daytime service' (*voller Tagesdienst*) were open from 7 or 8 a.m. until 9 p.m., depending on the season. Others had a 'limited daytime service' (*beschränkter Tagesdienst*) of 9 a.m. to 12 p.m. and 2 p.m. to 7 p.m. on weekdays, and some were able to send and receive telegrams on a twenty-four-hour basis.[162] The distinction between larger arteries and small 'blood vessels' of the network was thus reinforced by a new hierarchy between those with more or less time on the network.

Office opening hours thus became a new measure of a town's importance. Bremen, for example, with 60,000 inhabitants and a thriving trade-based economy, was jealous of its status as a commercial hub. Yet its telegraph office closed every day at 9 p.m., while those in Hamburg, Hanover, and Emden offered a night-time service. 'Given the mercantile significance of Bremen', the local *Handelskammer* complained, and given that it was the second most important source of telegraphic traffic for Hanover, it too should obtain such a service. Failing that, an extension of opening hours to 10 p.m., at the very least.[163] At a time when Bremen's emerging manufacturing sector was beginning to turn the merchant community's attention away from overseas trade, the telegraph provided a crucial connection to the German market.[164]

In Straubing, meanwhile, a small town of roughly 12,000 inhabitants situated in Bavaria's agricultural heartland, the 'limited daytime service' which had been 'accepted as sufficient' in the 1850s no longer seemed adequate a decade later.[165] 'As useful as the telegraph is to the public,' a petition from Straubing stated in 1860, 'it is only such insofar as it is continuously [in large towns, both day and night] at the disposal of the public.'[166] Straubing was dependent upon its trade in cereals, and according to the *Handelsrat* it could by now be assumed that merchants in grain and other agricultural produce were the most frequent users of the telegraph. As things stood, the town's weekly market opened on Saturdays at 8 a.m., but the first telegrams came in no earlier than 9.30, and sometimes later.

[161] StAB, 2-R.15.b.1, Commission des Senats für die Häfen to Telegraphenamt Bremerhaven, 30 Nov. 1859.

[162] *Dienstanweisung für die telegraphische Correspondenz auf den Linien des Deutsch-Österreichischen Telegraphen-Vereins* (1858), pp. 2–3.

[163] StAB, 2-R.15.b.3, S.L. Riechter, Namens der HK an den Senat, 21 Mar. 1865.

[164] L. Maischak, *German Merchants in the Nineteenth-Century Atlantic* (Cambridge, 2013), pp. 197–220.

[165] BHStA, GDVA 440, Handelsrat Straubing to Telegraphenamt', 25 Nov. 1860; Stadtarchiv Wuppertal, Q II 15, 'Von Eynern to Bürgermeister Bredt', 28 Mar. 1856.

[166] BHStA, GDVA 440, 'Gesuch um Einrichtung des vollen Tagdienstes bei der Station Straubing', 23 Nov. 1860. On 13 December, full daytime service was granted by the Telegraphenamt: BHStA GDVA 440, Brück to Telegraphenamt, 13 Dec. 1860.

By that time, goods had been bought, as most transactions were conducted within the first couple of hours of business. If one then wished to telegraph the results of the trade to Munich or Lindau, this could not be done until the office was free around 11.30, by which time those places had no interest in the matter. If one then sought to sell on some of the purchased products, a suitable offer might be received by 7 p.m., but by this stage it could not be received, as the office was shut until 2 p.m. the next day (a Sunday).[167]

The petition demonstrates the extent to which the telegraph could help or hinder the integration of local trade in agricultural produce into statewide exchanges. Not only merchants but also agriculturalists became dependent upon prices which reflected the state of supply and demand on increasingly distant markets. In the case of Straubing, decisions were being made based upon demand over 300 kilometres away in Lindau, on Lake Constance. Changes in these conditions, moreover, and the price fluctuations they caused could take place in ever shorter time frames. The petition in Straubing was signed by five men, who insisted that this was not merely 'the interest of an individual, but of the whole town'.[168] The town's principal commercial activity was no longer part of a local economic equilibrium but dependent upon a wider network of exchanges.

Much like the Internet today, while the telegraph had accelerated exchanges across Germany, supporting the development of integrated markets for securities, agricultural produce, and even goods shipped from abroad, it had also created a new temporal map which distinguished between zones of higher- or lower-speed communication. As the network spread its tentacles, reaching ever growing numbers of towns and villages, time became a new measure of the position which they occupied within the telegraphic body and of their changing socio-economic status.

* * *

At a local level, meanwhile, telegraph offices constituted an interface between the space of digital communication and the surrounding environment. It was here that the electric impulses transmitted through the wires of the network were converted into handwritten—later printed—form, to be collected or delivered by hand to their addressees. To the technical and logistical constraints of the telegraph itself, therefore, were added the vagaries of human behaviour. The process of transporting messages to and from telegraph offices, in particular, reintroduced a unit of time, or delay, in the chain of communication, which often served to highlight the configuration of local space and the social groups which it favoured.

Service regulations across Germany consistently upheld the objective of providing fast, uninterrupted communication. Upon a telegram's arrival and

[167] BHStA, GDVA 440, 'Gesuch um Einrichtung des vollen Tagdienstes bei der Station Straubing', 23 Nov. 1860.
[168] Ibid.

registration at an office, messengers were to 'carry [it] along with the proof of receipt, directly [*ohne Aufenthalt*] to the home, place of business of the addressee, or to the post'.[169] The receipt, registration, and delivery of telegrams was to take place 'immediately', a measure which could only be bypassed if 'the recipient has produced a written declaration, stating they will only receive telegrams at a specific time'.[170]

In practice, however, the time required to deliver a telegram depended, among other things, upon the distance between a telegraph office and the addressee's home or workplace. The perceived burden of this distance was subjective, of course, and as one official put it, '[T]he more distances of hundreds of miles disappear, the more thoughts and events are carried with the speed of lightning from one end of Europe to another, the more disturbing and sensitive the smaller distances in between will be which must be covered in order to reach the winged means of communication.'[171]

By the 1860s, the location of each office had therefore become a matter of concern for the network's primary users. When the telegraph office in Augsburg was moved from the centre of town to the railway station outside the city walls, the editors of the *Allgemeine Zeitung*, representatives of the town's trading establishments, and *Regierungspräsident* Ernst Freiherr von Lerchenfeld complained.[172] It was now taking the office's two messengers an average of forty-five minutes to go from the railway station into town and back, Lerchenfeld explained, a delay which had almost caused him to miss the appointment with the king described at the beginning of this chapter.[173] Sending messages was just as tiresome, and if the weather was bad, others pointed out, they had to rent a hackney carriage to take them to the railway station.[174] Even the minister of the interior recognized the negative impact of this change upon the 'high circles of society'.[175]

From the administration's perspective, the office in Augsburg was generating too little income to justify employing additional messengers or establishing two offices. In keeping with regulations, it was pointed out, telegrams were still reaching the hands of their addressees sooner than they would by post.[176] But

[169] *Dienstanweisung für die telegraphische Correspondenz auf den Linien des Deutsch-Österreichischen Telegraphen-Vereins* (1858), p. 32.

[170] BHStA, GDVA 674, Telegraphenamt to all stations, 10 Dec. 1862.

[171] BHStA, MH 16882, Präsident der Regierung Schwaben und Neuburg to HM, 4 Feb. 1850.

[172] BHStA, GDVA 193, Ministerial Entschliessung, 23 Feb. 1850; BHStA, GDVA 193, Dyck to Präsidium Regierung Schwaben und Neuburg, 30 Apr. 1859; BHStA, MH 16882, Bericht, Präsident Regierung Schwaben und Neuburg to MInn, 14 Sept. 1859.

[173] BHStA, MH 16882, Bericht, Präsident Regierung Schwaben und Neuburg to MInn, 14 Sept. 1859.

[174] BHStA, MH 16882, 'Vorstellung und Bitte des Gremiums des Augsburger Handelsstandes', 5 Nov. 1859.

[175] BHStA, MH 16882, MInn to HM, 16 Sept. 1859.

[176] The volume of correspondence was around eight private telegrams per day: BHStA, MH 16882, GDVA to HM, 21 May 1859; BHStA, GDVA 674, Dyck to Redaktion der *Allgemeine Zeitung*, 23 Jan. 1860; BHStA, MH 16882, GDVA to HM, 30 Sept. 1859.

this assessment did not take into account the relative value of each message for its recipients, the chamber of commerce pointed out: 'the national-economic value of facilitating use of the telegraph institute in Augsburg [should] be assessed in relation to what is often, for many large circles, its significant content, rather than simply by the number of incoming and outgoing telegrams.'[177]

The spatial distribution of these privileged users compounded the problem, moreover. In keeping with service regulations, messengers were required to deliver telegrams following the order in which they had been received at the office. Pragmatically speaking, however, the practice was nonsensical, as it prevented a messenger from adapting his trajectory through the city to take the shortest possible route. Considering the fact that most manufactories were relatively far away from the city centre, where most trading establishments were based, this could lead to absurd delays in the receipt of messages.[178] In seeking to preserve the seemingly neutral sequence in time by which telegrams were ordered, the administration had correspondingly heightened the significance of the space between its users.

When the decision was made in 1862 to re-establish a central office in the centre of town, leaving a subsidiary branch at the railway station, patterns of telegraphic traffic across the urban environment began to emerge. In order to decide upon the best location for the new central office, an analysis was prepared of telegrams sent between 1 and 12 March 1864. During that period, 267 of the 501 telegrams sent were from local inhabitants or owners of nearby manufactures; 334, however, were from travellers, or people only temporarily residing in Augsburg.[179] To begin with, this statistic highlighted the importance of the technology not only for a town's inhabitants but for people on the move seeking to coordinate their departure and arrival times and to manage their journeys across Germany. As a result, the majority of traffic was indeed in the railway station itself.

A list was also drawn up of the twelve most frequent resident depositors of telegrams during this same period, which highlighted the growing diversity within the economic elite now making use of the technology. Six of these were bankers (including Paul von Stetten), two were 'agents', two owned manufactories (including Ludwig August Riedinger, director of Augsburg's large Mechanische Baumwoll-Spinnerei und -Weberei), one was Consul Obermaier, and finally, Duke Ludwig.[180] This almost unique source naming individual users of the telegraph confirms the suggestion that, while finance and trade remained the leading source of demand, the production sector had also been drawn into the network.

[177] BHStA, MH 16882, *Jahresbericht der Handelskammer für Schwaben und Neuburg* (1860), p. 9.
[178] BHStA, MH 16882, 'Vorstellung und Bitte des Gremiums des Augsburger Handelsstandes', 5 Nov. 1859.
[179] BHStA, MH 16882, Dyck, 'Erinnerung', 15 Mar. 1864. [180] Ibid.

Situating the telegraph office in a suitable location, therefore, required balancing the interests of the city's elites, and doing so highlighted their distribution across urban space. To the director of the telegraph administration's frustration, 'in not a single one of the different vaguely formulated petitions and requests [was] there any indication of where the central point of traffic in Augsburg might actually be'.[181] The most frequent customers, he determined, were situated on average roughly one kilometre from the railway station, and no alternative location for the office—whether the post office, the police station, or the *Börse*—could be found which would reduce this average to less than 500 metres. This difference, he believed, was negligible, and the true centre of local traffic remained the railway station.[182]

'It would be with far more justification', the director added, 'for the factory owners by the Stephinger, Jakober, Schwibbogen and Rother Thor to request the establishment of a subsidiary branch in the Jacobervorstadt.'[183] Indeed, it was between the city walls and the Lech River to the east that many of Augsburg's historic bleach-works and newer spinneries had been established, dependent as they were upon waterways.[184] Already in 1850, the Mechanische Baumwoll-Spinnerei und -Weberei, built outside the Jakobertor, was employing around 1,500 workers.[185] As the railway station was to the west of the city walls, however, many of these factories found themselves around 2 kilometres from the office, as the crow flies.

Use of the telegraph had thus become a source of tension within Augsburg's bourgeois elite. Bankers had long been at the heart of the city's economic, and indeed social, life, and had even provided a large proportion of the capital required to reinvigorate, mechanize, and expand the local textile industry.[186] However, now that both they and the manufacturers, as well as the editors of the *Allgemeine Zeitung* and the leaders of local government, had come to depend upon the same service, the community of interests had been disrupted. The expectations placed in the speed of telegraphic communication had accentuated the importance of local distance and highlighted the transformation of urban space. Situating the telegraph office, meanwhile, involved a symbolic reorientation of the local community's socio-economic focal point. No conclusive decision was reached as to the most convenient location for the telegraph office as a result, but in a reflection of enduring local priorities, it was eventually established in the *Börsengebäude*.[187]

[181] Ibid. [182] Ibid. [183] Ibid.

[184] C. P. Clasen, 'Die Augsburger Bleichen im 18. Jahrhundert', in C. Grimm (ed.), *Aufbruch ins Industriezeitalter* (3 vols., Munich, 1985), ii, pp. 184–225.

[185] W. Wüst, 'Die Manufaktur- und Fabrikarbeiterschaft als neue Gesellschaftsschicht im frühindustrialisierten Augsburg', in Grimm, *Aufbruch ins Industriezeitalter*, pp. 402–11; S. Fees, 'Die frühen Spinnereien und Webereien in Augsburg: Architektur, Maschine, Arbeit', in Grimm, *Aufbruch ins Industriezeitalter*, pp. 261–9.

[186] F. Möller, *Bürgerliche Herrschaft in Augsburg, 1790–1880* (Munich, 1998), pp. 147–50.

[187] BHStA, GDVA 193, Geschäftsnummer 341, 7 Dec. 1867.

Similar issues cropped up across Germany during the 1860s, as urban elites experienced the burden of local spatial configurations. Every day, the editors of the *Würzburger Anzeiger* watched the town's messenger 'doing the rounds, often with half a dozen telegrams, whereby hours often go by before his return', while the dispatches which they were expecting to publish in their next edition arrived at the office and 'accumulated in such a way that, in the best of cases, they become useless'.[188] The representatives of the Bremen *Handelskammer*, meanwhile, complained that telegrams sent to Hamburg through Hanover had to be deposited at the railway station on the outskirts of town—a crucial connection during stock trading hours.[189] Only ten years later, however, the office for that line was moved to the new *Börse*, built next to Bremen's central market place, along with the local news agency Bösmann's.[190]

Significantly, local authorities now sometimes worried about the 'unpleasant impression' which the poor service was creating among the public, particularly when complaints were expressed in the press.[191] The *Neues bayerisches Volksblatt* printed in Regensburg, for instance, evoked the complaints of 'the provincial representative, bankers, merchants and editors' at the fact that the telegraph office was now a full fifteen minutes away from town. 'It seems as though', it continued, 'the public is there for the benefit of the telegraph, and not the telegraph for the public.'[192] The language used in these texts reflects an increasingly widespread assumption that the state had a duty to provide an adequate communications service for all its citizens.

Delivery charges, meanwhile, further accentuated the hierarchy between the commercial and financial elite living in town centres and the manufacturers situated beyond communal borders. Numerous individuals, from mill owners to locomotive manufacturers, complained that the delivery of a telegram could often end up costing as much as its transmission over considerable distances.[193] When threatened with new delivery fees, Christian Ammon, a manufacturer of compressed yeast who lived at the very limits of the Fürth municipality, engaged legal proceedings against the Bavarian telegraph administration. As his lawyer explained, Ammon simply did not have 'the luck to live in that part of this town in which the railway and the telegraph office were set up'.

[188] *Würzburger Anzeiger*, 8 Apr. 1864.

[189] StAB, 2-R.15.b.4.a, Extract aus dem Senatsprotocolle, 26 Nov. 1855; StAB, 2-R.15.b.3, Hr Fischer, Namens der Handelskammer to Senat, 25 Feb 1856; StAB, 2-R.15.b.3, Commission des Senats für das Telegraphenwesen to K. Han. General-Diretion der Eisenbahnen und Telegraphen, 28 Feb. 1856.

[190] StAB, 2-R.15.b.4, Vorsitzer der Börsencommission, to Senator Duckwitz, 6 Dec. 1864.

[191] BHStA, MH 16882, Bericht, Präsident Regierung Schwaben und Neuburg to MInn, 14 Sept. 1859.

[192] BHStA, GDVA 675, *Neues Bayerisches Volksblatt*, 23 Jan. 1863.

[193] BHStA, GDVA 674, Telegraphen Amt to Oberpost- und Bahnamt, 20 Nov. 1862; BHStA, GDVA 676, Locomotivfabrik Krauss & Compagnie, to Telegraphendirection, 28 Apr. 1870; BHStA, GDVA 676, Karl Kraemer to Telegraphenamt, 7 June 1868.

Invoking the legal foundations of citizenship in the Fürth municipality, a community whose recent expansion was the product of industrialization, the lawyer pointed out that his client did live within the town limits, and there was therefore 'no visible reason, for which Ammon should be treated worse with regard to wired correspondence, than any other of his fellow citizens [*Mitbürger*], that is than the rest of the inhabitants of Fürth'. 'Within one and the same *Gemeindebezirk*', his lawyer continued, 'a distinction cannot be made, and is not made anywhere; it certainly would not comply with the fundamental basis of equality.'[194] Ammon's legal challenge underscored the issues facing the telegraph administration. Access to the network was now widely accepted as something amounting to a universal right. Exclusions could no longer be made on the basis of an individual or a locality's relative economic importance.

Far from conquering space and homogenizing time, therefore, the telegraph had made many users all the more conscious of speed and distance. Within local communities, spatial and temporal distinctions were intimately related to individuals' socio-economic functions and the position which they occupied in the urban landscape, which was being transformed by the process of industrialization. The effect of these changes was not the dissolution of communities, however, but their reorientation around new priorities and a new local, malleable space-time continuum.

5.5 The Dangers of Acceleration

'The 1st July 1870 saw Europe most profoundly at peace,' Theodor Fontane wrote in the introduction to his account of the Franco-Prussian War.[195] It was the spa season, and

> [i]n Wiesbaden, in Homburg, in Baden-Baden, the full glimmer of evening dress was already unfolding, music rang out through the alleys, the hum of conversation was now in bloom as never before – though it seemed as though the great triad of Rhineland spas could this year be envious of a fourth: Ems. King Wilhelm had arrived there on the 20th June. He had made the journey from the railway station to the *Kurhaus* under a shower of flowers and bouquets … One was surrounded by famous personalities and ancestral names … Happy, peaceful, daily changing days. In the mornings there were reviews and inspections of drill marches: the Augusta grenadiers, the 29th regiment, the brown Hussars; in

[194] BHStA, GDVA 676, Telegraphenstation Fürth to GD der VA, 6 Sept. 1869; BHStA, GDVA 676, Vorstellung des k. Advokaten Gunzenhäuser', 20 Oct. 1869. On the construction of local citizenship in a 'new' town, see Oliver Zimmer's discussion of Ludwigshafen in O. Zimmer, *Remaking the Rhythms of Life: German Communities in the Age of the Nation-State* (Oxford, 2013), pp. 143–50.

[195] Theodor Fontane, *Der Krieg gegen Frankreich, 1870–1871* (2 vols., 1873), i, p. 3.

> the afternoon, overtures and symphonies of concerting chapels, in the evening a theatre production . . . and then to close it all off, a firework . . . Nothing more joyful, more peaceful than midsummer in the spa season of 1870 in beautiful Ems. Life was an idyll![196]

Within a few days, however, a news story broke the tranquillity of the resort:

> Then came the 7th July. The to- and fro- of guests seemed the same as every earlier day; the same bright colours, the same laughing, but at the end of one of the alleys, where the members of high finance and the princes gathered every morning to greet one another and exchange a few words, a newspaper was being passed from hand to hand, a long telegram from Paris.[197]

Over the next few days the spa resort became increasingly agitated. Baron Werther, the Prussian ambassador to Paris, travelled to Ems to speak with King Wilhelm. His arrival was followed by that of Count Benedetti, the French ambassador to Berlin. Diplomatic exchanges and interviews with the king ensued: 'In the "Hotel Brüssel", at least, in the rooms which had been taken up by the French delegation, there was no rest by day or night. Secretaries and attachés flew back and forth, ciphered dispatches came and went, audiences were sought and granted.'[198] On the morning of 13 July, the French ambassador had a brief conversation with the Prussian king along the promenade. On the 14th, only around half of the spa guests were to be seen on the promenade. Count Benedetti hurried to Paris. Early in the morning of 15 July, King Wilhelm returned to Berlin. In the words of Fontane, '[w]hat had happened?'[199]

* * *

By the time the journalist, now in his fifties, was sent to report on the events of the Franco-Prussian War, he was quite aware of the influence that new means of communication were beginning to exert upon the conduct of politics, international relations, and, as we have seen, warfare itself. Already during the Crimean War, the to and fro of diplomatic telegrams had raised concerns that the speed of communication was affecting not only businessmen but also the quality of information being disseminated to politicians and the general public. The expansion of telegraph networks across Europe and, eventually, the globe during the 1860s further accentuated these concerns, as the speed of the telegraph began to accelerate the linkages between a growing number of modes of communication in international relations.

