

**Inventing telephone usage:  
debating ownership, entitlement and purpose in early British telephony.**

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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## **Abstract**

In this thesis I counter the received scholarly view that restrictive government policies delayed the uptake of telephony in Britain before its nationalisation in 1912. Rather, I demonstrate how telephone usage shaped British telephone growth and development between 1877, when telephones were first successfully demonstrated in Britain, and 1893, when the decision to nationalise the trunk lines had been taken and competition between private companies ended. My use-focused approach differs from previous supply-centred narratives in four important respects: instead of considering only exchange telephony, I also focus on private, point-to-point telephony, and innovative uses of telephone instruments devised by users. Secondly, whilst most focus on London, I also examine events in the provinces. Thus I show how developments in telephony around the country had national effects. Thirdly, I question how well telephony met the needs of individuals and groups when compared with efficient alternative communication methods such as telegraphy and the letter post. Finally, I also examine the actions and opinions of non-users of telephony, who often preferred to use more traditional methods of communication. Thus, by studying material from the BT Archives, and digitised Victorian periodical sources, I demonstrate how telephone users and non-users contributed to three Victorian discussions: the first concerned who ought to supply telephony, for example, companies or the state, and whether competition or monopoly was preferable. The second was who should be able to use telephony, whether it was a luxury or a necessity, and for whom; the third concerned the uses to which the embryonic technology ought to be put. The answers to these three questions of ownership, entitlement and purpose shaped the variety of telephone systems which emerged around the country by the end of the period covered by this thesis. I argue that users and non-users influenced the development of British telephony by deciding to adopt or reject the telephone, by the uses to which they put telephone instruments, or by deciding to impede the growth of telephone systems. Overall, I show that by 1893 it was the agency of users and non-users which led to the British government's decision to nationalise the trunk lines, and to the end of private competition in exchange telephony.

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## List of Abbreviations and Acronyms

**BAAS:** British Association for the Advancement of Science

***BMJ:*** *British Medical Journal*

**BT:** British Telecom

**ETC:** Electric Telegraph Company

**HL Deb:** House of Lords debate

**L&C:** Lancashire and Cheshire Telephone Company

**London and Globe:** London and Globe Telephone and Maintenance Company

**NDTC:** Northern District Telephone Company

**NTC:** National Telephone Company

***NTJ:*** *National Telephone Journal*

**SETC:** South of England Telephone Company

***TJER:*** *Telegraphic Journal and Electrical Review*

**UTC:** United Telephone Company

**WC&SW:** Western Counties and South Wales Telephone Company

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## Chapter One: Reappraising the 'British experience' of early telephony

### 1. Introducing the telephone

“Extraordinary as this novel invention is, I am not sure that I quite like the idea of its intrusion into our domestic scenes at any moment of the day. It is bad enough to have letters delivered at our doors every two hours... but when it comes to being at the beck and call of any intrusive person who may possess a telephonic wire, and being liable to be summoned at any moment by a little bell, to reply to any impertinent inquiry that might be propounded, no man's house can thenceforth be called his castle, unless he be brave enough to resist such innovations, and leave himself far behind the rest of the impetuous world – in peace.”

Phebe Lankester, columnist, October 1882<sup>1</sup>

“It is a common complaint that the conditions of modern life, and especially of mercantile life, have been rendered well-nigh intolerable by the telegraph; and the addition of the telephone must inevitably 'more embroil the fray.' In old times a man of business could arrange his affairs for the day after the delivery of the morning post, and the perpetual arrival of telegrams has served to add new stings to existence. The case will surely be much worse with the verbal communications than with the written ones... With the new instrument hanging over his desk the merchant or the banker will be liable to perpetual interruptions from telephonists, who will begin with some such phrase as 'Oh, by the bye.'”

The *Times*, May 1879<sup>2</sup>

In October 1882 Phebe Lankester, a writer on botany and health, detailed her encounter with an exchange telephone for her syndicated column for provincial newspapers.<sup>3</sup> She had been invited to lunch with a friend in Kensington, London, and after

1 Lankester, Phebe, 'Our Ladies' Column', in the *Preston Chronicle*, 21 October 1882, pg. 2.

2 ['According to a Letter from Mr. White'], in the *Times*, 10 May 1879, pg. 11.

3 Shteir, Ann B., 'Lankester, Phebe (1825–1900)', *Oxford Dictionary of National Biography* (Oxford University Press, 2004) [<http://www.oxforddnb.com/view/article/58526>, accessed 23 Oct 2013]. The column was printed in widely-read daily or weekly newspapers of all political affiliations around the country, such as the Conservative *Aberdeen Journal*, *Nottinghamshire Guardian* and *Blackburn Standard*, and the Liberal *Bristol Mercury*, *Wrexham Advertiser*, *Leicester Chronicle*, *Western Times*, *Preston Chronicle* and *Northampton Mercury* (Newspaper political affiliation details from: <http://find.galegroup.com/bncn/dispBasicSearch.do?>

the meal they had spoken with a third friend who had broken his leg and was unable to leave his chambers. Lankester found it difficult to believe at first that she was really speaking across London, but when she heard “the unmistakeable tones of his voice, nay even his laugh, when I asked him if I should send him 'some blackberry jam,’”<sup>4</sup> she was convinced. Nevertheless, her evaluation of the new technology, given in the epigraph above, was not wholly positive. Lankester expressed reservations regarding the increasing pace of life and the loss of privacy which having a telephone would entail, and intimated that not having a telephone might eventually be a decision which only someone “brave” could take. In voicing these concerns, Lankester was not alone in this period; whilst this first epigraph was a response to the potential impact of telephony on domestic life, the second represents a business perspective. The author was concerned already by the disruptive influence of telegraphy, and feared that the advent of telephony would mean that commercial men would no longer be able to organise their time effectively due to the abundance of telephonic interruptions. Indeed, he argued, whereas sending a telegram required some thought and took some time, a telephone call could be made much more easily.

These responses to telephony in Britain are amongst the many I address in this thesis. My research investigates the development of British telephony between 1877, when the telephone was first successfully demonstrated in Britain,<sup>5</sup> and 1893, when the government had taken the decision to purchase the national trunk line network, and competition between private telephone companies ceased. By examining a wide range of responses to early

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[prodId=BNCN&userGroupName=leedsuni](#), accessed 5 May 2014;

<http://www.victorianperiodicals.com/series2/default.asp>, accessed 5 May 2014; North, John S., *The Waterloo Directory of Scottish Newspapers and Periodicals, 1800-1900* (North Waterloo Academic Press, 1989), pg. 90).

4 Lankester, 1882 (see n.1).

5 This demonstration was by William Preece, then the Assistant Engineer and Electrician of the Post Office, in August 1877 at the Plymouth meeting of the British Association for the Advancement of Science (hereafter BAAS) ('The British Association', in the *Times*, 18 August 1877, pg. 6). Although an earlier demonstration had taken place in 1876 in Glasgow by William Thomson, it had not been successful. For details see Arapostathis, Stathis and Gooday, Graeme, *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain* (The MIT Press, 2013), pg. 98-101 and Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 56-8.

telephony, I recover telephone use-experiences: what it was like to interact and engage with the technology at the time. I therefore reveal how and why people used, or did not use, telephones in this period. I then demonstrate how these uses shaped the state of British telephony as it stood by 1893. My study of primary sources such as the epigraphs presented above has led me to provide a use-focused history which explains aspects of British telephone history, such as the nationalisation of the trunk lines, more fully than existing supply-focused narratives. My approach is similar to that which Jon Agar has employed regarding the history of mobile telephony.<sup>6</sup> Like Agar, I take into account the impact on technological development of users and non-users, categories which I apply from the work of Nelly Oudshoorn and Trevor Pinch.<sup>7</sup> Although these categories would not have been used in this way in the Victorian era, and are thus not entirely unproblematic, I explain in more detail how I apply them in section five below.