Just as the technology might be blamed for upsetting the harmony (and monotony) of public opinion, so, it seemed, did it also constitute the perfect

[196] Ibid., i, pp. 3–4. [197] Ibid., i, p. 4. [198] Ibid., i, p. 5. [199] Ibid., i, p. 5.

tool for the era's great geopolitical disrupter, Napoleon III. 'Do not forget', *Kladderadatsch* admonished its readers in 1861, 'that Louis Napoleon too may one day wake up in a grumpy mood and, at a quiet click of his private telegraph, the underground wires of which go just as well to Warsaw, Prague, Pest, Lemberg and Stockholm as to Hannover, Dresden, Stuttgart, Munich, Rome and Naples, can put an end to the entire global status quo.'[200] The French emperor, it later claimed, had established 'a commission for the establishment of a telegraph network around the entire world. Paris is to be raised to the position of Central Office, for HE supports the project on the condition that HE hold all the wires in his hands.'[201]

An increasingly connected Europe was thus a more unpredictable Europe, one in which the balance of power could shift from one moment to the next. The deposition of the Wittelsbach King Otto of Greece, for instance, was depicted as yet another last-minute change of government. The revolts which had taken place during the monarch's visit to the Peloponnese in October 1862 had spread in a matter of days from the west of the country to Athens, where a new government was formed. The whole affair had been rather swift, according to *Kladderadatsch*: 'Telegrams here, telegrams there / from the cheery skies sharp lightning is thrown / And once again stands empty in Europe / Another monarch's throne!'[202] As Christopher Clark has shown, this sense of a world in constant motion was key to Bismarck's understanding of politics in the post-1848 era, and it was his ability to adapt to ever-changing circumstances with the sangfroid and calculation of a chess player that made him such a powerful statesman.[203]

In Germany itself, indeed, the technology seemed to play its role in exacerbating the confederal chaos caused by the Schleswig-Holstein War of 1864. One night, according to a satirical poem, the deputies in Frankfurt were startled out of their peaceful sleep to news from Posen: 'What? An extraordinary session has been scheduled? / Damn the telegraphs! / One barely gets eighteen hours now / to sleep before loud sessions!' The people of Frankfurt, it continued, wondered what all the hurry was about at 'such an unusual *hora*', and whispered from ear to ear, '*periculum in mora*'. The poem went on to describe the important Prussian dispatch which had just been received, demanding that the Confederation withdraw its troops, something which the Bavarians, in particular, firmly objected to. The telegraphs replied that the delegates had decided to sleep on the matter, only, of course, to bow down to Prussian pressure the next day.[204]

Not all accounts were as cynical as these examples imply. The German popular press, like their European counterparts, did indeed celebrate the triumphs of

[200] *Kladderadatsch*, 25 Aug. 1861.
[201] *Kladderadatsch*, 17 May 1863.
[202] *Kladderadatsch*, 2 Oct. 1861.
[203] C. Clark, *Time and Power: Visions of History in Politics, from the Thirty Years War to the Third Reich* (Princeton, 2019), pp. 118–70.
[204] *Kladderadatsch*, 4 Dec. 1864.

technological progress, epitomized by the laying of the transatlantic telegraph cable in 1866. *Die Gartenlaube*, for instance, published an article describing the new 'electric girdle around the world': 'At the same time as the thunder of the "seven-day" war was shaking the European continent and hundreds of thousands of battle-heated combatants were wresting in a battle for domination and freedom from the Carpathians to the Rhine, in the first days of the memorable month of July 1866, almost unnoticed, a fleet expedition left the English coast to complete a great work of peaceful conquest, a new powerful link in the living chain which unites the nations of the earth.'[205]

In a similar vein, much was made of Pope Pius IX's rejection of 'modernity' and all its technological apparel in the *Syllabus Errorum* of 1864. In a parody of an 'encyclical against the abominable errors . . . of the nineteenth century', *Kladderadatsch* declared, 'return to the devil's hellish fires all the inventions and innovations, the railways and steam engines, which serve only the rage of progress, the telegraphs which have stolen lightning from its heavenly seat', underscoring the perceived absurdity of the Holy See's attitude to the age of progress.[206] While the rest of the world was joining the new network of speed, the response from Rome in an exchange of telegrams was said to have taken the 'almost unbelievably short time of 1275 years, 18 hours and 4 minutes'.[207]

The satirical paper could not refrain from commenting upon the technology's failings, however. When the transatlantic cable initially laid in 1865 failed to function correctly, it published a 'biblical' extract on the 'Babel cable': 'There was one tongue and language across the world, and it was electric. And the Americans and Europeans said to one another: Now then, let us draw a rope, on which we will hang everything that is against the uniting of nations! And the rope is to go around the entire earth, and will become the bond between all men and the chain of all tyrants.' The project, however, was brought to nought by the 'lords' of the world who felt threatened and worked together to destroy the cable.[208] Over the following years, the paper made repeated references to the frequent interruptions in telegraphic communication, at times using this as a device to convey its liberal views: 'Telegraphic Dispatch: Austria is to introduce trials by jury, even for political and press trials. In Prussia too, if the people show a little patience - - - (here the thread is torn).'[209]

Telegrams themselves were increasingly depicted as interruptions in the course of daily life. This was true both of the short sketches published in *Kladderadatsch*, where a servant might appear with an urgent message, and of E. Marlitt's *Das Geheimnis der alten Mamsell*, a serial novel published in *Die Gartenlaube* in 1867, in which a widow informs her son of his father's death by telegraph, allowing him

[205] 'Der elektrische Weltband', *Die Gartenlaube*, vol. 40 (1866), p. 624.
[206] *Kladderadatsch*, 8 Jan. 1865.
[207] *Kladderadatsch*, 22 Oct. 1865.
[208] *Kladderadatsch*, 13 Aug. 1865.
[209] *Kladderadatsch*, 3 Nov. 1867.

to arrive in time for the funeral.[210] Looking back on the period in 1901, Thomas Mann correctly described the late 1850s and 1860s as a time when Thomas Buddenbrook was increasingly busy writing 'urgent letters and telegrams' for his business.[211] It is also around this time that two specific dispatches punctuate the narrative, marking important stages in the family's decline. The first brings news of his sister's sudden divorce and her intention to return to Lübeck from Munich; the second arrives in the midst of his firm's hundredth-anniversary celebrations—as the music stops, the message informs the entrepreneur of a catastrophic turn in his investments.[212] Business, politics, and, increasingly, social life had become subject to the unpredictable rhythms of telegraphic communication.

* * *

So what, to return to Fontane, had in fact happened in the days leading up to 15 July 1870? In the next section of his account, Fontane reveals the events that underlay the sudden disruption of peace at Ems, and indeed in Europe. On 3 July, he explains, the French news agency Havas reported that, the previous day, the government in Madrid had offered the Spanish throne, vacant since 1868, to Leopold von Hohenzollern, a cousin of the Prussian king. Over the next few days, the French parliament and government expressed their opposition to the offer which, they believed, would upset the balance of power in Europe. On 7 July, the French foreign minister, the Duc de Gramont, telegraphed his ambassador in Berlin, Count Benedetti, to go to Ems, where he would be met by an attaché with further instructions. This, of course, was the day that the tranquillity of the spa resort was broken.[213]

Two days later, Benedetti met with the king, who assured him that he had not encouraged his cousin Leopold to accept the Spanish crown, and that the decision in no way represented an expression of Prussian imperialist ambitions. In this first interview, Benedetti explicitly chose not to 'violently rush' (*brusquer violemment*) the king for further assurances, but by 11 July Benedetti was impressing upon the king the 'extreme urgency, not to lose any time' in pronouncing his opposition to the Hohenzollern candidacy.[214] From King Wilhelm's perspective, however, the decision could wait: 'one or two days' postponement [would] not make the situation any more difficult'.[215] Benedetti's urgency, he warned, came across as a sign that the French government wished to provoke a conflict. Peace would not be disturbed, he said, 'so long as those in Paris accept to wait, and leave me the necessary time'.[216]

On 12 July, the Duc de Gramont telegraphed Ems that Prince Leopold had now renounced the Spanish crown, but forwarded the French government's demand

[210] E. Marlitt, 'Das Geheimnis der alten Mamsell', *Die Gartenlaube*, vol. 22 (1867), p. 342.
[211] T. Mann, *Buddenbrooks: Verfall einer Familie* (Berlin, 1901). [212] Ibid.
[213] Fontane, *Krieg gegen Frankreich*, i, pp. 6–7. [214] Ibid., i, pp. 11–12. [215] Ibid., i, p. 14.
[216] Ibid.

that King Wilhelm formally oppose any future Hohenzollern candidacy: 'This was the true war telegram,' Fontane asserts.[217] History, of course, has placed considerably more emphasis on the telegram modified and expedited the next day by Bismarck, which expressed King Wilhelm's refusal to guarantee that no Hohenzollern candidate would ever be put forward for the Spanish throne. And, to a great extent, it was Bismarck's timing just as much as his editing of that telegram that gave it potency. Either way, on 19 July 1870 France declared war on Prussia.

'Never had a feud developed so rapidly, and with so little cause,' Fontane opined.[218] Indeed, as his account suggested, the infamous 'Ems Dispatch' was the culmination of two weeks' worth of frantic exchanges between diplomats and statesmen which had taken place in person, by letter, by messenger, through newspapers, and by telegraph. Fontane did not limit himself to recording the sequence of communications that had been made; he structured them so as to emphasize the multiple temporalities which they engaged. Telegrams were reprinted in newspapers; they were transmitted across the continent to order ambassadors to convene in Ems. There, meetings took place in person, and the French ambassador's hurry to relay the results of his royal interview was confronted with the Prussian king's desire to reflect more extensively upon the issue at hand.

Fontane the journalist was thus well on his way to becoming Fontane the novelist.[219] Yet his account was very much based on both the real and perceived impact of new means of communication upon German society. Much like Freiherr von Lerchenfeld, whose experience was described at the beginning of this chapter, the statesmen and officials gathered at Ems in July 1870 were drawn into an intricate mechanism of interactions which depended upon various means of communication. During the 1860s, the telegraph had come to serve a growing range of functions, accelerating one crucial gear in this mechanism, inserting an extra element of speed which pushed some users ahead while leaving others behind. Increasingly, it seemed, these sudden bursts of acceleration could even upset the stability of international relations—an impression certainly reinforced by the outbreak of the Franco-Prussian War. Soon the technology would come to infiltrate social life itself, embedding itself in the everyday interactions that formed the basis of the novels for which Fontane was to be remembered.

[217] Ibid., i, p. 15. [218] Ibid., i, p. 6.

[219] G. Craig, *Theodor Fontane: Literature and History in the Bismarck Reich* (Oxford, 1999), esp. pp. 70–95.

6
A Nation Connected

In 1876, Germany's new Postmaster General, Heinrich Stephan, stood before the *Reichstag* to defend the recent introduction of a new telegraph tariff. In the past, the cost of a telegram had been directly related to the distance it travelled, but the new '*Worttarif*' established a flat rate for all telegrams sent within the Kaiserreich, on a pay-per-word basis. The decision met with considerable opposition from many deputies, who called for the former distance-based pricing zones to be reintroduced. Heinrich Stephan stood firm, asserting:

> Gentlemen, the issue also has its idealistic side. We have received this wonderful force of nature as a gift from the Creator, which rushes through entire sections of the earth in a second, and is essentially an annihilator of distance, and you now want to constrain this force according to the measure of a clod and hoof [*der Scholle und der Hufe*]! The development of large-scale international exchange, in which we have had no zones for years, has long moved beyond 'clod-tariffs' [*Schollentarife*]. The power of this development is so irresistible that your attempts to introduce a small zone appear to me as though you are trying to construct a weak barrage on the territory of telegraphy, against the tide of world correspondence.[1]

To Stephan's grandiose vision of a shrinking globe, however, the conservative deputy Theodor Günther juxtaposed a different reality:

> The *Generalpostmeister* has reminded us that we mustn't lose sight of the big questions of international correspondence; that it is no longer time to cling on to the hoof and clod. Gentlemen, by far the greatest part of the German people lives from the hoof and clod, and I would like to express the most vivid wish, that the *Generalpostmeister*... not withhold his goodwill from the interests of the hoof and clod.[2]

These were the two opposing poles of the debate on the nature and purpose of modern means of communication during the 1870s. On the one hand, it seemed, the telegraph flattened space; it was the 'annihilator of distance' that transgressed

[1] *VDR* (1876), vol. 1, 8 Nov. 1876, pp. 88–9. [2] Ibid.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0008

borders and allowed for instant communication across the globe. On the other hand, it was a technology rooted in the thousands of telegraph offices across the country, a service to which access remained unequal, dependent upon an individual's geographical location and social status—it served, in other words, to heighten many Germans' sense of place and the short distances within which they still lived their daily lives. The further the telegraph extended individuals' potential range of communication, the more it reminded many of their distance from that horizon. Ever more global, or ever more local: these were the two extremes to which German society was pulled by the wires criss-crossing the nation.

* * *

With the founding of the *Kaiserreich* in 1871, the new *Generaldirektion der Telegraphen* (General Directorate of the Telegraphs) established within the *Reichskanzleramt* (Imperial Chancellery) inherited a web of state networks which had been expanding inwards and outwards for two decades. Colonel Meydam, the first director of the imperial telegraph administration—and a military man, in keeping with Prussian tradition—lost little time in launching a construction programme intended to harmonize this patchwork of connections and to establish a uniform national network. Upon his death in 1875, post and telegraphy were brought together under the authority of a new, civilian *Generalpostmeister* (Postmaster General), Heinrich Stephan. In 1876, he too launched a structural overhaul of the Reich network, multiplying the number of offices and strengthening the main arteries of communication.[3]

A dual process of modernization and nationalization, such as that elegantly described by Eugen Weber in the context of the French Third Republic, appeared to have been set in motion.[4] Yet as the responses to Weber's work have shown, processes of state integration are never smooth, and it faced particular challenges in the context of the *Kaiserreich*, built as it was upon a strong federal tradition.[5] As Siegfried Weichlein has shown, the management of imperial postal and railway systems during Bismarck's tenure as chancellor actually fuelled the dynamic interaction of 'unitarist' and 'federalist' forces, which remained unresolved.[6] In a

[3] J.-O. Hesse, *Im Netz der Kommunikation: Die Reichs-Post- und Telegraphenverwaltung, 1876–1914* (Munich, 2002), pp. 51–3.

[4] E. Weber, *Peasants into Frenchmen: The Modernization of Rural France, 1870–1914* (Stanford, 1976).

[5] M. Cabo and F. Molina, 'The Long and Winding Road of Nationalization: Eugen Weber's *Peasants into Frenchmen* in Modern European History, 1976–2006', *European History Quarterly*, vol. 39, no. 2 (2009), pp. 264–86; cf. C. Applegate, *A Nation of Provincials: The German Idea of Heimat* (Berkeley, 1990); A. Confino, *The Nation as a Local Metaphor: Württemberg, Imperial Germany, and National Memory, 1871–1918* (London, 1997); for an early summary of research which began to demonstrate the salience of regionalism as a characteristic of European nations, see C. Applegate, 'A Europe of Regions: Reflections on the Historiography of Sub-National Places in Modern Times', *American Historical Review*, vol. 104, no. 4 (1999), pp. 1157–82.

[6] S. Weichlein, *Nation und Region: Integrationsprozesse im Bismarckreich* (Düsseldorf, 2004).

similar fashion, the imperial telegraph administration was forced to balance its aims with those of the diverse social and institutional actors involved in managing the network.

Moreover, as we have seen, the *Kaiserreich*'s many networks were locked into an expanding system of international exchanges. During the 1850s and 1860s, the Deutsch-Österreichischer Telegraphen-Verein and the International Telegraph Union had sought to streamline international communication, establishing the rules by which all the states involved had to play. By the 1870s, a further participant had joined the game, and governments now sat across the table from large multinational corporations that managed the new submarine cables connecting the continents—the rising 'Euro-American' elite that was to dominate the world's telecommunications industry.[7] Carving out the *Kaiserreich*'s jurisdiction over a portion of this global network, therefore, necessitated cooperation, sometimes collaboration, with a number of regional and transnational actors. Networks, as Jürgen Osterhammel has observed, stimulated the first 'surge of globalization' after 1860, but it also fuelled the process of 'delimitation and fragmentation' which was its necessary corollary.[8]

The technology's user base, meanwhile, was rapidly expanding and diversifying, as individuals turned to the telegraph to communicate on a local, national, or international scale. Bankers, traders, and news agents remained the service's most vocal and determined customers, but the network was reconfigured to cater to a growing number of industries and agriculturalists. The telegraph network did not, in theory, discriminate between different economic sectors, serving as a support structure to accommodate the variety of forms in which industrial capitalism developed across Germany.[9] The technology came to fulfil a variety of social functions too, as doctors, firefighters, and ordinary individuals increasingly relied upon the telegraph to respond to the vagaries of everyday life. The privileged bourgeoisie's 'networks of means' were thus being stretched to include new sections of society—sometimes beyond capacity.[10]

Just as the telegraph was being woven into the fabric of society, the pressures exerted upon the network from without and from within were pulling at its seams. Balancing the centrifugal and centripetal forces in the *Kaiserreich*'s administration, the national and international dimensions of telegraphic news distribution, the diverging interests of global finance and local industries, and the diverse needs

[7] S. M. Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks* (New York, 2016), pp. 231–2.

[8] J. Osterhammel, *The Transformation of the World: A Global History of the Nineteenth Century* (Princeton, 2014), pp. 710–11; S. Conrad, *Globalisation and the Nation in Imperial Germany*, trans. Sorcha O'Hagan (Cambridge, 2010), p. 4.

[9] G. Herrigel, *Industrial Constructions: The Sources of German Industrial Power* (Cambridge, 1996), pp. 111–25.

[10] J. Seigel, *Modernity and Bourgeois Life: Society, Politics and Culture in England, France, and Germany since 1750* (Cambridge, 2012), pp. 1–37.

of urban and rural telegraph users revealed the divisions emerging in modern Germany. Since the 1850s, the telegraph had become an engine of industrialization, market capitalism, and community formation, but its expansion also highlighted the social tensions which these processes were fuelling, as competition for adequate bandwidth emphasized the distinctions between the privileged and the neglected.[11] A nation connected, it seemed, meant a society divided.

6.1 A Network for a Nation

In many ways, the Franco-Prussian War of 1870 witnessed the culmination of government efforts during the preceding decade to establish homogeneous, 'national' spheres of information circulation. During the phase of mobilization, the North German Confederation established a number of new telegraph lines and coastal observation stations intended to plug crucial gaps in the network in preparation for the conflict. The war itself, as Theodor Fontane had observed, then demonstrated the technology's utility in coordinating the deployment of the allied German forces, which included twelve confederal field telegraph units under the authority of Colonel Meydam, two units from the Bavarian army, and one from Württemberg.[12] Beyond the battlefield, the telegraph network became a linchpin in the campaign to shape the public's perception of events, both across the emerging *Kaiserreich* and abroad.

Two weeks into the conflict, in late July 1870, the minister of the interior for the North-German Confederation, Friedrich Albrecht zu Eulenburg, sent out a circular to local officials announcing that 'reliable news arriving from the battlefield will be brought rapidly by telegraph to the attention of the public in North Germany'. The northern confederation's telegraph offices were instructed to print multiple copies of the telegrams they received, to affix one of these to the office building, and to distribute the rest to all official centres in the locality and its surroundings—if necessary, by post. As the principal aim of this policy was to 'allow the public to receive, in the face of the large number of erroneous or exaggerated rumours which, as experience has shown, circulate in such times, as rapid and reliable information as possible'; moreover, 'its diffusion in towns by means of wall postings, [was] advised'.[13]

[11] Rather than conflating the processes, Stein Rokkan highlighted the differentiation involved in simultaneously unfolding processes of modernization, industrialization, and nation-state formation: 'Dimensions of State Formation and Nation Building: a Possible Paradigm for Research Variation within Europe', in C. Tilly (ed.), *The Formation of National States in Europe* (Princeton, 1975), pp. 562–600.

[12] GStA PK I HA Rep. 120 A XIV, Nr. 9, Bd. 2, *Statistik des Verkehrs der Stationen des Deutschen Reichs-Telegraphen-Gebietes pro 1873*, p. xi.

[13] GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Circular, Eulenburg to all *Regierungs-Präsidien* and *Landdrosteien*, 30 July 1870.