In this introductory chapter I critique the received view of telephone history from existing narratives, demonstrating how a different approach is needed. I then present the specific themes, methodology and structure of this thesis. In section two I discuss the historiography of British telephony, indicating the gaps in the received narrative which I address. I demonstrate that a particular historiographical stance, which I call the 'delay thesis', has negatively affected the historical study of telephony in Britain. This was the argument, formalised by Charles Perry in 1977, that telephone development in Britain was impeded by government policy as implemented by the Post Office and the Treasury.<sup>8</sup> Next, in section three I explore the problems with the 'delay thesis'. Detailing the four points on which Perry focused which led him to posit a delay, I explain how I re-evaluate them. Firstly, he focused simply on exchange telephony, whereby users could be put in contact with one another through a central exchange. However, I focus also on types of telephony which have not been extensively researched such as private telephony – connections between two or more points owned by one individual or business – and telephone innovations developed by users who modified telephone instruments. Secondly, I focus on

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6 Agar, Jon, *Constant Touch: A Global History of the Mobile Phone* (second edition, Icon Books, 2013).

7 Oudshoorn, Nelly and Pinch, Trevor (eds.), *How Users Matter: The Co-construction of Users and Technologies* (MIT Press, 2003).

8 Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977), pg. 69.

developments in the provinces and not simply in London; London was not representative of the rest of British telephony, and important developments often occurred elsewhere. Thirdly, I argue that telephone use was not easy or intuitive, as Perry assumed. Thus it is important to ask why people chose to use telephony within a context of established, effective alternatives, and not to take for granted its efficacy. Finally, as well as the Post Office and the telephone companies I also take into account the opinions and agency of non-users of the telephone, and their role in shaping the development of the technology. This is a historiographical approach I have adopted from the work of Sally Wyatt.<sup>9</sup>

Having critiqued the received view, in section four I present the three key themes on which I focus in order to revise Perry's approach and build upon existing historiography. These themes run throughout the thesis, and are based on three Victorian debates about telephony which emerge from the primary sources as being pivotal to the shaping of telephone development in this period. They were the questions of telephone ownership – namely who should provide telephone systems – entitlement – who ought to be able to use them – and purpose – what telephones ought to be used for. By investigating the four areas listed above, I gather evidence regarding the ways in which users and non-users contributed to these three debates and thus influenced British telephony. Each subsequent chapter addresses issues within one or two of these debates, and in my conclusion I demonstrate how, although they were not completely resolved at the end of the period covered by this thesis, some key developments had taken place within each theme. Section five sets out my methodology, including my focus on the agency of users and non-users in shaping technologies. I also explain why I focus on Britain specifically without making international comparisons, acknowledge the context of existing communications methods, and describe my engagement with histories of other telecommunications technologies. In section six I discuss the sources which I have employed throughout this thesis. Finally in section seven I give an overview of the structure of the rest of the thesis, including the time period and geographical area covered by the study and the aims and content of the chapters.

## 2. The historiography of British telephony

Before presenting my own research framework, I first evaluate the state of the field. From the turn of the twentieth-century until the present day, there have been several strands of British telephone history. One strand consisted of those accounts written by engineers,

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<sup>9</sup> Wyatt, Sally, 'Non-Users Also Matter: The Construction of Users and Non-Users of the Internet', in Oudshoorn and Pinch, 2003 (n.7).

mostly telephone engineers, such as J. E. Kingsbury, F. G. C. Baldwin and E. A. Marland.<sup>10</sup> Understandably, these authors focused mainly on the technical aspects of telephone development, with a particular emphasis on telephone exchanges as opposed to the use of private wire telephones by individuals or institutions. Throughout this thesis I utilise Kingsbury and Baldwin for their descriptions of technical aspects of various telephone systems, and for certain points of chronology. They are reliable sources for this purpose due to their proximity to the events they documented, and are also useful sources of diagrams of telephone instruments. A short book by David Occomore on the history of London exchanges has also been helpful when considering specific switchboard technologies employed in different exchanges in chapter three.<sup>11</sup> Nevertheless, the focus of these studies on exchanges and on telephone suppliers has left much historical ground unexplored; these are the gaps in the narrative which I address.

A brief historical note will serve to give some context from these sources. After the telephone was first demonstrated in Britain in August 1877,<sup>12</sup> the first British exchanges were opened in London in August and September 1879 by the Telephone Company and Edison Telephone Company of London.<sup>13</sup> By the end of the year representatives of these two companies had also opened exchanges around the country. However, the Post Office possessed a monopoly over telegraphic communications, and argued in late 1879 that telephony was a form of telegraphy.<sup>14</sup> In December 1880 this claim was confirmed in law, and telephony thus came within the Post Office monopoly. Post Office licences were

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10 Kingsbury, 1915 (n.5); Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925); Marland, E. A., *Early Electrical Communication* (Abelard-Schuman Ltd., 1964).

11 Occomore, David, *"Number, Please!" A History of the Early London Telephone Exchanges from 1880 to 1912* (Ian Henry Publications, 1995). For other works which have been useful sources of images of telephone instruments, see Prescott, George Bartlett, *Bell's Electric Speaking Telephone: Its Invention, Construction, Application, Modification and History* (D. Appleton & Company, 1884 (reprinted Arno Press, 1972)); Emmerson, Andrew, *Old Telephones* (Shire Publications Ltd., 1986); and Povey, P. J., and Earl, R. A. J., *Vintage Telephones of the World* (Peter Peregrinus Ltd., 1988).

12 See n.5.

13 Kingsbury, 1915, pg. 193 (n.5). Subscriptions were for the year and were flat-rate, with the Bell company charging £20 per annum and the Edison company £12 (Baldwin, 1925, pg. 33 (n.10)).

subsequently required in order to legally carry on telephone exchange business.<sup>15</sup> Meanwhile, the two telephone companies had amalgamated to form the United Telephone Company (UTC) in May 1880, and subsequently established subsidiary companies to run the telephone business around Britain, as noted in the table below. These companies will be known throughout this thesis as the UTC group.<sup>16</sup> From 1889, with key telephone patents about to expire and competition looming, the companies began to amalgamate. The NTC purchased the other companies, until by 1894 it was the only telephone company in Britain.<sup>17</sup> However, although the historical accounts in this strand provide the perspective of telephone suppliers, the views of telephone users are largely absent, as is the provision and use of non-exchange forms of telephony, as I discuss in chapter two.

Table 1.1. The UTC group companies in Britain<sup>18</sup>

<i>Name of company</i>	<i>Area covered</i>	<i>Period of operation</i>
United Telephone Company (UTC)	London (and, until December 1884, Bristol)	May 1880 – May 1889
National Telephone Company (NTC)	Yorkshire, the Midlands, Scotland (by 1894, all of Britain)	March 1881 – December 1911
Lancashire and Cheshire Telephone Company (L&C)	Lancashire, Cheshire, Isle of Man, North Wales	May 1881 – May 1889
Northern District Telephone Company (NDTC)	Westmorland, Cumberland, Northumberland and parts of Durham and Scotland	December 1881 – April 1890

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14 Baldwin, 1925, pg. 43 (n.10). This monopoly had been conferred upon the department by the 1869 Telegraph Act, by which the telegraphic systems of the country had been nationalised.

15 Ibid., pg. 45, 51.

16 Ibid., pg. 40.

17 Ibid., pg. 191-7; 'Telephone Amalgamation and the Post Office', in the *Economist*, 8 June 1889, pg. 731-2.

18 Baldwin, 1925, pg. 40 136-8, 191-2, 197 (n.10).

Western Counties and South Wales Telephone Company (WC&SW)	The western and south-western counties of England, and South Wales	December 1884 – January 1892
South of England Telephone Company (SETC)	Southern counties of England, East Anglia	January 1885 – October 1890

A second strand of telephone historiography focuses on the political and economic context of British telephony, and comprises the work of scholars such as A. N. Holcombe and Hugo Meyer.<sup>19</sup> An article by Arthur Hazlewood, concerning the advantages and disadvantages of telephone nationalisation, also belongs in this category, as does Jeffrey Kieve's work on telephony, in the context of his history of telegraphy.<sup>20</sup> This second strand focuses on the institutions which supplied telephone service, primarily the UTC group companies. These scholars tend to frame in a negative light the role of the Post Office in framing policy and licensing the companies, and Parliamentary debates are drawn on very heavily. Of the histories in this category, I argue that the most influential for subsequent scholarship has been that of Charles Perry, with which I will engage critically throughout this thesis.<sup>21</sup> In 1977 Perry attacked the British Post Office and the Treasury for allegedly holding back the uptake of telephony in Britain in the years before its nationalisation in 1912. His main arguments were that Post Office officials believed that telephony was a luxury and not a necessity, and that they insisted on attempting to promote wasteful competition through granting licences to multiple companies. In addition, Perry believed, government policies were too focused on protecting revenues from the state-run telegraph system. Histories in this strand do not tend to examine in detail the importance of the

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19 Holcombe, A. N., 'The Telephone in Great Britain', in *Quarterly Journal of Economics*, vol. 21, no. 1 (November 1906); Meyer, Hugo Richard, *Public Ownership and the Telephone in Great Britain: Restriction of the Industry by the State and the Municipalities* (The Macmillan Company, 1907).