The policy in fact triggered a wave of requests from local authorities asking that additional towns to those initially enumerated by the government be included in the network of news distribution.[14] In Berlin, 'war dispatches' were affixed to the public advertisement columns which Ernst Litfaß had set up across the city since the 1850s, fostering the public's addiction to fast news.[15] Much as Karl Knies had hoped over a decade earlier, during the war the telegraph was finally operating like a nervous system, allowing all parts of the country to share in the fate of its armies, almost in real time.

The policy was not without its issues, however. Some of the municipal requests to be directly provided with 'war dispatches' were tinged with indignation. Essen, 'which has sent around 1,000 men into the field', and some of its smaller neighbours, it was felt, should at the very least be able to keep abreast of their efforts to defeat 'our hereditary enemy [*Erbfeind*]!'[16] Some newspaper editors complained that some of their competitors had been chosen to reproduce copies of the incoming telegrams and thereby had privileged access to valuable news.[17] In Berlin, Ernst Litfaß had begun to sell printed copies of the dispatches affixed to his columns, creating undue competition for local newspapers.[18] Indeed, after the war, a number of accusations would emerge against newspapers which had profited from their advance printing of news.[19] In war, as in everyday life, speed and time were at a premium.

Meanwhile, the cooperation between Wolffs and the Prussian government and the recent establishment of a global news cartel turned the Franco-Prussian conflict into a campaign for international public opinion. The cartel itself fell apart during the war, as mediatic battle lines were drawn and cooperation between Havas and Wolffs ceased.[20] Instead, Bismarck now turned to Reuters, as a 'neutral' power, both to receive news from France and to disseminate information from his headquarters to London. In this, the value which Bismarck placed upon a positive media strategy was immediately evident. Whereas Napoleon III initially forbade correspondents from accompanying forces into the field, the Prussian chancellor commented to his minister of war, Albrecht von Roon, that '[n]othing will be more favourable for our political standing in England and America than the

[14] See, for example, GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Magistrat Sagan to MInn, 2 Aug. 1870; GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Magistrat Pasenvalk to Minn, 4 Aug. 1870.

[15] F. Becker, *Bilder von Krieg und Nation: die Einigungskriege in der bürgerlichen Öffentlichkeit Deutschlands, 1864–1913* (Munich, 2001), p. 75.

[16] GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Bürgermeister Bochum to Kgl. Landräthliche Behörde, 2 Aug. 1870.

[17] GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Chauvin to Eulenburg, 2 Sept. 1870.

[18] GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, Eulenburg to Polizei Präsident, 8 Aug. 1870.

[19] See, for example, GStA PK, I. HA Rep. 77, Tit. 945, Nr. 51, Bd. 1, General-Direction der Telegraphen to Dr Hahn, 20 Oct. 1870.

[20] E. Dörfler and W. Pensold, *Die Macht der Nachricht: Die Geschichte der Nachrichtenagenturen in Österreich* (Vienna, 2001), p. 195.

appearance . . . of very detailed accounts of our army in the field'.[21] The informal alliance with the powerful British agency was evidently a smart strategic move, and Reuter assured Bismarck that he was using his widespread network to counter the false news spread by the French as far afield as the USA, India, and Australia.[22]

In Central Europe itself, relations were more strained. Before the war, Wolffs had agreed with its Austrian counterpart, the K. K. Correspondenz-Bureau, to continue their partnership for the benefit of the finance community in particular, ensuring the continued circulation of news across Central Europe.[23] While the North German government's regulations regarding the dissemination of information to all telegraph offices did not apply to the southern states, Wolffs' monopoly in those regions influenced the tone of the news circulated there, establishing a separate mediatic sphere that encompassed the future *Kaiserreich*.

* * *

At first sight, the Reich constitution which came into force on 4 May 1871 signalled the establishment of a new, centralized, and thoroughly national communications network. Article 48 stated that 'postal and telegraph systems will be established and administered across the entire territory of the German Empire as unitary state communications institutes [*als einheitliche Staatsverkehrs-Anstalten*]'.[24] The telegraph administration, headed by Colonel Meydam, was initially subsumed within the *Reichskanzleramt*, but it was superseded by a more autonomous *Reichspost- und Telegraphenverwaltung* in 1875. The latter's director, Heinrich Stephan, was an ally of Bismarck and a rising star in the world of communication, having founded the Universal Postal Union a year earlier. Over the next twenty years, the status of the *Generalpostmeister* and his department would continue to grow both at home and abroad, as the *Kaiserreich*'s communications networks were overhauled and Stephan himself became a prominent figure on the international stage. By 1880, his department had been elevated to the status of *Reichspostamt* and he had been appointed *Staatssekretär*. 'Nothing is impossible with the German Postmaster General,' *The Times* commented.[25]

Meydam and Stephan faced a monumental task. Quite apart from the physical damage inflicted upon a number of international telegraph lines during the war of 1870, the new Reich network was a complex beast. The *Reichsgründung* (founding of the Empire), of course, had famously involved a number of territorial

[21] P. Knightley, *The First Casualty: The War Correspondent as Hero and Myth-Maker from the Crimea to Kosovo* (London, 2000), p. 45; A. Nalbach, '"The Ring Combination": Information, Power, and the World News Agency Cartel, 1856-1914' (PhD Dissertation, University of Chicago, 1999), p. 170; Dörfler and Pensold, *Die Macht der Nachricht*, p. 194.

[22] E. Naujoks, 'Bismarck und das Wolffsche Telegraphenbüro', *Geschichte als Wissenschaft und Unterricht*, vol. 14 (1963), pp. 605–16.

[23] Dörfler and Pensold, *Die Macht der Nachricht*, p. 191.

[24] E. R. Huber, *Dokumente zur deutschen Verfassungsgeschichte* (3 vols., Stuttgart, 1961–6), ii, p. 298.

[25] Quoted in Weichlein, *Nation und Region*, p. 107; cf. K. Beyrer (ed.), *Kommunikation im Kaiserreich: Der Generalpostmeister Heinrich von Stephan* (Heidelberg, 1997).

acquisitions, and the incorporation of the telegraphs in Alsace-Lorraine (and Baden) threatened the network's 'necessary and desirable organic structure'.[26] Across Germany, moreover, many of the telegraph lines opened to the general public were in fact managed by private railway companies, in keeping with the agreements which various German states had established during the 1850s and 1860s. Whereas the network in Württemberg was almost entirely state-run by 1870, in Bavaria and the Pfalz the private Ostbahn-Gesellschaft and Pfälzische Eisenbahnen, respectively, managed a number of crucial lines, and in Prussia over half of all telegraph lines were run by private railway companies.[27] As a result, Meydam observed, the state telegraph administration often '[came] away empty-handed'.[28]

Creating a unitary and coordinated system out of this patchwork of diverse public and private networks was by no means simple. Not least because, as Thomas Nipperdey emphasized, the new German Reich was a federal state.[29] In particular, the constitution defined a number of *Reservatrechte* which accorded the governments of Bavaria and Württemberg a significant degree of autonomy in the running of postal, telegraphic, and, in the case of Bavaria, railway networks.[30] For the first two decades of the *Kaiserreich*'s existence, the *Reservatrechte* were to limit the government's ability to homogenize its communications networks, and they reinforced the tendency towards regional differentiation.[31]

As for the railways, until the creation of the *Reichsbahn* in 1920, the myriad public and private administrations involved were constitutionally bound only to collaborate 'like' (*wie*), rather than 'as' (*als*), a unitary network.[32] Imperial legislation on telegraphy as a whole, therefore, would have a limited impact upon those lines managed by the various railway administrations—in fact, the first Reich-wide '*Telegraphengesetz*' was introduced only in 1892.[33] Unlike its counterparts in Britain and France, the German imperial telegraph administration was required to

[26] 'Denkschrift, betreffend die für die Jahre 1874 bis 1876 in Aussicht genommene Entwickelung und Vervollkommnung des deutschen Reichs-Telegraphennetzes', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, pp. 21–44.

[27] J.-O. Hesse, *Im Netz der Kommunikation: Die Reichs-Post und Telegraphenverwaltung, 1876–1914* (Munich, 2002), p. 53.

[28] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, p. 21.

[29] Thomas Nipperdey, *Deutsche Geschichte, 1866–1918*, 3rd edn. (2 vols., Munich, 1995), i, p. 85.

[30] Article 52 of the *Reichsverfassung* affirmed the Reich's power of legislation in postal and telegraphic matters, as well as its authority to negotiate international agreements and to determine the conditions of public access and any fee exemptions. The governments of Bavaria and Württemberg, however, maintained the right to determine their own tariffs and service regulations, and to reach agreements with their immediate neighbours. Their income from these institutions was also independent of the Reich's: Huber, *Dokumente zur Deutschen Verfassungsgeschichte*, ii, pp. 298–300.

[31] Weichlein, *Nation und Region*.

[32] Huber, *Dokumente zur Deutschen Verfassungsgeschichte*, ii, p. 297.

[33] Aside from various clauses in the imperial *Strafgesetzbuch* which defined damage to state telegraph lines as an offence. The question of the state's monopoly over telegraphy, moreover, had not been settled. See F. Kilger, *Die Entwicklung des Telegraphenrechts im 19. Jahrhundert, mit besonderer Berücksichtigung der technischen Entwicklung* (Frankfurt am Main, 1993), p. 53.

confer with its counterparts in Bavaria and Württemberg, as well as with private railway companies, in managing the Reich network.[34] 'In the domain of telegraphy,' Jan-Otmar Hesse has argued, 'one can barely speak of an economic constitution of the German Kaiserreich.'[35]

This domestic complexity was compounded by the international dimension of telegraph communication. The treaty establishing the International Telegraph Union of 1865 had already presented a considerable challenge for German telegraph administrations. The 'extensive reduction' in tariffs which it had imposed had not resulted in the anticipated increase in the volume of correspondence, dealing a blow to the overall income generated by Germany's network. New submarine cables between England, Denmark, Norway, and Russia, meanwhile, had deprived the Prussian administration of the 'not insignificant' income from communications between those countries, which had previously taken place across German telegraph lines.[36] The Reich's central position in European and global telegraphic space was in jeopardy.

The emotional wounds inflicted by the Franco-Prussian War, meanwhile, were slow to heal. The Munich–Paris connection, for example, had been destroyed during the conflict and was not re-established until 1876. The French administration, Heinrich Stephan later explained to his counterpart in Württemberg, '[made] no bones about deliberately avoiding the route through Germany for its correspondence, even taking detours to that end'.[37] Spiteful initiatives such as these were facilitated by the growing number of communications lines being established across Europe and the globe, obviating the need to use Central European networks, and they further deprived the imperial administration of the rather substantial income generated by international communication using 'transit' lines across a state's territory. The imperial network now risked being bypassed by intensifying continental exchanges.

In order to remedy these structural and financial deficiencies, both Colonel Meydam and Heinrich Stephan initiated an overhaul of the German telegraph network.[38] In 1873, Meydam proposed a 4.1 million thaler (12.3 million marks) injection of funds in order to complete the network. All places of 'some importance in terms of traffic' and possessing over 2,000 inhabitants were to be connected to the network. Over one quarter of the projected amount would be dedicated to building or extending internal lines, but Meydam also prioritized international connections because of Germany's 'geographic position' in Europe.

[34] C. Bertho, *Télégraphes et téléphones: De Valmy au microprocesseur* (Paris, 1981), pp. 92–3. Britain's telegraphs had been nationalized in 1868/9: see S. Fari, *Victorian Telegraphy before Nationalization* (Basingstoke, 2015), pp. 161–204.

[35] Hesse, *Im Netz der Kommunikation*, pp. 52–3.

[36] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, p. 21.

[37] BHStA, GD 235, Stephan to General-Direktion Württemberg, 3 Feb. 1875.

[38] Hesse, *Im Netz der Kommunikation*, pp. 56–7; 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, pp. 21–44.

Another quarter of the total sum was to be dedicated to links with Germany's immediate neighbours. A net profit, he asserted, could soon be expected from connections between large centres of trade and industry.[39]

Implementing Meydam's '*Organisationsplan*' then set in motion the interlocking cogs of the federal administrative machinery. By this stage, the Bavarian telegraph administration was coming to the end of its own project to complete the state telegraph network, initiated in 1868.[40] In fact, a year earlier the Bavarian administration had itself exerted pressure on the governments of both the *Kaiserreich* and the Austro-Hungarian Empire to review their networks: the poor quality of their lines was causing trouble for users making interstate transmissions, effectively nullifying the positive impact of their improvements.[41]

Meydam's project was nonetheless a spur to further development on the Bavarian side. Failure to match these efforts, the head of the Bavarian *General-Direktion der Verkehrsanstalten* Heinrich Gumbart asserted, would 'provoke bitter and not unjustified criticism on the part of the public', jeopardize the privileged position the state had been granted by the *Reservatrechte*, 'and give renewed support to those efforts aimed at removing the independent telegraph administrations'.[42] Both the *Kaiserreich* as a whole and its constituent states were engaged in a process of 'defensive modernization' to secure their position in a connected world, mollify domestic public opinion, and neutralize political opposition.[43]

In any case, the volume of traffic on Bavarian lines had by then become untenable. Since 1868, the number of paid telegrams handled annually (State telegrams were free of charge) had increased from around 678,000 to over 1.5 million, thanks in part to a reduction in tariff introduced early in 1872.[44] A bill was therefore presented to the Bavarian parliament that explicitly followed the model put forward by Meydam, so that certain principles came to underpin both networks—in particular, that all towns of 2,000 or more inhabitants qualified for the establishment of a telegraph office. It also promised to take action to multiply its network's ties to all towns bordering the German Empire.[45]

After Meydam's death in 1875, the reorganization of the united *Reichspost- und Telegraphenverwaltung* under Heinrich Stephan reinvigorated the Reich's efforts to integrate transport and communications. Stephan's plan was even more ambitious, and involved a 34 million mark investment into the Reich telegraph network. The money was to be spent on replacing the country's principal arteries

[39] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, p. 21.
[40] See Chapter 5, p. 164. [41] BHStA, GDVA 450, GDVA to MA, 30 Sept. 1872.
[42] BHStA, GDVA 234, Gumbart to MA, 20 Mar. 1873.
[43] H.-U. Wehler, *Deutsche Gesellschaftsgeschichte* (5 vols., Munich, 1987–2008), i, p. 343 ff.
[44] BHStA, GDVA 234, Gumbart to MA, 20 Mar. 1873.
[45] BHStA, Staatsrat 7175, 'Motive zum Gesetz-Entwurf', 10 Nov. 1873; see discussions in *VKA* (1873–5), 19 Dec. 1873, pp. 114–19.

of communication with underground cables, which were better protected from both the elements and malicious intent. It was also to help pursue Meydam's project to replace the country's many rather diminutive telegraph offices with new, grander imperial *Telegraphenämter*.[46] The Munich telegraph office had already been relocated to an independent building erected by the railway station in 1871, and a new '*Kaiserliches Telegraphenamt*' (Imperial Telegraph Office) was inaugurated in Berlin in 1878.[47] Similar considerations led to the razing of a building at the heart of Nuremberg's market place, the *Tuchhaus*, and the construction of a new telegraph office in 1872. Bremen was granted a new *Post- und Telegraphenamt* in 1877.[48]

There is no doubt that Stephan's ambition was indeed to establish a centralized network for the Empire. In 1878, he wrote to Interior Minister Eulenburg explaining that 'it is the objective, to continue extending this [underground] network and thereby to create a permanently secure telegraphic connection between the central point of the German Reich and all important places of commerce in Germany as well as with the larger fortresses'.[49] More generally, moreover, the *Generalpostmeister*'s overbearing presence and authority were often a source of friction between the German administrations. In 1877, for instance, the Reich administration was able to thwart Bavarian efforts to construct a telegraph line to the Pfalz by claiming jurisdiction over the land which it would have to cross.[50] By 1880, the minister-president of Württemberg explicitly complained of 'Stephan's systematic efforts to demolish the respective *Reservatrechte*'.[51]

The point should not be overemphasized, however, as relations between states and the imperial administration were marked by a strong degree of cooperation. To a certain extent, the *Kaiserreich* came to occupy the role previously fulfilled by the *Deutsch-Österreichischer Telegraphen-Verein*, which it had dissolved in 1871. In Bremen, for instance, although the private *Telegraphen-Verein* was absorbed by the imperial telegraph administration, the latter relied heavily upon the advice and local authority of the city's *Senat* and *Handelskammer*.[52] The archives of Bavaria's *General-Direktion der Verkerhsanstalten*, meanwhile, reveal close interaction between Stephan and its director, Heinrich Gumbart, if only for logistical reasons.[53] Nor were influences one-directional, and Stephan acknowledged that

[46] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, pp. 23–4.

[47] *Rückblick auf das erste Jahrhundert der K. Bayer. Staatspost (1. März 1808 bis 31. Dezember 1908)*, ed. K. B. Staatsministerium für Verkehrsangelegenheiten (Munich, 1909), pp. 163–4.

[48] StAN, D4 158, Stadt-Magistrat to Handelskammer, 17 Nov. 1869; Stadtarchiv Nürnberg, Stadtchronik, pp. 538, 746; HKBA, MA P II 1 Bd. 2, J. Albers, Namens der Handelskammer to Oberpost-Direktor, 27 Sept. 1877.

[49] GStA PK, I. HA Rep. 77 MInn., Tit. 1375, Nr. 4, Gen. Bd. 1, Stephan to Eulenburg, 17 Oct. 1878.

[50] BHStA, GDVA 235, Heinrich Gumbart to Kais. General Telegraphen-Amt, 18 Apr. 1877.

[51] BHStA, MA 109807, Bayerische Gesandtschaft to MA, 29 Oct. 1880.

[52] See, for example, HKB, MA—P II 1, Bd. 2, 'Delbrück to Senat', 4 May 1868.

[53] See the agreements reached in the construction of lines, contained in BHStA GDVA 234 and BHStA GDVA 235. For example, BHStA GDVA 235, Gumbart to Kais. Deutsche General-Direction

his efforts were aimed at bringing the imperial network to the same level of development as those in Bavaria and Württemberg.[54]

* * *

The intricate system of interlocking parts involved in the management of the network defies simplistic assumptions as to the nature of the Bismarckian Reich. The developments evoked thus far took place within the context of growing tensions between government and the liberal majority in the *Reichstag*, which culminated in a 'conservative turn' in 1878, when Bismarck turned away from the National Liberals and sought support from the Centre Party.[55] In economic terms, so the argument runs, this shift was encouraged by the depression which set in after the *Gründerkrach* of 1873 and was marked by a rejection of free trade in favour of protectionism. The era witnessed increasing state intervention, with policies aimed at regulating the economy and eventually the creation of a '*Sozialstaat*', as welfare measures were introduced in the 1880s to pull the rug out from under the socialist movement.[56]

Yet both government policy and parliamentary attitudes towards communications infrastructure present a far more complex picture. To be sure, *Reichstag* debates during the 1870s often reflected deputies' frustrations at their lack of influence upon legislation in this as in other crucial aspects of the economy. Complaints raised the fact that they were not given adequate statistical information upon which to assess government proposals, and tariff changes introduced in the middle of the decade led to accusations of administrative despotism.[57] But the administration of the telegraph network was connected to a raft of issues, attitudes to which cut across what are often identified as government or party lines.

The state's duty to provide the transport and communications infrastructure upon which the economy depended was now widely accepted, if diffracted across the political spectrum. For the conservative Reichspartei deputy Karl Gustav Ackermann, the state's monopoly was to be used to increase 'the capital of the nation' and its 'entrepreneurial spirit'.[58] For the National Liberal Johannes Miquel, it was 'not the task of telegraphy to bring revenue to the treasury, it is an economic institution, and serves economic purposes'.[59] Meydam himself had asserted that the extension of the network to smaller, unprofitable localities was 'justified by

der Telegraphen', 3 May 1875, requesting a bias-current connection between Ludwigshafen and Mannheim to support the completion of the Bavarian network in the Pfalz.

[54] H. A. Wessel, *Die Entwicklung des elektrischen Nachrichtenwesens in Deutschland* (Wiesbaden, 1983), p. 300.

[55] Wehler, *Deutsche Gesellschaftsgeschichte*, iii, pp. 866–73. [56] Ibid., iii., 907–14.

[57] *VDR* (1873), 11 June 1873, p. 1083; *VDR* (1876), 8 Nov. 1876, pp. 90–1; *VDR* (1877), 12 Apr. 1877, p. 394.

[58] *VDR* (1871), 12 Nov. 1871, p. 269. [59] *VDR* (1872), 24 May 1872, p. 491.

concerns for general utility and state assistance' [*staatliche Fürsorge*]. Telegraphy, he stated, was 'an essential means of driving contemporary civilized life'.[60]

Given the interdependence of the telegraphs and the railways, efforts to improve the former forced deputies to reconsider their stated attitudes to the latter. In 1876, Bismarck had proposed to create a unified *Reichseisenbahn,* involving the state's purchase of the private railway companies. Bismarck had couched his project in terms of serving the 'public good' by removing the railways from the jurisdiction of companies purely driven by profit, asserting the state's independence from market forces. The measure had split the parliamentary majority, with National Liberals broadly accepting the unifying aims of a *Reichseisenbahn* and Progressives allying with conservative particularists to oppose what was seen as unwarranted centralization.[61]

By 1878, true to this stance, the Progressive Eugen Richter similarly asserted that *Reichstelegraphen* were not needed everywhere, and that the *Generalpostmeister* should take the time 'to establish a friendly relationship with the railways', for the benefit of the telegraph service—and thereby the public—as a whole.[62] In this matter, however, Richter had widespread support, including from the National Liberal Eduard Lasker, Centre Party leader Ludwig Windthorst, and the conservative Nordeck zur Rabenau. The priority, Lasker argued, was to provide those places deprived of telegraphic connections with an office, and only then to focus on state competition with the railways.[63] Rallying around the defence of what they perceived to be the public interest, deputies had crossed party lines to oppose the government collectively.

The involvement of German firms in the production of telegraph cables, meanwhile, caused further contention. Both Siemens and Felten & Guilleaume had benefited from Heinrich Stephan's mammoth infrastructural upheaval, the two firms establishing new cable manufactures during the 1870s to fulfil government contracts. Felten & Guilleaume had by now established subsidiaries across Europe, and by 1879 it even established a contract to provide cables for a major British company, the Telegraph Construction & Maintenance Co.[64] In an early example of government-sponsored cartelization, the Postmaster General encouraged the two competitors to compromise and to collaborate in the laying of the network's underground cables.[65] Stephan defended the decision on the grounds that the two firms employed hundreds of workers, that the project would invigorate the iron industry, and that the time was ripe for action, not least because the

[60] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, p. 21.
[61] Weichlein, *Nation und Region*, pp. 60–7.
[62] *VDR* (1878), 28 Mar. 1878, p. 571.
[63] Ibid.
[64] H. Vogt, *Die Uberseebeziehungen von Felten & Guilleaume (1874–1914)* (Stuttgart, 1979).
[65] Werner to Wilhelm, 10 Oct. 1876, in C. Matschoβ (ed.), *Werner Siemens. Ein kurzgefaβtes Lebensbild nebst einer Auswahl seiner Briefe* (2 vols., Berlin, 1916), ii, p. 503; on the rise of cartel capitalism from the late 1870s as a means of defending against economic instability, see H.-U. Wehler, *Das Deutsche Kaiserreich, 1871–1918* (Göttingen, 1973).

price of gutta-percha on the world's markets was low. For Eugen Richter, however, the signs were ominous. The move was of benefit solely to the two major corporations, would be of little benefit to the workers, and prevented competition from bringing down prices.[66]

While the state's management of the telegraph network was never seriously challenged, it was thus intrinsically connected to policies in other sectors of the economy, towards which attitudes were divided. Part of the problem, of course, was that in the wake of national unification the liberal majority in parliament was deprived of the one clear policy which had united its members in the 1860s. As attention turned to economic issues, divisions emerged within its ranks, particularly as liberal theories of free trade were discredited following the *Gründerkrach*.[67] But the *Reichstag* debates also emphasize the importance of accounting for the multiple moving parts which together fuelled the telegraph's development. Business circles, for instance, often welcomed government intervention in the railway sector, while state policies towards the companies involved had themselves fluctuated over the course of the century, defying linear narratives of growing state intervention.[68] Instead, as explored below, government and parliamentary attitudes to the telegraph network were shaped by a broader discussion of the purposes of communication.

6.2 An Infrastructural Revolution

The projects initiated by the imperial and Bavarian administrations drove the telegraph further into the countryside.[69] In the Reich's jurisdiction, the number of offices increased from 3,325 in 1873 to over 8,000 by 1880, reducing the number of inhabitants per office from over 24,000 to under 7,000.[70] In Bavaria, meanwhile, the number of offices increased from 755 to 1,112 in 1880, among which a few dozen were planned in villages of fewer than 1,000 inhabitants, such as Karpfham, comprising a mere 197 souls.[71] Both rural and urban space were increasingly pervaded with telegraphic connections as a result. The construction of new offices

[66] *VDR* (1879), 23 Mar. 1879, p. 579.

[67] J. Sheehan, *German Liberalism in the Nineteenth Century* (London, 1982), pp. 123–80.

[68] As James Brophy has suggested, attitudes to state intervention within business circles were not always hostile, particularly in the wake of the 1873 *Gründerkrach* and ensuing depression, which directly impacted the value of railway stocks: J. M. Brophy, *Capitalism, Politics, and Railroads in Prussia, 1830–1870* (Columbus, 1998), pp. 168–72; cf. also D. Ziegler, *Eisenbahnen und Staat im Zeitalter der Industrialisierung: die Eisenbahnpolitik der deutschen Staaten im Vergleich* (Stuttgart, 1996).

[69] BHStA, GDVA 234, Gumbart to MA, 20 Mar. 1873.

[70] Wessel, *Entwicklung des Nachrichtenwesens*, pp. 293, 298.

[71] *Rückblick auf das erste Jahrhundert der Kgl. Bay. Staatspost (1.3.1808 bis 31.12.1908)*, ed. Kgl. Bay. Staatsministerium für Verkehrsangelegenheiten (Munich, 1911), p. 253; BHStA, MA 109800, Gumbart to MA, 22 Apr. 1873.

in larger towns spawned an array of subsidiary branches—'*Zweigstellen*' or '*Filialbüros*'—which often reflected the changing social composition of the telegraph's user base. Munich's new central *Telegraphenstation* was connected to former offices in the *Hauptpostgebäude* (Central Post Office) and *Börsengebäude* (Stock Exchange), which were now subordinated to it.[72] In Bremen, new suburban branches reflected the growing importance of its manufacturing districts.[73] In Elberfeld and Barmen, whose populations were stretched out along a considerable portion of the Wupper River, small offices were set up at regular intervals through the valley.[74]

In towns themselves, efforts were made to ensure the reliable and uninterrupted flow of information across urban space. In Munich, for instance, a contract was established with Zechmeister's *Stadtomnibus-Institut*, enabling telegraph messengers to use the omnibus service which was to 'traverse the entire city in every direction at intervals of 15 minutes'. Within the city limits, the institute was contractually obliged to deliver telegrams into the hands of the addressee within thirty minutes of the messenger's receipt of the message.[75] In some metropolises, the human element of communication was bypassed as far as possible. From the 1860s, messengers were replaced with pneumatic telegraphs, or posts (*Rohrposten*), consisting of underground pipes through which small containers could be sent from one city office to another. These appeared in Berlin in 1865, in Vienna in 1875, and Munich in 1877, and in 1879 the *Senat* in Bremen granted the entrepreneur Carl Westenfeld a concession to establish a private urban telegraph network.[76]

Telegraphic circuits also came to underpin urban security as 'fire telegraphs' (*Feuertelegraphen*) were built throughout Germany. Siemens & Halske had introduced the concept in Berlin as early as 1851, but only later did the installation become widespread. In 1860, an urban signalling network was built in Stuttgart, with the municipal police department at its centre, to which were connected two of the city's church towers, the commander of the fire department, and a number of other strategically placed watch points.[77] This system facilitated the signalling of any outbreaks of fire and the coordination of responses to them, and could be used for policing purposes if necessary. *Feuertelegraphen* were introduced in Breslau in

[72] BHStA, MA 109800, GDVA to MA, 22 Apr. 1877.

[73] HKBA, MA P II 1, Bd. 3, 'Statistische Angaben über den telegraphischen Verkehr für das Jahr 1877'.

[74] Stadtarchiv Wuppertal, E V 22, Manuscript zum Verwaltungsbericht für das Jahr 1877.

[75] BHStA, GDVA 454, 'Uebereinkommen zwischen der Telegraphen-Central-Station München und dem Stadt-Omnibus-Institute', 11 Nov. 1871.

[76] Matschoβ, *Werner Siemens*, pp. xliii–iv; 'Ueber pneumatische Anlagen zur Depeschenbeförderung', *DPJ*, 227 (1878), pp. 39–49; BHStA, MA 109800, Gumbart to MA, 27 July 1877; StAB, 6,40–K.4.c., Mittheilung des Senats, 24 June 1879.

[77] *Deutsche Feuerwehr-Zeitung*, 22 Mar. 1861.

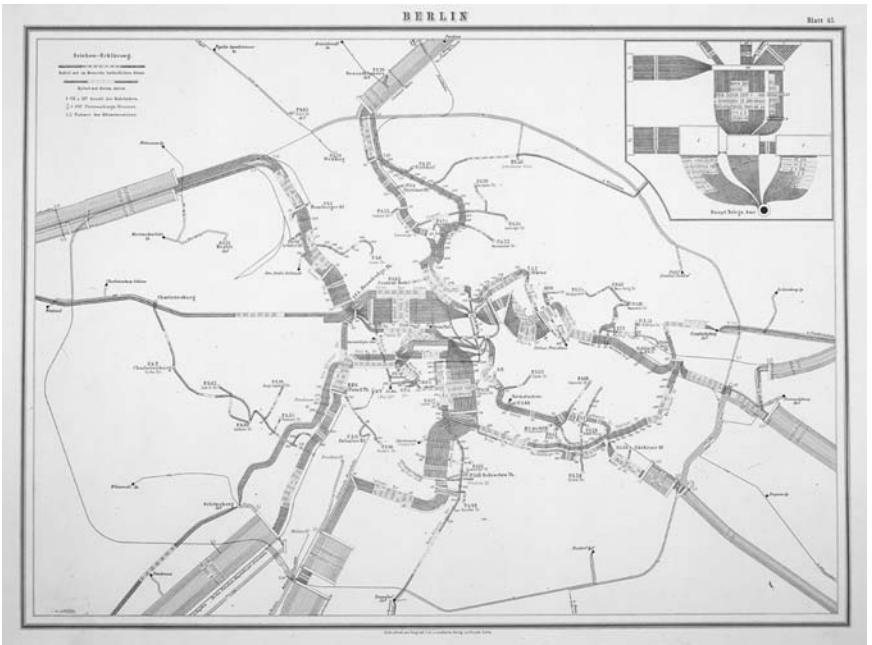

Figure 6.1 Map of the telegraph network in Berlin, 1881. Reproduced with the kind permission of the Museumsstiftung Post und Telekommunikation.

1865, Nuremberg in 1869, Augsburg and Aachen in 1871, Hamburg in 1872, Elberfeld in 1874, Frankfurt am Main in 1875, Barmen in 1876, and the list goes on.[78] (See Figure 6.1 for a map of the telegraph network in Berlin.)

The power of telegraphic foresight was also applied to that great disruptor of everyday life—the weather. As early as 1850, the physicist Georg Ohm had suggested that the telegraph might be used to collect information on weather conditions, as well as other scientific observations.[79] In the 1870s, the importance of a regular telegraphic meteorological reporting system was raised in the *Reichstag*, particularly 'the national-economic value of reliable and prompt weather predictions' which enabled agriculturalists to adapt to changing conditions.[80] The regularity and reliability of information exchange which had primarily served business circles now extended to the countryside, and by 1881 services providing regular meteorological reports existed in both the Reich and Bavaria.[81]

[78] Stadtarchiv Wuppertal, G VIII 41, Brandrath Barmen: 'Bericht über die Anlage eines Feuer-Telegraphen', 26 Feb. 1878; 'Der Frankfurter Feuertelegraph', *Museums-Depesche: Informationsschrift des Feuerwehrgeschichts- und Museumsvereins Frankfurt am Main e.V.*, 20 (Dec. 2014), pp. 3–14; see also *Deutsche Feuerwehr-Zeitung*, 22 Mar. 1861.

[79] BHStA, MH16802, Ohm 'Gutachten zum Bericht der Eisenbahnbau Commission', 21 June 1850.

[80] *VDR* (1879), 26 Mar. 1879, p. 619.

[81] Wessel, *Entwicklung des Nachrichtenwesens*, pp. 182, n. 206, 255.

What the telegraph could do for social life, moreover, it would also do for the state. In a characteristically conservative understanding of progress, the deputy Eduard Georg von Bethusy-Huc asserted that the telegraph's 'principal value is not to be sought only in its speed, rather especially also in the absolute security and reliability of its functions. If this is already the case for the ordinary business correspondence of the public, so it will be all the more applicable when considering the question of the Reich's diplomatic mission; to incidents . . . from which nobody can protect us with certainty.'[82] The telegraph was thus to structure both state and society. As one *Reichstag* deputy put it, the laying of underground cables projected by Heinrich Stephan was crucial in order that these 'nerves which traverse the Empire, these sensitive blood vessels, be protected from a chill'.[83]

Time itself began to spill out of the confines of railway stations and telegraph offices, channelled through the electric wires into public spaces. The new telegraph office projected for Nuremberg was to contain both a 'meteorological station' and an electric clock.[84] As one report from the Vienna World's Fair in 1873 emphasized, '[i]t is now possible, with the help of electricity, to transfer the precision of a scientifically controlled astronomical pendulum clock to a whole system of clocks, not only in railways, post offices, stock exchanges, large administrative buildings, etc., but also in the streets and on the squares of large towns, and thereby to create a reliable and precise management of time for the complicated activities of large centres of population and administration.'[85]

Under Heinrich Stephan's stewardship, indeed, the revolution in communication appeared to be spreading to all Germans, regardless of social and geographical divisions. By 1878, almost half of the 34 million marks assigned to the project had been spent, the total number of publicly accessible telegraph offices within the imperial network had risen from 2,615 in 1871 to 6,842, and some deputies were calling for the tempo of construction to be moderated.[86] But Stephan believed that a further 850 stations should be built, and in an address to the Reichstag he waxed lyrical about the capacity for telegraphy to serve the needs and wishes of all Germans, urban and rural:[87]

> [T]hink of the distilleries, brickworks, sugar plants, and then of the foundations of the wool industry, the breeding of sheep, the cattle trade, cereal trade, wood trade; all of this creates considerable long-distance exchange . . . And family interests too! How many families in the countryside have had to send their children to distant schools, *Gymnasien* and universities; their sons to the army,

[82] *VDR* (1879), 24 Mar. 1879, p. 576. [83] Ibid., p. 579.
[84] StAN, D4 158, Magistrat to Handelsvortand, 12 Mar. 1869.
[85] Anonymous, 'Die elektrischen Uhren auf der Wiener Weltausstellung', *DPJ*, 209 (1873), pp. 461–4.
[86] Wessel, *Entwicklung des Nachrichtenwesens*, p. 285. The figure includes railway telegraph offices, with numbers increasing from 1,485 in 1871 to 2,699 in 1878; *VDR* (1878), 28 Mar. 1878, pp. 565–6. By 1879, 18 million marks had been spent: *VDR* (1879), 24 Mar. 1879, p. 578.
[87] *VDR* (1878), 28 Mar. 1878, p. 567.

> etc., and there can be instances in which it is a matter of dear interest, of peace of mind, of life and death, in which the most rapid transmission of news is of decisive importance . . . Think further, gentlemen, of instances where a doctor is called in all haste! . . . There are celebrations in the countryside; why should these be deprived of the comforts of the big cities?[88]

His concerns extended beyond the merely practical, moreover: 'that which belongs to the beautification and the allure of life does not seem to me to be a matter of indifference in ethical and cultural terms . . . the clergy in the countryside tend to telegraph quite a lot . . . there the telegraph sustains the currents of intelligence. With the telegraph, you give these places a tongue.'[89] (See Figure 6.2 for a portrait of Heinrich Stephan.)

Figure 6.2 Portrait of Heinrich Stephan, original by Anton Weber, *c.*1875. Reproduced with the kind permission of the Museumsstiftung Post und Telekommunikation.

[88] *VDR* (1879), 28 Mar. 1878, p. 569. [89] Ibid.

Heinrich Stephan's triumphant tone reaffirmed his belief in the transformative power of telegraphy as a means of connecting all people and places. In providing this service equally to rich stockbrokers and lowly peasants, the state was taking liberal principles one step further. *Verkehr* was recognized not only as intrinsic to economic activity but as a social and cultural force. The telegraph, as Stephan imagined it, was now to bring progress and security to all Germans.

6.3 The Telegraphic Sphere

In 1873, roughly 80 per cent of the 9,077,000 telegrams sent by Germans within the Reich's telegraphic jurisdiction were destined for correspondents within the same space. Of the remaining 1.5 million telegrams, almost a quarter were addressed to stations in Bavaria or Württemberg, and a further quarter to offices in Austria and Hungary. Well over four-fifths of telegraphic correspondence, therefore, remained confined to what might be described as a '*großdeutsch*' sphere of communication. The most popular truly 'international' destinations for telegrams, meanwhile, were France (excluding occupied territories, 2 per cent of all telegrams sent, or 192,550), Great Britain and Ireland (1.6 per cent, or 146,779), followed by the Netherlands, Russia, Belgium, and Switzerland, in descending order. Around 11,000 telegrams were sent to 'America' in 1873, and 43 to Australia.[90] By the early years of the *Kaiserreich*, therefore, telegraphic communication within a loosely defined Central European sphere had taken on significant dimensions, but the emerging global network served only a very small minority.

6.3.1 Finance and Trade

In 1873, the year that witnessed the *Gründerkrach*, the four principal hubs of communication within the Reich's telegraphic jurisdiction were Berlin, followed by Frankfurt am Main, Cologne, and Hamburg, cities of clear commercial as well as demographic and political significance. Of the roughly 5.5 million telegrams which passed through Berlin in 1873, just over 1 million had been sent from or to the stock exchange alone. In fact, almost 8 per cent of all the telegrams sent across Germany in 1873 had emanated from the Berlin stock exchange itself.[91] While there is no corresponding statistic for Frankfurt, it can be assumed that a large proportion of the 2.2 million telegrams handled there also passed through the

[90] GStA PK I HA Rep. 120 A XIV, Nr. 9, Bd. 2, *Statistik des Verkehrs der Stationen des Deutschen Reichs-Telegraphen-Gebietes pro 1873*, p. 60.

[91] That is to say, the *Kaiserreich* excluding Bavaria and Württemberg.

stock exchange.[92] Finance and trade, as a sector, continued to occupy a disproportionately large share of the available telegraphic bandwidth.

Indeed, while Heinrich Stephan was increasingly eager to couch his infrastructural revolution in the rhetoric of a general public good, throughout the 1870s efforts continued to be made to accommodate the needs of the commercial elite. There already existed, for instance, a direct connection between the stock exchange in Berlin and that in Frankfurt am Main, as well as a selection of other 'important *Börsenplätze* in Northern Germany', and the decade witnessed the expansion of such dedicated channels for the circulation of financial information. The chamber of commerce in Cologne, for instance, regretted that they did not possess a direct line to the capital's stock exchange, whose building, it was explained, did not have sufficient space to accommodate an extra connection.[93] This neglect was soon put right, at which point, however, the business community in Elberfeld in turn complained that its recently acquired connection to Berlin—paid for by local inhabitants—was not as reliable as that to Cologne—stock prices from the capital city were reaching the city over two and a half hours after their dispatch.[94]

The emerging system of arteries connecting major centres of finance and trade across Germany and Europe threatened to exclude historically significant but now declining stock exchanges such as Augsburg. The Chamber of Commerce there complained that '[t]elegrams sent in the morning to Vienna and Berlin often receive a reply by night time or the next morning . . . and telegrams sent at the closing of the stock exchange in Frankfurt often do not arrive here on the same day'. The very 'existence and capacity of a second-rank exchange depends principally upon the fact that it is in continuous and the promptest contact with the price fluctuations of the leading trading emporia', it explained.[95] Just as in Cologne and Elberfeld, the representatives of the Augsburg *Börse*—currently connected to Frankfurt by a telegraph line passing through Nuremberg—asked that direct lines be established between Augsburg and Munich, Frankfurt, and Hof (towards Berlin).[96]

In Bavaria too, indeed, the demands of the financial elite were placing disproportionate pressure upon the management of the network as a whole. Describing the situation in Augsburg, one official stated that 'the *Börse* provides at most four percent of all correspondence, but requires a much speedier transmission of its telegrams than all other branches of communication, due to the task of completing

[92] GStA PK I HA Rep. 120 A XIV, Nr. 9, Bd. 2, *Statistik des Verkehrs der Stationen des Deutschen Reichs-Telegraphen-Gebietes pro 1873*, pp. 26 and 54.

[93] GStA PK I. HA Rep. 120 A XIV, Nr. 9, Bd. 1, Itzenplitz to HK Cöln, 27 Nov. 1870.

[94] See, for example, GStA PK I. HA Rep. 120 A XIV, Nr. 9, Bd. 2, *Elberfelder Zeitung*, 27 Nov. 1874.

[95] BHStA, GD der VA 450, 'Bericht der Handels- und Gewerbekammer von Schwaben und Neuburg', 5 Sept. 1872.

[96] BHStA, GDVA 450, Bericht der TStation Augsburg Stadt to GDVA, 27 Sept. 1872.

its business during a trading day, or even to operate on two stock exchanges at the same time'.[97] As far as he was concerned, 'the telegraph administration should not be particularly inclined to expand its means—which suffice for commercial and family telegrams—to the benefit of the stock exchange which offers no equivalent in terms of mass usage outside the stock exchange's business hours'.[98]

The gradual installation of secure, direct intercity connections for the benefit of the business community was a pan-European phenomenon. Efforts had been made, for instance, to reach an international agreement allocating certain lines to the '*Börsenpublikum*' during business hours, and at a higher tariff.[99] The Dutch telegraph administration, meanwhile, sought to build a direct line between Vienna and Amsterdam 'in the interest of the not insignificant stock exchange correspondence'.[100] As will be shown below, the emergence of a privileged, transnational 'telegraphic elite' across Europe and beyond would become a source of tension in political discussions, particularly after the stock market crash of 1873.

It remains exceedingly difficult to establish whether the telegraph alleviated or exacerbated the effects of the *Gründerkrach* itself. As Hannah Catherine Davies has demonstrated, the technology's role in the economic meltdown of 1873 was perceived differently by journalists and market actors in different locations on both sides of the Atlantic. On the one hand, the telegraph allowed some traders in Vienna and Berlin to react swiftly to news of the failure of the American bank Jay Cooke & Company, which had been involved in financing the Northern Pacific Railway. From this perspective, the technology appeared to fulfil the expectation that it would act as a stabilizing force in an interconnected global capital market. On the other hand, the influx of multiple, at times contradictory, telegraphic 'sound bites' from across the Atlantic left German journalists with an almost impossible task in seeking to untangle the course of events, contributing to the image of chaos caused by the panic itself.[101]

Whatever the perspective adopted, the crisis highlighted the technology's role in connecting markets across the globe. Statistics compiled by the imperial telegraph administration directly attributed a dip in the volume of traffic in 1857 to the 'business calm as a result of the monetary crisis', and as the 1873 crisis was followed by a 1.7 per cent reduction in telegraphic correspondence—postal exchanges remaining unaffected—similar conclusions could be drawn.[102] The journalist and economist Max Wirth observed that, already in 1857, 'the telegraphs hurled the bad news . . . across all European places of commerce', and

[97] BHStA, MV I 2069, Gumbart to HM, 30 Sept. 1872. [98] Ibid. [99] Ibid.
[100] BHStA, GDVA 234, Hauptdirection der Niederländischen Staatstelegraphen to GDVA, 16 July 1873.
[101] H. C. Davies, 'Spreading Fear, Communicating Trust: Writing Letters and Sending Telegrams during the Panic of 1873', *History and Technology*, vol. 32, no. 2 (2016), pp. 159–77. See also R. Radu, *Auguren des Geldes: Eine Kulturgeschichte des Finanzjournalismus in Deutschland, 1850–1914* (Göttingen, 2017), esp. pp. 114–54.
[102] Hesse, *Im Netz der Kommunikation*, p. 57.

since then international exchange had intensified.[103] This had also been fuelled by the railways, steamships, and reform of the postal system, but all, he emphasized, 'stand in the shadow of the almost magical development of the telegraph, this most fairy-tale-like of all means of communication'.[104] 'Year on year', he added, 'that network is being drawn tighter around the earth which carries the winged word from place to place, from coast to coast, and links our thoughts to those in our antipodes.'[105] Whether it diffused panic or facilitated rational responses to crises, the technology appeared to be accelerating economic feedback mechanisms across the globe.

And so the world of finance's appetite for telegraphic communication continued to grow unabated after 1873, as German business slowly began to turn its attention overseas. Writing to announce the opening of a telegraphic connection between the 'states of La Plata' and Europe, the German Minister-Resident in Buenos Aires assured Bismarck that 'European capital will more easily be brought to find a place [there . . .] when it can monitor the [stock prices] telegraphically'. As the official noted, given the high cost of the service—around 80 thaler for twenty words from Buenos Aires to Germany—this scale of communication and investment was limited to 'large businesses'.[106] Nevertheless, it placed a new market in South America more firmly on the horizon.[107]

The growth of international finance placed pressure upon administrations to ensure the speed and reliability of telegraphic communication. The telegraphic ticker had already made its appearance across the Atlantic in the late 1860s and was introduced to continental Europe over the following decades, but in the meantime the Reich administration collaborated with representatives of the stock exchanges in Berlin, Hamburg, and Frankfurt to streamline interactions. A new standardized form (*Formular*) to be filled out when executing transactions, for instance, was said to save around 50 per cent in time and labour.[108] Other proposed reforms, which might impinge upon traders' privilege, were not well received, however. The suggestion to open up the telegraph lines dedicated to stock exchanges for general correspondence outside the trading hours of 11 a.m. to 3 p.m. were opposed on the grounds that businessmen carried out important transactions during the '*Früh-*' or '*Vorbörse*'—lines were to remain open at all

[103] M. Wirth, *Geschichte der Handelskrisen*, 2nd edn. (Frankfurt am Main, 1874), p. 381.
[104] Ibid., p. 444. [105] Ibid., p. 450.
[106] Bundesarchiv Berlin-Lichterfelde, R901, Nr. 16206, Kaiserlicher Minister-Resident in Buenos Aires to Bismarck, 6 Aug. 1874.
[107] C. Torp, *The Challenges of Globalization: Economy and Politics in Germany, 1860–1914*, trans. A. Skinner (New York, 2014), esp. pp. 33–40.
[108] U. Stäheli, 'Der Takt der Börse: Inklusionseffekt von Verbreitungsmedien am Beispiel des Börsen-Tickers', *Zeitschrift für Soziologie*, vol. 33, no. 3 (June 2004), pp. 245–63; Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, Telegraphen-Direction Berlin to General-Direction der Telegraphen, 15 Sept. 1875; Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, Kaiserliche General-Direction der Telegraphen to Telegraphen-Direction Berlin, Hamburg and Erfurt, 17 Aug. 1875.

times.[109] The *Aeltesten der Kaufmannschaft* in Berlin, meanwhile, fought in vain to maintain the privilege of having telegrams delivered to their place of business when addressees could not be found at the stock exchange, an agreement they had negotiated with the administration in 1863.[110]

Often, seemingly trivial matters became a source of contention when they concerned the precious extra seconds which traders faced in making their transactions. Thus, the *Börsenzeitung* complained that too much time was now being lost buying stamps to send telegrams at the stock exchange, where customers had previously been able to run up a tab and pay later.[111] In Bremen, customers at the stock exchange had flat out refused to adopt the practice.[112] The telegraph thus helped to fuel the perception of stock exchanges as spaces of chaotic busyness. 'On days when, for whatever reason, the markets are subject to strong fluctuations', the Oberpostdirector in Berlin complained, 'telegrams are scribbled down and handed over by the public at the stock exchange with unmistakable haste and precipitousness, and not rarely amended once again just as they are handed in'.[113]

Financial transactions across Europe as a whole were further facilitated by a policy introduced at the 1875 conference of the International Telegraph Union in St Petersburg, according to which private telegrams could henceforth be marked as 'urgent' and given priority in international transmission. Although this theoretically applied to any form of private correspondence, the triple tariff charged for this privilege placed a further premium on speed and time which remained in the hands of a transnational financial elite.[114] Interestingly, the regulation had been rejected by a number of countries at the first conference of 1865, and it remained contentious throughout the 1870s. It was almost immediately introduced in France and Germany, it seems, but the British, in particular, refused to implement it into the 1880s, on the grounds that no private dispatches could be prioritized over others.[115]

By 1879, the Austrian minister of trade stated that 'urgent' dispatches were to be allowed on a trial basis in the Habsburg lands, though only 'for correspondence between the stock exchange offices which are linked by direct lines'. That such a

[109] Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, Kaiserliches General-Telegraphen-Amt to kaiserliche Oberpostdirektion, 14 Mar. 1876; Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, Oberpostdirector to General-Telegraphen-Amt, 17 Apr. 1876.

[110] Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, Oberpostdirector to 29 June 1876.

[111] Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, *Börsenzeitung*, 21 Apr. 1879.

[112] HKBA, MA—P II 1, Bd.2, Oberpostdirektor to Praeses der HK, 29 Nov. 1876; HKBA, MA—P II 1, Bd. 2, Oberpostdirektor to Praeses der HK, 6 Jan. 1877.

[113] Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 2133, 'Verfahren des Telegraphenamts im Börsengebäude', 30 Nov. 1878.

[114] *Documents de la conférence télégraphique internationale de St-Pétersbourg* (Bern, 1876), Article XLIV, pp. 53–4.

[115] According to a letter from the Directeur Général des Télégraphes to the Direction Générale des Télégraphes de l'Empire, 4 Jan. 1879, Bundesarchiv Berlin-Lichterfeld, R4701, Nr. 9864. Cf. letter to HK Hamburg, Bundesarchiv Berlin-Lichterfelde, R4701, Nr. 9864.

policy was of particular utility to the world of finance was highlighted by the response from the Reich telegraph administration. Given that only Berlin and Frankfurt possessed a direct connection to Vienna, it was pointed out that '[t]here are also a large number of important *Börsenplätze* whose correspondence with Berlin takes place directly from exchange to exchange during trading hours… namely, the stock exchanges in Cologne, Bremen, Dresden, Hamburg, Königsberg i/P, Leipzig and Stettin, as well as foreign exchanges as in Paris, ~~London~~ [struck through in the original] and Brussels….'[116] Together, these hubs constituted Europe's network of financial urgency.

6.3.2 News and Public Opinion

The war of 1870 had sealed the alliance between the Prussian, now imperial, government and Germany's principal telegraphic news agency, Wolffs.[117] The agency's display of patriotism in the campaign to win over national and international public opinion during the conflict secured its place in Bismarck's general strategy of media manipulation during the 1870s, famously financed by the 'Guelph fund' which had been inherited from a defeated Hanover in 1867 and was now at the chancellor's disposal.[118] Not only did the agreement between the agency and the government ensure the latter's ability to control the principal source of news for the domestic press, the resumption of the cartel between Havas, Reuters, and Wolffs—which was now granted control over newly annexed Alsace-Lorraine—provided it with a tool to help shape international public opinion.[119] Encouraged by his experience in this field during the war, Bismarck collaborated with Wolffs to establish an outpost in London, 'Schlesingers Correspondenz', which was to help disseminate information to the British press.[120]

Wolffs was now in a position to secure its monopoly over Central Europe. After initially refusing to renew its contract with the Austrian *K.K. Korrespondenz-Bureau*, the latter's dependence on news from its powerful northern counterpart forced it into a thoroughly subordinate position. Relations between the two agencies were re-established, on the condition that the Austrian bureau pay an indemnity for its breach of contract, and that it agree to hand over all its telegrams to Wolffs, while having to paying for the privilege of news in

[116] Bundesarchiv Berlin-Lichterfelde, R4701, Nr. 9864, Kais. Deutsches General-Telegraphen-Amt to K.K. Handelsministerium Section für Posten und Telegraphen, 8 Nov. 1879.

[117] Technically then the Continental-Telegraphen-Compagnie.

[118] K. Koszyk, *Deutsche Presse im 19. Jahrhundert* (2 vols., Berlin, 1966), i, pp. 229–50; S. H. Stehlin, 'Bismarck and the Secret Use of the Guelph Fund', *The Historian*, vol. 33, no. 1 (Nov. 1970), pp. 21–39.

[119] Nalbach, 'Ring Combination', p. 174.

[120] D. Basse, *Wolffs Telegraphisches Bureau 1849 bis 1933: Agenturpublizistik zwischen Politik und Wirtschaft* (Munich, 1991), p. 43.

exchange.[121] Henceforth, the Austrian agency struggled to maintain its position on the international news market. A new, if weak, competitor briefly emerged in Austria itself—the 'AG Globus' offered its services to the German government, citing, in particular, the *K. K Korrespondenz-Bureau*'s anti-Prussian policy during the Franco-Prussian War.[122] An attempt by the banker Louis Haber to turn the state agency into a joint-stock corporation, meanwhile, was turned down by the Austrian Ministry of Commerce, on the grounds that this would reduce the state's influence over the dissemination of news, as well as over the rather volatile Viennese stock exchange.[123] Only with the emergence of the 'Eastern Question' in the late 1870s would the *K.K Korrespondenz-Bureau* become an important source of information on the Balkans.[124]

The alliance between Wolff and the government, meanwhile, became an additional tool in the clampdown on the Catholic Church during the *Kulturkampf* initiated in 1873. The *Kölnische Volkszeitung*, for instance, claimed that a telegram sent by the Catholic '*Wandererversammlung*' to Cardinal Antonelli, the Vatican's Secretary of State, had been blocked by the authorities.[125] In 1876, Prince Radziwill wrote to the administration to defend a priest's use of Latin in a telegram to Cardinal Ledochowski, who had been imprisoned and later banished from the *Kaiserreich* for opposing his dismissal by the authorities. The telegram, the authorities revealed, opposed the election of a new priest who had not been approved by the local archbishop.[126] When the head of the telegraph administration, Colonel Meydam, complained that the distribution of free political telegrams to newspapers was both costly and an affront to Wolffs' monopoly, the Minister of the Interior replied that the publication in question needed such preference to help combat the ultramontane press in Westphalia.[127]

From the outset, however, the supranational nature of telegraphic news distribution, and of the 1870 news cartel itself, had constituted a potential source of tension in the state's relationship with Wolffs. In 1874, the organization reconstituted itself as a publicly listed *Aktiengesellschaft*, without consulting the government, whose direct involvement in the management of the firm had been guaranteed by the agreement of 1869.[128] As the global news cartel expanded to include the American Associated Press, meanwhile, rumours of a fusion of Reuters and Wolffs in 1875 led Bismarck's close ally in the foreign office,

[121] Dörfler and Pensold, *Die Macht der Nachricht*, pp. 198–200.
[122] GStA PK III MauswA II, Nr. 8117, Prospectus AG Globus with draft note to Philipsborn, 12 Dec. 1870.
[123] Dörfler and Pensold, *Die Macht der Nachricht*, pp. 200–1.
[124] Nalbach, 'Ring Combination', p. 193.
[125] Bundesarchiv Berlin-Lichterfelde, R4701, Nr. 2027, Kais. Telegraphen-Direktor Cöln to Kais. General-Direktion der Telegraphen Berlin, 10 Jan. 1873.
[126] Bundesarchiv Berlin-Lichterfelde, R4701, Nr. 2027, Report, Oberpostdirector, 25 Sept. 1877.
[127] GStA PK, I. HA Rep. 77, MInn, Tit. 845, Nr. 51, MInn to Meydam, 12 Dec. 1870.
[128] Nalbach, 'Ring Combination', p. 225.

Bernhard von Bülow, to question the government's relationship with the agency.[129] The agency had complaints of its own, particularly regarding the time which the state administration was taking to verify telegrams before authorizing their publication, no doubt fuelling its desire to emancipate itself from the government's tutelage.[130]

As the prospect of renewing the government's ten-year contract with Wolffs appeared on the horizon, therefore, questions were raised regarding existing arrangements. Bismarck and Wolffs' quasi-agent in London, Schlesinger, had established ties to *The Times* and had begun to take an independent stance on certain matters. Schlesinger's criticisms of Gladstone, for instance, were seen to be damaging Anglo-German relations. When he began to stimulate rumours of hostilities between Germany and France, an investigation was launched into his operations, which revealed that the Austrian ambassador to London—and former Minister-President for the Habsburg monarchy—Ferdinand von Beust had gained influence over Schlesinger.[131] The memorandum which resulted from these inquiries addressed the government's relationship with Wolff in general. The latter, it was purported, had displayed a reluctance to support government policy and had reached agreements with Reuters and Havas instead of combatting their influence.[132]

As a result, the formal treaty between Wolffs and the government was not renewed in 1879. Bismarck's efforts to establish a new, tighter agreement with Wolff which excluded Schlesinger were opposed by the agency's representatives. In the end, in fact, Bismarck insisted on maintaining a purely informal agreement to cooperate with Wolffs. Doing so allowed Bismarck to avoid seeking the parliament's approval for expenditures in this field, but it also reduced his ability to control the publication of problematic telegrams even in his own, favoured *Norddeutsche Allgemeine Zeitung*.[133] Although the schism of 1879 by no means signalled the end of the alliance between the German government and Wolffs, it had highlighted the complexity of monitoring the increasingly international circulation of information, and the large corporations that regulated it.

The ties between the government, finance, and Wolffs were not lost on the public. Bismarck's banker, Gerson Bleichröder, who had helped finance the restructuration of Wolffs in 1865—like his counterpart in France, the Baron d'Erlanger, who invested in Havas—was accused of meddling with the

[129] GStA III MauswA II, Nr. 8117, Bleichröder to MA, 20 Feb. 1875; GstA III MauswA II, Nr. 8117, Bülow to MA, 10 Mar. 1875.

[130] GStA III MauswA II, Nr. 8117, CTC Vertreter to Legationsrat, 12 Apr. 1875; Basse, *Wolffs Telegraphisches Büro*, p. 44.

[131] E. Naujoks, 'Bismarck und das Wolffsche Telegraphenbüro', *Geschichte als Wissenschaft und Unterricht*, vol. 14 (1963), pp. 605–16.

[132] GStA III MauswA II, Nr. 8117, 'Promemoria, das Wolff'sche Telegraphen-Bureau betreffend', 26 Apr. 1876.

[133] Naujoks, 'Bismarck und das Wolffsche Telegraphenbüro'.

distribution of news to influence the course of the stock market.[134] The *Allgemeine Zeitung*, meanwhile, complained of undue censorship when it was refused a telegram reporting the dissolution of the *Reichstag* in 1878, a fact it threatened to share with its readers.[135] Even the Saxon government, it seems, colluded with Reuter in an effort to counterbalance Wolffs' influence on the news.[136] These issues continued to be discussed by those attending the *Journalistentage* in the early years of the decade, who agreed on the need for more liberal press laws and proposed establishing an independent telegraphic news agency: 'It is the German press's duty', one member explained, 'to liberate itself from the semi-official dependency of the telegraphic bureaus.'[137]

In the third edition of his 'Contribution to the History of the Press', published in 1875, Heinrich Wuttke redoubled his attacks on the telegraphic news agencies, and Wolffs in particular. 'Wolffs *Telegrammbüreau* in Berlin,' he wrote, 'which speaks daily in almost all German newspapers, was once favourable to the hegemonic or Prussian party, and unfavourable to the *großdeutsch* [party], such that it telegraphed to all the world the essential points of the products of the Prussian central press bureau, whose irrelevant views were received everywhere like the sayings of the oracle. Its connection with the authorities in Prussia is concealed only to superficial observers....' Wuttke was concerned that 'many readers still believe today that a telegram has greater significance than an ordinary newspaper report. Telegrams still evoke a blind faith. The sensible reading public must numb itself to them and learn to view them with mistrust.'[138]

6.3.3 Distant Connections, Local Realities

By the 1870s, the telegraph offices in thousands of German towns and villages were channelling myriad local, regional, and international exchanges. Wood merchants in the small village of Unterrodach in northern Bavaria were now concerned to keep up with 'the value of paper money [which] often suddenly increases or falls as a result of apparently insignificant incidents'.[139] In Traunstein, towards the foothills of the Alps, meanwhile, it was hoped the technology would

[134] Nalbach, 'Ring Combination', p. 238; on Bleichröder and his involvement with the 'fourth estate', see F. Stern, *Gold and Iron: Bismarck, Bleichröder and the Building of the German Empire* (London, 1977), pp. 262–79.

[135] Bundesarchiv Berlin-Lichterfelde, R4701, Nr. 2027, Gumbart to Kais. Telegraphenamt Berlin, 9 June 1878.

[136] Nalbach, 'Ring Combination', p. 217.

[137] *Bericht des Vororts Breslau über die Verhandlungen des sechsten deutschen Journalistentages* (Breslau, 1872), p. 40; R. Keyserlingk, *Media Manipulation: The Press and Bismarck in Imperial Germany* (Montreal, 1978), pp. 15–17.

[138] H. Wuttke, *Die deutschen Zeitschriften und die Entstehung der öffentlichen Meinung. Ein Beitrag zur Geschichte des Zeitungswesens*, 3rd edn. (Leipzig, 1875), pp. 177–8.

[139] BHStA, MH 16873, Postexpeditor Unterrodach to HM, 24 Oct. 1870.

support local responses to major health epidemics—cholera, in particular—by enabling the district doctor and police to act quickly: 'in these cases, intervention, for example by examining the cause of death, ordering the burial, disinfection, etc. must happen in the first instance'.[140] Caspar Honegger, owner of the 'Spinnerei, Weberei, Maschinenfabrik Kottern' outside Kempten, depended on the service to help him face 'the great competition, which is already developing in our branch of the cotton industry', hinting at the changing global market in cotton after the end of the American Civil War, as Indian, Brazilian, and Egyptian producers pushed prices down.[141]

Telegraph offices thus occupied an increasingly important role in the everyday life of German communities. Through these offices, urban and rural Germans were connected to the channels of communication which were transforming the country, expanding markets, diversifying production, and, some feared, dissolving local communities by tying individuals to a broader network of social and economic relations. Indeed, the reconfiguration of local telegraph services to cater to a diversifying clientele highlighted the social divisions emerging within many cities, towns, and villages. But it also afforded the kind of new opportunities which, as Oliver Zimmer has shown, led to a reorientation of the local community within a 'modern' framework.[142]

In larger towns and cities, the reorientation of the telegraph service decentred the commercial elite within local networks of communication. The new central telegraph offices built during this period tended to be further removed from the stock exchanges in or near which they had originally been situated. In Bremen, the Reich administration's plan to move the office to the new *Oberpostdirectionsgebäude* provoked complaints on the part of the *Handelskammer*. 'The telegraph office was given its current place', it explained, 'on the one hand because it is at the centre of the town, but also because all trade correspondence is undertaken at the *Börse*, in particular during trading hours, and it is of vital importance for this correspondence . . . that it be in a position to use the telegraph at all times without losing any time.'[143]

Despite the *Handelskammer*'s complaints, the main telegraph office was indeed removed to the new post office building in 1878, but it was promised that a branch office would be established in the *Börse*. The administration insisted, however, that the space necessary for this installation be provided free of charge, 'based on the understanding that the installation of this subsidiary is not necessitated by

[140] BHStA GDVA 234, 'Ausgenommen vom Protocoll, Dr Urban, K. Bezirksgerichtsarzt, Bezirksamt Traunstein', 28 Aug. 1873.

[141] BHStA, MH 16873, Caspar Honegger, Vorstand der Spinnerei, Weberei, Maschinenfabrik Kottern, to HM, 1 Mar. 1870; S. Beckert, *Empire of Cotton: A New History of Global Capitalism* (London, 2014), pp. 274–311.

[142] O. Zimmer, *Remaking the Rhythms of Life: German Communities in the Age of the Nation-State* (Cambridge, 2013), esp. pp. 103–69.

[143] HKBA, MA—P II 1, Bd.2, Handelskammer to Generalpostamt, 8 May 1875.

general correspondence [emphasis in the original], rather is solely a measure for the benefit of the stock exchange's traffic'.[144] In effect, the interests of the local community as a whole were now being more clearly distinguished from those of the financial and mercantile elite. The *Handelskammer* reluctantly accepted this compromise, insisting that urgent telegrams nonetheless always be forwarded to the new central office 'immediately after being handed over, without waiting for other telegrams to be collected'.[145]

To a great extent, it was the symbolic demotion of the mercantile elite in Bremen which caused frustration, as demonstrated when complaints regarding the practical consequences of the changes were statistically disproved by the administration.[146] Indeed, the reconfiguration of Bremen's network, both through the displacement of the *Börse* from its centre and the opening of new branches in the city's suburbs, was a direct challenge to its 'home town' traditions, which had long revolved around the merchant and shipping community.[147] By 1879, however, telegraphic traffic at the Bremen *Börse,* from which 19,500 telegrams had been sent, was considerably outpaced by that at the new central telegraph office, where the figure was 179,000. Alongside the central telegraph office, transmissions were now also being made from the offices in the surrounding districts of Neustadt, Horn, and Hastedt, albeit in small numbers at this stage.[148]

In Munich, meanwhile, Heinrich Gumbart recognized that the relocation of the *Telegraphenamt* to a building by the railway station '[brought] with it inconveniences for previously privileged classes within the population'. He therefore considered proposals for the introduction of a pneumatic post to connect the city's various offices.[149] As work got underway in 1876, it was recognized that this new network might also come to serve the urban community as a whole, and it was decided that the installation should be constructed so as 'later with the increase in Munich's population, to include the suburbs of Au, Haidhausen, Schwabing, and Sendling'.[150] When the installation was inaugurated a year later, it was announced that a transmitter and receiver had been established, on a trial basis, 'upon the urgent wishes of the local *Handelsgremium* . . . in the building in which the *Börse* is located'—a last-minute attempt to mollify the local elite.[151] (See Figure 6.3.)

[144] HKBA, MA—P II 1, Bd.2, Oberpostdirektor to Praeses der Handelskammer, 25 Aug. 1877.
[145] HKBA, MA—P II 1, Bd.2, J. Albers, Namens der Handelskammer to Oberpostdirektor, 21 Sept. 1877.
[146] HKBA, MA—P II 1, Bd.2, Kaiserliches Telegraphenamt to Präsident der Handelskammer, 10 June 1879.
[147] HKBA, MA—PII 1, Bd. 3, 'Statistische Angabe für den Bezirk der HK für das Jahr 1877'; HKBA, MA—PII 1, Bd. 3, 'Statistische Angabe für den Bezirk der HK für das Jahr 1879'.
[148] HKBA, MA—PII 1, Bd. 3, 'Statistische Angabe für den Bezirk der HK für das Jahr 1879'.
[149] BHStA, GDVA 234, Gumbart, 'Voranschlag über die zur Erweiterung des bayerischen Telegraphennetzes herzustellenden Linien', 25 Apr. 1873.
[150] BHStA, MA 109800, Gumbart to MA, 6 Feb. 1876.
[151] BHStA, MA 109800, Gumbart to MA, 22. Apr. 1877.

Figure 6.3 The Royal Telegraph Office, Bahnhofplatz, Munich. Woodblock print, 1876. Source: Bayerische Staatsbibliothek München/Bildarchiv.

As in Bremen, however, the symbolic displacement of a privileged social group within the network was just as important as its concrete implications. The utility of a pneumatic post installation in Munich was questioned in the Bavarian parliament, but as the former minister of trade, Gustav von Schlör explained, 'there are now some things in the world which are desired by public opinion with such determination and emphasis, that one cannot successfully oppose them in the long term, and I include among them the installation of a pneumatic connection between the *Centralstation* and the *Localstation*. Even if you prove by a hair's breadth and with mathematical certainty that the telegrams would not lose a minute if they were handed over to an omnibus, a messenger or a horse-drawn carriage . . . not a single person will believe you, and if only for this reason, this installation is necessary.'[152]

In Nuremberg, meanwhile, where industry played a more significant role, it was a broader alliance of businessmen which felt most threatened by changes to local infrastructure. In 1872, a petition from over 700 local businessmen (*Geschäftsleute*) was brought forward to complain of the recent transfer of the principal telegraph office to the central marketplace.[153] Ignoring statistical evidence to the contrary, the petitioners asserted that the majority of correspondence

[152] *VKA* (1873/5), 19 Dec. 1873, p. 116.
[153] Stadtarchiv Nürnberg, C11/I (KA 4), Nr. 389, Antrag der Kämmerei Commission, 10 Aug. 1872.

actually emanated from the now secondary, subordinate office at the railway station—that is to say, outside the city walls, where most industrial activity had developed.[154] They requested that a specifically *telegraphic* connection therefore be established between the two offices, as 'the carrying of telegrams to the main office by messengers, even if it takes place quickly and regularly, implies a loss of time relative to the previous transmission by telegraphic route'.[155]

Conflicts over local space had thus intensified since 1860. Then, the debates had centred upon the positioning of a single office which was to serve the needs of the entire community. As urban geography often reflected the socio-economic composition of a locality, the outcome had effectively privileged one professional group. By the 1870s, the communal nature of the telegraph was itself increasingly put into question, as multiple offices were built to serve the various needs of the population dispersed across an expanding urban environment, and the rifts between social groups were accentuated. The response, as these examples have shown, was to connect the various offices which were now opened in each town. The local 'telegraphic elites' of the preceding decades were thereby resituated within a new urban network of communication.

The manufacturing sector, meanwhile, stimulated a further individualization of the telegraph service, putting forward requests for the establishment of private, local telegraph lines. The objective was to help connect different branches of a given business, particularly where an individual's home, office, and manufacture were in separate locations. An ironmonger in Munich, for instance, wished to connect his home to his depot.[156] Both the Prussian and Bavarian governments had received such requests on occasion since the 1850s, and though official regulations on the matter remained unclear across Germany into the 1890s, an increasing number were approved. From the perspective of the authorities, the issue was to protect the state's monopoly over public telegraph lines, 'without unduly inhibiting the free movement of the individual in the realm of industry'.[157] These requests were therefore considered on a case-by-case basis, and generally approved if the lines in question began and ended on private property.[158]

Soon, however, requests were also presented asking for individualized connections to the state network itself. In Bavaria, the first such successful request was put forward by a spinnery in Blaichach, in the Allgäu region, in 1869. The manufacturer asked that the state provide a telegraph line between their establishment and the nearest telegraph office, a request which was approved on condition that the spinnery pay interest of around 10 per cent of the installation costs.[159] As a senior official in the Bavarian administration explained, its approval

[154] Ibid. [155] StAN, D4 158, Handelskammer Nürnberg to Stadt-Magistrat, 7 Aug. 1872.
[156] BHStA, MH 16876, HM to Regierung von Oberbayern, KdI, 29 Apr. 1863.
[157] BHStA, MH 16876, Dyck to HM, 2 Apr. 1863.
[158] BHStA, MH 16876, Circular, HM to Kreisregierungen, 27 Jan. 1863.
[159] BHStA, MH 16873, Gumbart to HM, 19 Jan. 1869.

was based on the example of Switzerland, where such installations had been allowed in order to bring 'a lively traffic' to isolated or disadvantaged locations and manufactures.[160] The practice was clearly of particular utility in regions of decentralized production such as Switzerland, or indeed western Bavaria, as a means of coordinating the acquisition, transformation, and distribution of goods among different actors. The Bavarian minister of trade therefore worried that 'a hundred private individuals [might] make claims to the same preferential treatment as the Spinnerei Blaichach, which is imaginable, even probable . . . '.[161]

And so, indeed, a growing number of private enterprises in the region reached arrangements with state and municipal governments in order to tailor the network to their needs. In 1870, the Swiss entrepreneur Caspar Honegger, evoked earlier, connected his isolated spinnery to the telegraph office in Kempten.[162] In 1873, the founder of the renowned Badische Anilin- und Soda-Fabrik (BASF), August Clemm, obtained a connection between his factory and the telegraph office in Ludwigshafen in order to avoid 'time-consuming messenger transport between both points'.[163] Further agreements were reached with the Leineck spinnery and a manufacture near Bayreuth, an iron foundry near Eisenberg, and a manufacture of printers near Würzburg.[164]

One particular request during this period led to the introduction of a crucial innovation which was to transform practices of communication in decades to come. The München-Dachauer Aktien-Gesellschaft für Maschinenpapier Fabrikation asked for permission to connect two branches of its business, one in Dachau and the other in a Munich suburb, to ensure 'quicker, direct and uninterrupted exchange' between them. Concerned that this constituted a private network parallel to the state's, in 1873 Heinrich Gumbart suggested that the two branches be connected *via* the Munich central office, which would effectively serve as a switchboard—the principle which was to support urban telephone networks from the late 1870s onwards.[165] Driven by the needs of a manufacturing sector eager to establish very localiz ed connections to the much larger network upon which it depended, it had developed the principle of the central switchboard through which eventually, in theory, any two individuals could be placed in contact.

[160] Ibid. [161] BHStA, MH 16873, HM to GDVA, 23 Jan. 1869.
[162] BHStA, MH 16873, Gumbart to HM, 5 Apr. 1870.
[163] BHStA, MA 109807, August Clemm of BASF to MA, 19 May 1873.
[164] BHStA, MA 109807, Gumbart to MA, 26 June 1873; BHStA MH 16873, Gumbart to HM, 23 May 1870; BHStA, MA 109807, Regierung Pfalz, Kammer des Innern, to MA, 18 Sept. 1878; BHStA, MA 109807, Gumbart to MA, 3 Apr. 1879.
[165] BHStA, MA 109807, Gumbart to MA, 20 Dec. 1873.

6.4 The Values of Time and Space

The consequences of the telegraph's uneven progression across Germany became the object of *Reichstag* debates on the transformation of society and the economy, when deputies were asked to approve the government's annual budget. Discussions generally revolved around the justification for an expansion of the network, the need to ensure that 'the desire for an extension of the telegraphic installations, so often emphasized by so many parties', in the words of Colonel Meydam, actually did reflect 'a widespread and general need'.[166] For a National Liberal such as Johannes Miquel, the matter was not up for debate. While conceding that 'the telegraph service is incessantly forced to construct unprofitable lines', particularly local connections, he insisted that these were nonetheless 'economically necessary'.[167]

The *Gründerkrach* of 1873, however, raised questions as to the proportion of telegraphic exchanges dominated by the financial sector. Some deputies, such as the National Liberal August Grumbrecht, suggested that the technology had in fact caused the crisis by encouraging speculation among sections of the population who had no place or experience dealing in such financial matters.[168] In general, though, the perception was that the telegraph service, as it was currently organized, was structured primarily to the benefit of a minority, a cosmopolitan elite of bankers and traders engaging in international transactions. To this extent, the crisis of 1873 drew deputies together across party lines in denouncing the influence of the highest echelons of the *Wirtschaftsbürgertum*.

In 1874, Leopold Sonnemann, a left-liberal and staunch opponent of the Bismarckian regime, complained that the greater part of the telegraph administration's budget was spent on constructing lines which benefited the commercial bourgeoisie as a whole, including 'merchants and such people who only occasionally send messages'. As for the *Börsen*, he believed, given their excessive occupation of the network's bandwidth, they should be taxed for the priority which their telegrams were effectively being given.[169] This policy, as we have seen, was then introduced following the international conference in St Petersburg in 1875. But the regulation was hardly a punitive measure, as it effectively formalized the temporal advantages that money could buy, a fact which his conservative colleague, Nordeck zur Rabenau, would later point out.[170]

The conference in St Petersburg, indeed, symbolized the growing dominance of an international, increasingly global, elite. It was as a result of the new regulations issued at the conference that Heinrich Stephan sought to introduce the new '*Worttarif*', or pay-per-word tariff, which turned the *Kaiserreich* into one

[166] 'Denkschrift', *Haushalts-Etat des Deutschen Reichs für das Jahr 1874*, Anlage XI, p. 24.
[167] *VDR* (1872), 24 May 1872, p. 491.
[168] *VDR* (1875), 26 Nov. 1875, p. 328.
[169] *VDR* (1874), 7 Dec. 1874, p. 542.
[170] *VDR* (1875/6), 26 Nov. 1875, p. 328.

homogeneous space of communication, and which evoked the vivid reaction from Theodor Günther quoted at the beginning of this chapter. There was no doubt that the policy was part of a movement to streamline international communication above all: 'In the last few days', Stephan explained to the Reichstag, 'we have received the approval of France, England, Belgium, and the Netherlands . . . and we have thereby made a good start. We will therefore, in normalizing our new internal tariffs, provisionally go on the basis of the *Worttarif*.'[171]

This uniform tariff resembled the postal *Einheitsporto* which had recently been introduced across Germany.[172] As things stood, telegrams were charged according to both a price category reflecting the total number of words they contained and the distance over which they were being sent, for which a number of zones had been established. The *Worttarif*, by charging a flat rate of 5 pfennigs per word and eliminating zones, effectively made the distance of individual communications irrelevant—a practice which had already been adopted in Bavaria and Württemberg, though at a slightly lower rate. To the homogeneity of time which the network promised to create, the *Worttarif* promised to add the uniformity of 'telegraphic space'.

The policy provoked heated discussions in the *Reichstag*, however, and highlighted the fallacy that distance had been annihilated. Indeed, the flat rate introduced by Stephan was higher than that previously charged for telegrams sent within 'Zone 1'—that is to say, within the shortest radius. The conservative deputy and estate owner Theodor Günther therefore argued that the *Worttarif* would only be to the benefit of '*Großhandel*' and '*Großindustrie*'. Unlike the post, he explained, only 'particular classes are in the habit of sending telegrams over a long distance'.[173] Instead, Günther claimed to defend the rights of 'agriculture in its entirety, the artisan class, the public, even the working classes', who only sent telegrams over short distances (though he felt compelled to insist that he by no means harboured socialist inclinations). If the interests of these groups were instead supported, Günther believed that their 'propensity to telegraph' would increase, and thereby also the network's revenue. What, Günther asked, did Stephan intend to do for the 'vast majority' of the population?[174] He was supported by his colleague at the opposite end of the political spectrum, Leopold Sonnemann, who recommended giving 'the public the opportunity to telegraph more' by lowering fees.[175]

In the end, the *Worttarif* was imposed, but Stephan also took up some of the deputies' proposals. The triple tax on priority transmissions was, of course, introduced. It had been agreed in St Petersburg but, as mentioned earlier, not all states introduced the measure, and so the deputies' support for it no doubt

[171] *VDR* (1875/6), 26 Nov. 1875, pp. 329–30.
[172] Weichlein, *Nation und Region*, pp. 118–20.
[173] *VDR* (1875/6), 26 Nov. 1875, pp. 326–7.
[174] Ibid., p. 327.
[175] Ibid., pp. 327–8.

encouraged its adoption in Germany. Other new policies included providing newspapers with the option of using telegraph lines at off-peak times, at a reduced cost. Thanks to this agreement, Stephan stated, the *Kölnische Zeitung* was printing extracts of the *Reichstag* proceedings in its daily paper.[176]

Resistance to the *Worttarif* nevertheless continued. In 1876, two deputies, the National Liberal Bernhard Schröder and the Progressive Wilhelm Spielberg, presented a request to the *Reichstag* asking that 'Zone 1', the most local zone of correspondence, be reintroduced in parallel with the *Worttarif*. Keeping the cost of local correspondence low, Schröder emphasized, would favour exchanges from 'locality to locality, small enterprise to small enterprise, as well as agriculture'.[177] To the needs and desires of finance, '*Großindustrie*' and '*Großhandel*', were thus being opposed those of a lower stratum within the commercial and industrial bourgeoisie, whose interests were seen to align with those of rural producers.

And indeed, the conservative estate owner Friedrich Behr-Schmoldow similarly denounced the new tariff. His anger displayed a characteristically conservative blend of hostility to both producers and consumers of an emerging global financial order. 'Where did we get this disastrous *Worttarif* from?,' he asked. 'I believe it comes from the transatlantic submarine cable companies.' These companies, he continued, charged per individual word in order to limit the length of telegrams transmitted and avoid overburdening their lines.[178] The left-leaning liberal Carl Schmidt concurred: the government was at the mercy of submarine cable companies which 'seek more to reap high dividend than to promote the interests of communication'.[179] Schmidt later raised the issue again, complaining of the excessively high costs of communicating with England by telegraph despite the international agreements of 1875 which should have regulated the matter.[180]

This time Stephan admitted that he was powerless to effect further change. On the one hand, he pointed to the lack of incentive among neighbouring states to clamp down on high costs. 'As for the cable companies,' he added, 'it is for their benefit that they are not pursuing a liberal tariff policy.'[181] Indeed, throughout the 1880s Stephan was to place pressure upon Bismarck to support the establishment of German submarine cables that might reduce this dependency upon foreign corporations, but the chancellor refused, his attention focused on the balance of power in Europe.[182]

For Behr-Schmoldow, meanwhile, these multinational companies were intimately connected with the agricultural crisis which had struck his class of Prussian estate owners, a consequence of cheap American and Russian grain flooding

[176] Ibid., p. 330. [177] *VDR* (1876), 8 Nov. 1876, p. 84. [178] Ibid., p. 85.
[179] *VDR* (1875/6), 26 Nov. 1875, p. 320. [180] *VDR* (1877), 21 Apr. 1877, p. 803.
[181] Ibid., p. 806.
[182] R. Pommerin, 'Seekabel und Nachrichtenbüros: Determinanten des Deutschlandbilds im Zeitalter des Imperialismus, 1871–1914', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte*, vol. 73, no. 4 (1986), pp. 520–31.

European markets. Their power, he implied, derived from a new reliance upon global communications: 'ever since Europe is used to finding out about every tremor in the gold securities [market] in New York; ever since, as we recently discovered, the price of wheat in Chicago can suddenly rise when General Ignatieff has some boxes packed up'. Despite the fact that the greater part of all telegraphic traffic was local, he explained, the *Worttarif* had doubled the cost of telegraphing at a distance equivalent to the former first zone, but halved that for transmissions at a distance of three zones. In Bavaria and Württemberg, at least, the flat rate was much lower, at 3 pfennigs.[183]

Heinrich Stephan admitted that the new tariff was in fact being adopted for the benefit of international correspondence, though he did not explicitly associate long-distance communication with a particular class.[184] His resistance to the reintroduction of zones led to the pronouncement quoted at the beginning of this chapter, and to Günther's response in defence of all Germans still living by the 'hoof and clod'. Once again, the conservative was joined in his opposition by Eugen Richter, who believed that the new tariff was 'an unfair increase in cost over short distances to the benefit of stock market exchanges'.[185]

In more practical terms, Richter also questioned the very possibility of annihilating distance by means of reduced costs, as Heinrich Stephan proposed: 'The *Generalpostmeister* simply doesn't take distance into account; he says that space must be conquered, no attachment to the clods of earth. Gentlemen, yes, following this principle we would eventually come to the conclusion that we can telegraph to India or America for only 5 Pfennig, but you are well aware that this is impracticable.' Pointing out the technical limitations to providing cheap, long-distance correspondence, he added: 'this shows, however, that the principle should not be over exaggerated, that there is a limit at which [the *Generalpostmeister*'s argument] becomes wrong and counterfactual.'[186]

Across the political spectrum, there was thus almost unanimous condemnation of, or at least frustration with, the power of the new financial elite. Denouncing the privilege purportedly granted by the administration to stock exchange traders, and to a lesser extent large-scale merchants and industrialists, deputies upheld the right of the lower middle classes, artisans, and agriculturalists to affordable communication. The intimate connection between the *Gründerkrach* and the frenzy of investment facilitated by the new technology had led the *Reichstag* to spotlight the social, as well as economic, dimension of telegraphic communication. When considering the purpose and structure of the network, it was not the particular activities pursued by the users which defined communities of interest but, rather, their relationship to space. Agricultural interests and artisans, but also

[183] *VDR* (1876), 8 Nov. 1876, p. 85.
[184] *VDR* (1875/6), 26 Nov. 1876, p. 329.
[185] *VDR* (1875/6), 8 Nov. 1876, pp. 90–1.
[186] Ibid., p. 91.

small-scale enterprise and, to a lesser extent, workers, were allied insofar as they identified with practices of short-distance communication.

Indeed, the *Worttarif* established a rate of 1 mark for an ordinary telegram of twenty words sent within Germany. In the mid 1870s, an independent craftsman in Münster could expect to earn up to 1,000 marks in a year, and, at around a third of his daily wage, the cost of telegraphing was perhaps exorbitant but by no means prohibitive.[187] Communication across longer distances, however, and particularly using private submarine cables, remained well beyond the reach of ordinary Germans. Across the network, therefore, as new users poured in, social distinctions were being replicated, but they were being expressed in terms of distance and the communicative horizons of the interested parties.

* * *

The *Worttarif* was eventually accepted, but the organization of the telegraph network became intertwined with a further emerging social distinction. Whereas delivery fees had been universally abolished for postal services, the distribution of telegrams to individuals' homes was charged according to their distance from a telegraph office. Those residing in a district without a telegraph office of its own (*Landbestellbezirk*) were required to cover the cost of delivering telegrams to their home. Yet it was generally in rural districts that such fees applied, effectively privileging urban residents who lived close enough to a telegraph office to receive their telegrams for free.

Graf Stolberg-Wernigerode, the conservative owner of a Pomeranian estate, complained of this inequality, arguing that if the delivery fees could not be abolished outright, all messenger services, regardless of their location, should be charged equally—urban recipients of telegrams effectively subsidizing the cost of reaching those living further away. This, Stolberg asserted, was the principle of 'equalizing justice (*ausgleichende Gerechtigkeit*)'.[188] He had the support of his fellow country estate owner, Behr-Schmoldow, who also complained of the disadvantage at which those living in rural areas were placed and warned of a dispute 'between town and countryside'. He too believed that all should pay for the delivery of messages, so as to spread the cost more evenly.[189]

In this matter, the debate highlighted clearer social and party-political distinctions, as the conservative deputies representing rural interests opposed a policy which favoured urban dwellers. The Centre Party adherent Burghard von Schorlemer-Alst, however, turned their argument on its head. He too lived in the countryside, he explained, and similarly had 'the luck, or bad luck, to receive

[187] K. H. Kaufhold, 'Grundzüge des handwerklichen Lebensstandards in Deutschland im 19. Jahrhundert', in W. Conze and U. Engelhardt (eds.), *Arbeiter im Industrialisierungsprozess: Herkunft, Lage und Verhalten* (Stuttgart, 1979), p. 153.

[188] *VDR* (1877), 12 Apr. 1877, p. 407. [189] Ibid., p. 398.

telegrams often'. He lived twenty-five minutes by foot from the telegraph office and often paid up to 1 mark to have his messages delivered. The fees were so high, he admitted, that he knew of craftsmen who had become messengers because of the generous wages involved. While he therefore wished that these costs ultimately be reduced, he could not support the idea that to charge all users the same fee was to exact 'equalizing justice'; rather, it was to artificially overburden some to the benefit of others.[190]

Eugen Richter also admitted to having suffered from this policy, during the few months in the summer when he lived in the countryside. He too agreed that delivery fees were set too high, but he blamed the fact that the political boundaries of rural communities were not drawn 'rationally' and did not therefore correspond to delivery zones. As for Graf Stolberg's proposition to charge a flat rate to all users, however, which paid no regard to the cost of labour involved, he denounced it—to the amusement of the right wing of the assembly—as a communist principle, far worse than social democracy.[191]

In response to the discussion, Heinrich Stephan reminded the deputies that messenger fees could not be reduced at will. The administration, he claimed, was beholden to the individual messengers' demands, as they were in a position to withdraw their service. For his part, he asserted that, by a logic of '*ausgleichende Gerechtigkeit*', it would be more appropriate to favour the towns, whose business was currently compensating for the deficit created in the countryside. More stations were being built, he emphasized, to come closer to the people.[192]

Basing their argument upon the principle of 'equalizing justice', the conservative deputies had demonstrated the widespread acceptance of contemporary terms of debate. Their complaint revealed that access to the network was now considered a universal right, and that it was regularly used by members of a landowning, politically active, class. In practice, however, the telegraph had also established distinctions between rural and urban localities, just as it had privileged certain sections of the *Wirtschaftsbürgertum* and excluded the artisans, workers, and agricultural labourers whose plight was increasingly the source of political concern. The struggle of liberal politicians and the rising middle class during the 1850s and 1860s to establish economic development as the primary objective of communication had largely been successful. But it had also drawn attention to the social divisions created by the forces of industrialization and market capitalism which it supported. In this respect, the deputies themselves called for state intervention to balance the inequalities which were emerging.

[190] Ibid., p. 407. [191] Ibid., pp. 408–9. [192] Ibid., p. 407.

6.5 Networks of Modernity

By the late 1870s, the telegraph had begun to weave itself into the fabric of German society, encouraging users to resituate themselves within a new network of relationships. 'A telegram to "Herr Müller in Berlin"', an article in *Die Gartenlaube* explained to its readers in 1874, 'is naturally undeliverable from the outset, for which of the thousand Müllers is the right one?'[193] Visions of a global village notwithstanding, indeed, users of the telegraph network slowly became all the more aware of their position in a variety of local, regional, national, and global contexts. This cognitive transformation was, of course, a learning process—as one deputy informed the *Reichstag*, many people were initially 'not so well informed of the distances' across which they communicated.[194] *Die Gartenlaube* therefore felt compelled to explain that 'a precise address also requires a precise description of the location . . . A telegram to Straßburg, for instance, can be sent to Alsace but also to West Prussia'.[195]

Deputies in the *Reichstag* well knew that the technology was not yet one of mass consumption. Carl Schmidt explained that, whereas each German received on average nineteen letters per year, they were expected to receive fewer than one telegram annually.[196] 'Statistics make it clear', he asserted, 'that *furor Teutonicus* has not yet been transformed into *furor telegraphicus*.'[197] And so it was up to the state to inculcate individuals with the habit of telegraphing: 'We all know, gentlemen,' Schmidt continued, 'that both the post and telegraph institutes stand in an intimate relationship with popular education. In those countries in which education is compulsory, the number of letters is greater than in those where it is not. Similarly, education also impacts the sending of telegrams.' One way of encouraging uptake of the service, in Schmidt's view, was therefore to familiarize people with it, perhaps by teaching children how to write 'laconically' in schools.[198]

The technology was nevertheless progressively embedded in the structures of everyday life, a fact reflected by its changing depiction in contemporary culture. Adverts in *Kladderadatsch* now regularly contained references to the telegraph services available in or near the country's many *Kurhäuser*, as well as the occasional villa which was put up for sale. Businesses advertised the possibility of placing orders by telegraph, and working models of telegraphs could now be bought as Christmas presents. In the newspaper itself, meanwhile, the technology increasingly featured as an integral part of satirical plots rather than as a subject for explicit comment, as its novelty slowly faded in the shadow of the latest

[193] R. Billig, 'Ein Plauderstündchen bei der Depeschen-Annahme', *Die Gartenlaube*, 26 (1874), pp. 418–20.
[194] *VDR* (1872), 18 June 1872, p. 1110.
[195] Billig, 'Ein Plauderstündchen', pp. 418–20.
[196] *VDR* (1872), 17 May 1872, p. 449.
[197] Ibid.
[198] *VDR* (1872), 24 May 1872, pp. 485–6.

invention—the telephone. Readers were presented with a 'midsummer novel in letters, postcards and telegrams', while an entire satirical poem was devoted to 'instructions for telephone operators'.[199]

Indeed, as an article in *Die Gegenwart* explained in 1872, when Bernhard Wolff had first proposed to open a telegraphic news agency, one Berlin financier had thought him mad, but now even 'the grocer in his cellar in Berlin demands that a telegraphic message bring him news over breakfast of the fire which took place that same night in Chicago. If the telegram is a few hours late, he considers harshly that the newspaper isn't worth the paper it is printed on.'[200] The article went on to describe the complexity of business at Wolff's telegraph office, where Paul Lindau himself, founder of *Die Gegenwart*, had worked for some time. It was overwhelmed, the author stated, by the

> desires, demands, accusations, instructions and rejections from a few hundred newspapers, each of which would like to see an office established just for itself. Subscribers in Berlin alone are difficult to satisfy. One of them notes that the market price of Dutch cheese is of particular importance to him, and yet is never telegraphed. Another, a well established and intelligent banker affirms quite seriously that the pronouncements of Louis Napoleon may well be of interest, but that it would be more important for the thoughts of the French sovereign to be relayed in a timely way, such that one could then make arrangements for one's end-of-month settlements!.[201]

Telegraphic news agencies could find consolation, however, in the 'feeling of their indispensability. Imagine the cries if the office in the Jägerstraße were one day to strike! If ever a great flood were to occur once again . . . one can guarantee that Noah II, upon awaking in his ark on the morning after the catastrophe, would ask not after the state of the menagerie he had brought with him, but rather after the latest telegraphic dispatches . . . .'[202] The notion that religious ideas and practices themselves were being 'modernized' was not, of course, far-fetched. As a satirical poem in *Kladderadatsch* made clear, while pilgrims had in the past made their way by foot, '*per pedes Apostolorum*', the discomforts of those times were now over, and one could spot them 'driven by steam'. Man, indeed, had 'allied itself with evil' in creating the first railway, but 'everything, the iron steed and also tracks, must yet be of service to the pious. Even the telegraph, I should also note, serves good causes. For should the pope anathematize, its effects are felt already a few hours later in Berlin.'[203] In matters of faith, too, the telegraph had helped shape the

[199] 'Die ermöglichte Sommerreise', *Kladderadatsch*, 25 June 1876; 'Instruction für Fernsprech-Beamte', *Kladderadatsch*, 16 Dec. 1877.
[200] 'Aus der Telegraphenwelt', *Die Gegenwart*, vol. 1, 9 (1872), pp. 130–2.
[201] Ibid.
[202] Ibid.
[203] *Kladderadatsch*, 25 Mar. 1877.

passage from the 'traditional' to the 'modern', complete with its many ambiguities.[204]

For users sending rather than receiving telegrams, the dissemination of the practice of 'laconic' writing itself became the subject of satire. The need for conciseness in telegraphing had been accentuated by Heinrich Stephan's application of the uniform *Worttarif*, which placed a price on each individual word. But in a country whose language possessed a remarkable capacity to amalgamate and thereby elongate words, the policy had required the introduction of limits on the length of a telegraphically recognized term. In an article addressed to 'the orthographic commission', *Kladderadatsch* explained that '[b]ecause of telegraphy, no word is to have more than 15 characters. Words breaching this rule must be reduced to the standard number. In some cases that is quite easy. *Obergierungsrat* instead of *Oberregierungsrath* is hardly remarkable. But it will be somewhat more difficult to reduce the *Kammergerichtsauscultator* from 25 to 15 characters. But no doubt a *modus vivendi* will be reached.'[205]

The progressive embedding of the technology into the foundations of social life could be traced in the realist fiction which flourished during this period. Friedrich Spielhagen's often neglected, yet bestselling and wonderfully evocative, description of the *Gründerzeit* and its immediate aftermath, *Sturmflut* (1877), written in the thick of these transformations, illustrates the ideological connotations which new means of communication evoked.[206] The novel revolves around the building of a railway and naval base in northern Germany specifically, but it highlights the conflict of world views which these modern infrastructural projects provoked between—and crucially, within—the proud but declining aristocracy and the rising entrepreneurial bourgeoisie who, more or less willingly, collaborated in bringing them to life. A key representative of the latter, the successful and tremendously wealthy Philipp Schmidt who invests in the railways, has four marble statues carved to adorn his new home, one of which represents Hermes, the Greek god who, we are told, 'if only he had lived to see it, would undoubtedly have been appointed to the position of Olympian Postmaster General'.[207] It is no coincidence, moreover, that the retreat of the metaphorical '*Sturmflut*' of gold from French reparations, which brings these projects to an unhappy end, is interspersed with the arrival of important telegrams.

[204] See, in particular, D. Blackbourn, *Marpingen: Apparitions of the Virgin Mary in Nineteenth-Century Germany* (New York, 1994); cf. also A. Green and V. Viaene (eds.), *Religious Internationals in the Modern World: Globalization and Faith Communities since 1750* (Basingstoke, 2012).

[205] *Kladderadatsch*, 23 Jan. 1876.

[206] B. Neumann, 'Friedrich Spielagen: *Sturmflut* (1877): Die „Gründerjahre" als die „Signatur des Jahrhunderts", in H. Denkler (ed.), *Romane und Erzählungen des bürgerlichen Realismus: Neue Interpretationen* (Stuttgart, 1980), pp. 260–73; J. L. Sammons, 'Friedrich Spielhagen: The Demon of Theory and the Decline of Reputation', in T. Kontje (ed.), *A Companion to German Realism, 1848–1900* (Rochester, N.Y., 2002), pp. 133–58.

[207] F. Spielhagen, *Sturmflut* (Berlin, 2017 [1877]), pp. 203–4.

It is, however, in Theodor Fontane's novels, written in the ensuing decades, that the subtle penetration of new infrastructures of communication into the sinews of German society is most clearly expressed. Rarely does the author explicitly comment upon the impact of telegraphs, telephones, and railways, and yet they are omnipresent as the simultaneously binding and divisive social force which they had become.[208] All the emerging characteristics of an ambiguous, connected modernity which have been described in these chapters are there, from the city as a 'complex machine system' to the punctuality that plagued the bourgeois elite, and the interaction of various means of communication, quiet manifestations of the uneven transformation which had preceded them and which Fontane had witnessed.[209]

The theme of time and punctuality appears early on in one of Fontane's earlier novels, *L'Adultera*, published in 1882 but set in the *Gründerjahre* of the 1870s. The narrative, which unfolds in the stereotyped milieu of high finance, revolves around the converted Jewish banker Ezechiel van Straaten's dissolving relationship with his young wife, Melanie de Caparoux, from an ennobled family of French heritage. Chief among the characteristics which van Straaten—no doubt modelled on Bismarck's personal banker, Gerson Bleichröder—associates with the nobility he struggles in vain to integrate is that of 'punctuality and not-causing-to-wait [*Nichtwartenlassen*]',[210] a concern bordering on obsession which structures the couple's life. Dinner, for instance, should be taken at 7 p.m., when darkness had 'naturally emerged', rather than artificially, at 4 p.m., and throughout the novel letters, notes, and telegrams are sent to help keep Ezechiel and Melanie to time.[211] When the marriage finally breaks down, Melanie herself insists that she must interrupt her conversation with her husband, as she is expected elsewhere: 'And I don't want to begin my new life with unpunctuality. To be unpunctual is to be disorganised.'[212]

If time forms the 'iron cage' in which the protagonists in *L'Adultera* are trapped, in his later novels Fontane increasingly emphasizes the various modes of communication which tie together his characters in relations of interdependence.[213] In *Cécile* (1886), we follow the evolving relationship between a married young woman, Cécile von St Arnaud, and the man she meets by chance at a hotel. The man in question, Robert von Gordon-Leslie, is a former Prussian army officer turned civil engineer and telegraph cable expert—a background far too reminiscent of Werner Siemens to be coincidental, and a testament to the latter's

[208] P. Frank, *Theodor Fontane und die Technik* (Würzburg, 2005), p. 166. [209] Ibid., p. 153.
[210] T. Fontane, *L'Adultera* (Stuttgart, 1983 [1882]), p. 14. [211] Ibid., p. 21.
[212] Ibid., p. 105.
[213] H. Segeberg, *Literatur im technischen Zeitalter: von der Frühzeit der deutschen Aufklärung bis zum Beginn des ersten Weltkriegs* (Darmstadt, 1997).

recognized position within German society by the 1880s.[214] Fontane's depiction of the telegraph, in particular, is characteristically ambivalent. Indeed, throughout *Cécile* it becomes clear that Gordon-Leslie, a thoroughly modern man, has become so accustomed to using the telegraph as to hinder his ability to communicate his sentiments adequately—his letters, by contrast, serve principally to prolong Cécile's suffering.[215] The technology's very characteristics are thus at the heart of the two protagonists' difficult and fitful relationship—twice, when they threaten to cross the boundaries of 'social propriety', it is a telegram which calls Gordon-Leslie away to work.[216]

By the time he wrote his 'social novels', therefore, Fontane was no longer interested in the overt enthusiasm for the material and economic benefits of technological progress which his contemporaries had previously celebrated. Rather, as Eda Sagarra has argued, he sought to illustrate their profound socio-psychological impact.[217] In *Effi Briest*, both the temporal structuring and disruption of daily life practised in *L'Adultera* and the ambivalent technological infrastructure of society help to shape the narrative. At the end of the novel, the telegraph in fact serves to disconnect the threads of social convention which led Effi's parents to disown her: '*Ich werde ganz einfach telegraphieren*: "*Effi Komm*", her father announces, symbolizing his desire to reintegrate his daughter into their family.[218]

Der Stechlin, Fontane's last novel, published in 1898, most fully encapsulates the ambiguity of the telegraph's impact upon society, an ambiguity which, this book has argued, was intrinsic to the technology itself. Here, the author does allow his protagonist, Dubslav von Stechlin, to comment quite explicitly upon the changes which he has witnessed. Encamped on his provincial estate, the elderly Dubslav depends upon the 'tipp tipp tipp' of the electric current to tie him into the political and social developments taking place across Germany and beyond: 'these remarkable shifts in time and hour. Almost bizarre. When the September Revolution broke out in Paris in the year seventy, one knew about it over in America a few hours before the revolution even happened.' Yet as a self-defined 'recluse', he claims never to be informed of events in time—an illustration of the uneven distribution of the service across the country.[219] Of course, however, it is

[214] T. Fontane, *Cécile* (Berlin, 1887); on Siemens's reputation later in life, see J. Bähr, *Werner von Siemens, 1816–1892* (Munich, 2016).

[215] E. Sagarra, 'Kommunikationsrevolution und Bewusstseinsänderung: Zu einem unterschwelligen Thema bei Theodor Fontane', in H. Delf von Wolzogen and H. Nürnberger (eds.), *Theodor Fontane: Am Ende des Jahrhunderts*, 3 vols. (Würzburg, 2000), iii, pp. 105–18.

[216] T. Lang, 'Cécile: Reading a Fatal Interpretation', in M. Doebeling (ed.), *New Approaches to Theodor Fontane: Cultural Codes in Flux* (Columbia, 2000), pp. 78–81.

[217] Sagarra, 'Kommunikationsrevolution und Bewusstseinsänderung'.

[218] T. Fontane, *Effi Briest* (Stuttgart, 1969 [1895]), p. 312; see C. Thomas, *Theodor Fontane: Autonomie und Telegraphie in den Gesellschaftsromanen* (Berlin, 2015).

[219] T. Fontane, *Der Stechlin* (Stuttgart, 1978 [1898]), p. 26.

nevertheless by means of the telegraph that he organizes his social life and receives the news of his son's visit that launches the narrative as a whole.[220]

For this representative of a dissolving 'traditional' society, telegraphy is responsible for a range of disappointing changes, not least of which is the practice of 'laconic' writing: 'brevity', Dubslav laments, 'is supposed to be a virtue, but to be brief often also means to be coarse'—the address 'Herr', in particular, had disappeared from common usage. When one of his guests replies that, sadly, 'one cannot do without telegraphy, especially here in our solitude', pointing to the technology's indispensability in a connected age, Dubslav concedes that '[t]he devil is not quite so black as he is portrayed, nor is telegraphy', acknowledging the wonderful scientific achievements upon which the technology was based.[221] The protagonist's attitude to telegraphy thus mirrors his (and arguably Fontane's) characteristically moderate stance in politics, denouncing social democracy while also warning of the dangers of excessive conservatism.[222]

Now embedded in the infrastructure of modern Germany, the telegraph had become a force underpinning its social, economic, and even political divisions and yet connecting its extremes, at once a force of interaction, amalgamation, and differentiation which provoked ambiguous reactions. Or, in the characteristically terse words of Dubslav von Stechlin: '*Es ist das mit dem Telegrafieren solche Sache, manches wird besser, aber manches wird auch schlechter* . . . .'[223]

[220] Ibid., p. 12. [221] Ibid., p. 26.

[222] H. Fischer, 'Wendepunkte: Der politische Fontane, 1848 bis 1888', in H. Delf von Wolzogen and H. Nürnberger (eds.), *Theodor Fontane: Am Ende des Jahrhunderts* (3 vols., Würzburg, 2000), i, pp. 21–34.

[223] Fontane, *Der Stechlin*, p. 25. 'Telegraphing is one of those matters, some things get better, but others also get worse' –author's translation.

Epilogue

In 1878, a now internationally renowned Werner Siemens wrote a report for the Berlin Academy of Sciences on the prospects for a new means of communication which was then being widely discussed and implemented across Europe and North America. 'The impressive achievements of Bell and Edison's electric telephone', he stated, 'are justifiably drawing a great deal of attention from scientists. The problem of transmitting sounds and speech to distant places, which it resolves, promises to give humanity a new means of communication and civilisation which will significantly influence its social relations, and will also perform significant services to science!'[1]

Only three years later, this social revolution appeared to have begun. Returning from a trip across the Atlantic, Max Maria von Weber shared his observations on the dissemination of new technologies in the United States with the *Handelskammer* of Frankfurt am Main. He underscored 'the enormous development of personal communication, still barely imagined in Europe, most prominently by means of the telephone, as a central element in the strength of economic life and endeavours in the states of the Union'. There, Weber believed, 'one has understood that economies in time and, equally significantly, labour, grow in a geometric relationship to the number of individuals who are able to engage in free, direct oral communication'. Even in the realm of public administration, a high-ranking official had informed him, people 'barely care for the local proximity of our institutions and administrations any more, for even if they are distributed across the entire city, we speak from one room to the next as though we were standing side by side'.[2]

Within a decade of the founding of the German *Kaiserreich*, a new object had thus caught the attention of the scientific community and stimulated the public imagination. In 1877, the author of an article in *Die Gartenlaube* had asserted that 'the type of omnipresence which the invention of the telephone allows is capable of many an application. Long journeys may be avoided, business concluded, testimonies recorded; oral transmission can be extended across entire provinces without any loss of time.'[3] By 1880, the same author was prophesying the

[1] W. von Siemens, 'Ueber Telephonie', in *Gesammelte Abhandlungen und Vorträge* (Berlin, 1881), p. 425.
[2] BHStA, MA 109807, 'Mittheilungen der HK zu Frankfurt a.M.', 1 Jan. 1881.
[3] 'Die menschliche Stimme – auf Reisen', *Die Gartenlaube* (1877), no. 47, p. 796.

Networks of Modernity: Germany in the Age of the Telegraph, 1830–1880. Jean-Michel Johnston, Oxford University Press 2021. © Jean-Michel Johnston. DOI: 10.1093/oso/9780198856887.003.0009

imminent 'shrinking of cities': with private telephones installed in individuals' houses, it would soon be possible for two individuals 'to whisper the greatest of secrets to one another, without fear of being overheard by anybody'. Such 'electric secret societies', the author explained, already existed in the United States.[4]

Like the telegraph almost half a century earlier, the development of the telephone began with the raising of expectations as to the future of instantaneous long-distance communication. And once again those expectations served to enrol a wide array of actors in the development of the technology. Werner Siemens's report to the Academy of Sciences, indeed, was not simply the rational analysis of a disinterested scientist. His own firm had begun to produce telephone apparatuses by the late 1870s, and faced stiff competition from American models, particularly Alexander Graham Bell's—the address was also a means of establishing his reputation in this particular field.[5] The *Reich* telegraph administration, meanwhile, had sent technicians to observe the situation in the United States, Britain, and France, and to consider the best means of introducing the new technology in Germany.[6]

Notwithstanding its novelty and technical peculiarities, moreover, the telephone was understood in much the same terms as the telegraph, terms drawn from a discourse which stretched back beyond the nineteenth century. As we have seen, the transmission of speech itself had been at the heart of Carl Steinheil's conception of telegraphy during the 1830s, and articles published in *Dinglers* in those years had included a number of proposals to that end—the '*logophor*' is a case in point.[7] Throughout the process of the electric telegraph's development and implementation, others had then continued to pursue the objective of reproducing the human voice at a distance, and by the 1860s the German Philipp Reis had designed an 'improved telephone' which was later recognized as a precursor of the technology now most closely associated with Alexander Graham Bell and Thomas Edison.[8] The innovation that was to establish Bell's and Edison's reputations did not emerge in a vacuum—as the history of the telephone shows, their status as its inventors was the product of contemporary debates, legal proceedings, and subsequent historical reconstructions.[9]

By the 1880s, indeed, the 'motley tangle' of people and ideas involved in the development of communications technologies, which Heinrich Schellen had

[4] 'Die Verkleinerung der Großstädte durch das Telephon', *Die Gartenlaube* (1880), no. 37, p. 608.

[5] J. Bähr, *Werner von Siemens, 1816–1892* (Munich, 2016). In fact, given the popularity of the telephone, Siemens regretted not having pursued the invention earlier: cf. C. Matschoβ (ed.), *Werner Siemens: Ein kurzgefaβtes Lebensbild nebst einer Auswahl seiner Briefe*, 2 vols. (Berlin, 1916), ii, pp. 535–43.

[6] GStA PK I. HA Rep. 89, Nr. 29921, 'Darstellung der Entwicklung des Fernsprech-Telegraphenbetriebs in den größeren Städten des Reichs-Postgebiets', 1882.

[7] See Chapter 1, p. 33.

[8] Anonymous, 'Über das verbesserte Telephon', *DPJ*, 169 (1863), p. 399.

[9] C. Beauchamp, 'Who Invented the Telephone?: Lawyers, Patents, and the Judgments of History', *Technology and Culture*, vol. 51, no. 4 (2010), pp. 854–78.

evoked in 1850, was all the more muddled. The diffusion of the telegraph had given rise to new fields of expertise: 'electricity' was assigned to the disciplines of theoretical and applied physics; engineering was now taught as a subject in Germany's new *Technische Hochschulen*; and telegraphy itself had become a subject of specialization in certain polytechnical schools.[10] There were now government departments dedicated to the development of new means of communication, and *Verkehr* had become a recognized constituent of social and economic studies. And, once again, the requisite knowledge was being circulated internationally. The new institutions, disciplines, professions, and organizations which had coalesced around the subject of communication appeared to bring order to this 'motley tangle', but they also encouraged ever greater specialization and offered new opportunities for collaboration and conflict between the actors involved. The 'hybridity' of modernity, as Bruno Latour has suggested, was simply becoming all the more apparent.[11]

* * *

In practice, too, the diffusion of the telephone built upon the networked infrastructure that preceded it, multiplying the connections and exacerbating the divisions that were emerging across society. The two technologies were in fact conceptually and materially complementary. In Germany, telephone lines were initially used as a means of integrating rural villages into the existing telegraph network, for instance. More often, however, urban telephone networks were formed, allowing subscribers within the same city to contact one another directly, but also to send messages which they wanted relayed by post or telegraph to a more distant location. The new technology naturally displayed certain peculiarities, not least of which was its capacity to sustain longer, 'real-time', and direct exchanges between interlocutors who possessed a personal telephone apparatus. But the infrastructure of modernity had already been laid, and its tentacles were now extended into people's homes and offices, binding the individual ever more tightly into networks of interaction and differentiation.

In the *Kaiserreich*, more than elsewhere in Western Europe, the state was at the heart of these networks. While private enterprise had fuelled the diffusion of the telephone in the United States, France, and Britain, in Germany the technology was immediately placed within the jurisdiction of the telegraph administration and thereby subsumed under the monopoly which the constitution granted to the state in this field. The government's attitude, in this regard, expanded upon the principle which had gained ground since the 1850s that the state should provide

[10] W. König, *Technikwissenschaften: Die Entstehung der Elektrotechnik aus Industrie und Wissenschaft zwischen 1880 und 1914* (Chur, 1995), esp. pp. 12–111; Anonymous, 'Die Telegraphie als Unterrichtsgegenstand an polytechnischen Schulen', *DPJ*, vol. 217 (1875), pp. 156–7.

[11] B. Latour, *Nous n'avons jamais été modernes: essai d'anthropologie symétrique* (Paris, 1991), pp. 7–22.

the framework for economic growth, but foreshadowed the policies of social insurance or 'state socialism' which were adopted in the 1880s and which made the state the sole guardian of the public good.[12] Bismarck himself explained to Kaiser Wilhelm that the state alone was to assume responsibility for the construction of telephone networks, both because of a purported lack of 'public spirit' at a communal level and because private corporations could not be depended upon to protect the 'public interest' (*öffentliches Interesse*).[13]

Indeed, *Generalpostmeister* Stephan's ambition to equip every German household with a telephone was perhaps the most material expression of the state's direct involvement in the lives of its citizens.[14] This fact was not lost on those who depended most upon the free circulation of information—as Bismarck himself acknowledged, the press and 'the parties' had expressed their 'distrust' of the government's interference in this regard.[15] At the same time, however, the state's monopoly in the construction of communications networks made it the primary target of societal demands. Even more so than the telegraph, which had stimulated requests and complaints from the many municipalities that wished to be connected to the network, the pressure to improve telephone service now came from individuals. By undertaking to construct and manage these modern networks alone, the state became responsible for their successes and their failures, for the hopes and the frustrations which they stimulated in society.

Like its predecessor, the new technology became the tool and symbol of a connected elite. In 1882, the cities with the largest number of telephone connections were Berlin (525), Hamburg (483), Frankfurt am Main (179), Mannheim (139), and Leipzig (121), and among the towns in the process of establishing their own network were Elberfeld, Barmen, and Bremen, testifying to the continued importance of trade, finance, and industry.[16] Telecommunications, as Bismarck pointed out, 'witnessed extensive participation in all circles particularly of merchants, factory owners and tradesmen'.[17] Within the Berlin stock exchange itself, individual booths had been set up, 'allowing traders, during the stock market's opening hours, to be in direct contact with their own business premises or with other businesses connected to the general telecommunications network at any moment'. Every day, during these hours, the 76 traders with a subscription to the service were making a total of 280 phone calls per day, a figure above the general urban average of 2–3 connections per user per day. In the countryside, Bismarck

[12] G. Craig, *Germany, 1866–1945* (Oxford, 1978), pp. 150–7; D. Blackbourn, *The Long Nineteenth Century: A History of Germany, 1780–1918* (New York, 1998), pp. 346–7.

[13] GStA PK I. HA Rep. 89, Nr. 29921, Bismarck to Kaiser Wilhelm, 6 May 1882.

[14] K. Beyrer (ed.), *Kommunikation im Kaiserreich: Der Generalpostmeister Heinrich von Stephan* (Heidelberg, 1997).

[15] GStA PK I. HA Rep. 89, Nr. 29921, Bismarck to Kaiser Wilhelm, 6 May 1882.

[16] Ibid. It should be noted that this list excludes telephone networks in Bavaria and Württemberg, whose administrations were still independent of the Reich's.

[17] Ibid.

assured the Kaiser, hundreds of new localities were being connected to the telecommunications network every year, serving the needs of both business and familial correspondence.[18]

The ambiguous social effect of the existing networked infrastructure was only enhanced by the new technology. For the press, the telephone offered the possibility of communicating more detailed reports, allowing Wolffs to produce 'regional editions' of its daily summaries that were tailored to the interests of local populations.[19] The effect, however, was to promote both a broader national circulation of information and a heightened sense of regional particularism. The interdependence of the telegraph and the telephone, meanwhile, produced technical complications of its own. In March 1888, for instance, the *Münchener Fremdenblatt* was unable to print the new Kaiser Friedrich III's recent 'Proclamation to the Prussian People' because the editors had not been warned by telephone to expect its transmission by telegraph.[20]

The telephone thus added a further level of complexity to the growing interdependence between people and places, and thereby also a further source of tension. Local conflicts over time and space, in particular, were heightened, as access to new means of communication became even more closely tied to the social and economic status of users as individuals. The price of obtaining a telephone connection became dependent upon one's distance from the local switchboard, and the cost of phone calls themselves, of course, was eventually tied to their duration. Space and time were further monetized, fuelling related anxieties: 'minute-long conversations on the telephone' were singled out by Karl Lamprecht in the early twentieth century as a factor in the nefarious acceleration of modern life.[21] Combined means of communication made for an intricate layering of temporalities, and to the confusing mixture of newspaper reports, telegrams, and personal conversations that had characterized the outbreak of the Franco-Prussian War in 1870 was added the exchange of anxious phone calls in July 1914.[22]

As communications networks were woven ever more deeply into the fabric of society, they increasingly determined its texture, or cultural manifestation. To take one example, telegraph users—and initially, operators—had until then primarily been men. Whereas the sending of a telegram required a venture into the public space of business, however, the telephone marked the extension of communications networks into what was then seen as the female sphere of domesticity. In

[18] Ibid.

[19] D. Basse, *Wolffs Telegraphisches Bureau 1849 bis 1933: Agenturpublizistik zwischen Politik und Wirtschaft* (Munich, 1991), p. 56.

[20] BHStA, MV I 2069, *Münchener Fremdenblatt*, 14 Mar. 1888.

[21] K. Lamprecht, *Zur jüngsten deutschen Vergangenheit*, 2 vols. (Freiburg im Breisgau, 1903), ii/1, p. 159.

[22] See, for example, G. Martel, *The Month that Changed the World: July 1914* (Oxford, 2014).

keeping with the Janus-faced mechanism of the network, this expansion did not simply draw women into the pool of users, it also served to underscore contemporary cultural distinctions between them and their male counterparts.[23] When *Kladderadatsch* sought to humorously illustrate the consequences of a mistaken telephone connection, it suggested that a trader at the stock exchange might accidentally receive a call from a 'housewife' giving her cook instruction on how to prepare a chicken for dinner.[24] Not only did the story entrench the roles assigned to each gender in contemporary discourse, the mistake in question was naturally seen as particularly detrimental to the male participant in the conversation, whose business transactions were thereby affected. No wonder, then, that the crisis of neurasthenia that struck Wilhelmine Germany was perceived as a primarily male, bourgeois epidemic.[25]

The nexus of symbolic and cognitive transformations to which the new technology gave rise was duly registered by Theodor Fontane, ever the astute observer and subtle analyst of his times. In his poem '*Arm oder reich*', written towards the end of his life, Fontane expressed his disdain for the new commercial bourgeois elite that had come to dominate society. The telegraph had been for him an ambiguous technology, an embedded mechanism of both liberation and control. The telephone more clearly represented the wealth to which the German elite aspired, but a wealth—and a technology—which fostered dependencies and anxieties that the writer found binding and oppressive: '*Es gibt*', he wrote, '*und dafür Dank will ich zollen / Keine Menschen, die irgend was von mir wollen / Ich höre nur selten der Glocke Ton / Keiner ruft mich ans Telefon / Ich kenne kein Hasten und kenne kein Streben / und kann jeden Tag mir selber Leben.*'[26]

* * *

The modernization of Germany was thus a long and multifaceted process in which the telegraph played a partial, but crucial, role. The development of the technology itself is embedded in a much broader historical narrative of communication, which reaches further back than the nineteenth century and projects forward beyond the present day. There were no ruptures, knots, or additions in this thick historical continuity; rather, its threads and filaments were separated and intertwined in new ways.

[23] C. Marvin, *When Old Technologies were New: Thinking about Electric Communication in the Nineteenth Century* (New York, 1988), esp. pp. 109–51.

[24] *Kladderadatsch*, 1 May 1881.

[25] J. Radkau, *Das Zeitalter der Nervosität: Deutschland zwischen Bismarck und Hitler* (Munich, 1998).

[26] P. Frank, *Theodor Fontane und die Technik* (Würzburg, 2005), p. 39. 'There is, and for this I must grateful be / nobody who wants anything from me / Only seldom do I hear the bell's tone / No-one calls me on the telephone / I know no haste and no striving / and can each day for myself continue living' – author's translation.

Despite the apparent irruption of telephony in the late nineteenth century, indeed, telegraphy was only then primed for 'take-off'. By the end of our period, Werner Siemens himself hoped that 'the telephone [would] generalize the practice of telegraphing', while *Kladderadatsch* still felt it appropriate to mock a proposal for 'wireless telegraphy' on the basis that one might as well expect 'photography without light, lithography without stone'.[27] The telegraph became an essential and widespread means of communication during the First World War, and in 1930 over 31 million telegrams were sent and received in Germany. Indeed, the service is still available through the Deutsche Post, though it has become comparatively expensive and is being discontinued in a growing number of countries.[28] Notwithstanding *Kladderadatsch*'s scepticism, meanwhile, wireless telegraphy did emerge as a viable technology in the 1890s, expanding the reach of those who wielded its sources and, as Heidi Tworek has shown, underpinning German efforts to make their mark on a globalizing world.[29]

Viewing history through the lens of the communications networks that emerged during the nineteenth century allows us to unpack many of the monolithic categories through which 'modernity' is often analysed. 'Science', 'technology', 'industrialization', 'the state', and 'society' appear not as closed institutions, processes, or fields of inquiry but as the product of interaction between individuals situated in towns, workshops, academies, societies, and offices across a broad landscape of innovation.

Tracing the telegraph's infiltration of society highlights the mechanism underpinning many of the tensions and variations that characterized the German experience of modernity. The social and economic transformations to which the technology contributed, from this perspective, need not be seen as either linear or contradictory but, rather, as interconnected. 'Traditional' forms of decentralized manufacturing and new methods of concentrated factory production, short-term stock trading and longer-standing private banking practices, regional and national frameworks of interaction, the 'old' and the 'new' capitalist economies were sustained by the selfsame network which extended well beyond Germany's many changing borders.

The German bourgeoisie, viewed through this lens, emerges as a primarily urban elite whose defining characteristic was its connectedness, a quality which tied it to its counterparts in cities across Europe and eventually the globe but which could also be a source of internal divisions when one group was privileged

[27] *Kladderadatsch*, 22 June 1879.

[28] *Statistique générale de la télégraphie dans les différents pays de l'ancien continent* (Bern, 1932), p. 2; 'ITU Historical Statistics' (accessed 22 Mar. 2017, at http://www.itu.int/en/history/Pages/HistoricalStatistics.aspx); K. Westcott, 'Telegram Era ends Stop', BBC Article (accessed 20 Feb. 2017, at http://www.bbc.com/news/blogs-magazine-monitor-22,953,657).

[29] H. Tworek, *News From Germany: The Competition to Control World Communications, 1900–45* (Cambridge, Mass., 2019).

over another. Diverging perceptions of speed, space, and time, meanwhile, were directly related to the advantage or disadvantage which individuals experienced depending on their position within or outside the network, and could form the basis of political alliances which cut across traditional class divisions to denounce the undue privilege of the telegraphically endowed. These privileges, conflicts, and alliances were played out at a local level, where the positioning of telegraph offices became both a symbol of modernity and an opportunity to reconfigure a community's social and economic priorities.

Everything remains of the process from which telegraphy emerged and to which it contributed. New media have taken on the role of facilitating communication, and the long-awaited 'death of distance' remains firmly on the horizon, but it is the same growing interdependence of people and places which they serve.[30] The ambiguities which result from their expansion are experienced daily, as the triumph of new connections is matched by despair at new global, national, and local inequalities, driven by seemingly autonomous forces. It is only through our interactions across expanding networks that these similarities and distinctions become apparent, however, and that our hopes and disappointments are manifested. Integration and differentiation are the characteristic, ambiguous, and seemingly paradoxical products of interpersonal communication, to which the telegraph arguably made the most significant contribution during the nineteenth century. Together, they form the symptoms of modernity.

[30] F. Cairncross, *The Death of Distance: How the Communications Revolution is Transforming Our Lives*, 2nd edn. (Boston, 2001).

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Index

Note: Figures are indicated by an italic '*f*' respectively, following the page number.

For the benefit of digital users, indexed terms that span two pages (e.g., 52–53) may, on occasion, appear on only one of those pages.