20 Hazlewood, Arthur, 'The Origin of the State Telephone Service in Britain', in *Oxford Economic Papers*, New Series, vol. 5 no. 1 (March 1953); Kieve, Jeffrey L., *The Electric Telegraph: A Social and Economic History* (David and Charles Ltd., 1973).

21 Perry, 1977 (n.8).

provision of telephony by the Post Office and by various small, local independent companies. I address this in chapter four.

A third, less important, historiographical strand comprises shorter more popular histories, such as those written by the journalists Herbert Casson<sup>22</sup> and J. H. Robertson.<sup>23</sup> The former, a triumphant narrative of a new invention struggling against the odds and eventually becoming a great American success, prompted Perry to note that Casson placed too much emphasis on “the initial negative reception some periodicals gave the telephone.”<sup>24</sup> This was probably because such an emphasis supported Casson's dramatic narrative of the telephone eventually winning despite all the opposition. Perry, on the other hand, benefited in his narrative from emphasising how open most of the press and the public were to the telephone at first, and then contrasting this with the way in which the Post Office subsequently crushed the telephone spirit through its oppressive policies. This thesis argues that a more accurate account of public enthusiasm and scepticism lies somewhere between these two positions. This is largely because telephony was not an intuitive technology which was always easy to use, as such histories tend to assume, neither were telephone instruments or systems homogeneous around the country. I discuss this further in chapter three.

Some more recent and more in-depth histories have also been particularly useful; Raymond Feuerstein's 1990 doctoral thesis was a detailed examination of the provision of exchange telephony, specifically focusing on government policy and on the structure of Post Office and company exchange provision.<sup>25</sup> I have found this source very helpful for the insights it provides into Post Office policy and decision making during the period covered by my thesis. However, because he covered the whole period up until telephone nationalisation, Feuerstein did not go into as much detail as I am able to do in this thesis. The same applies to Jeremy Stein's doctoral thesis, which concentrated to a greater degree on the reception of the technology, and focused on the role allegedly played by different

22 Casson, Herbert Newton, *The History of the Telephone* (Tufts Digital Publishing Private Ltd., 2008 [originally 1910]).

23 Robertson, J. H., *The Story of the Telephone: A History of the Telecommunications Industry of Britain* (The Scientific Book Club, 1948).

24 Perry, 1977, pg. 71 (n.8).

25 Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990).

ideologies in attitudes displayed towards telephony.<sup>26</sup> Stein addressed the telephone in terms of social history over a long period of time, however he focused predominantly on London, and not on developments in the provinces.

Other social histories of telephony include Peter Young's global social history of the telephone,<sup>27</sup> and Carolyn Marvin's study of telephony and the electric light in Britain and the United States.<sup>28</sup> Young's book covered some varied uses for telephone instruments which are often overlooked in telephone histories, such as the use of telephones to communicate with sick rooms, thus minimising the risk of infection from fever patients.<sup>29</sup> His international focus, though, was too broad to allow for much detail about each country. Marvin focused on cultural conceptions of telephony and electric lighting in Britain and the US until the early twentieth-century, and used, as I do, a considerable amount of periodical material. However, she focused more on how people reacted to these technologies, and less on how users shaped their development through their decisions and requirements. More recently, Graeme Milne has begun to discuss telephone use specifically in his articles on the use of the telephone by British businesses.<sup>30</sup> Milne's focus on telephone users instead of providers has made his work very useful to me whilst thinking about the exchanges discussed in chapter four, especially when considering the frequency of exchange use amongst different subscribers.<sup>31</sup>

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26 Stein, Jeremy, 'Ideology and the Telephone: The Social Reception of a Technology, London 1876-1920' (Ph.D. thesis, University College London, 1996).

27 Young, Peter, *Person to Person: The International Impact of the Telephone* (Granta Editions, 1991).

28 Marvin, Carolyn, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford University Press, 1988).

29 Young, 1991, pg. 34-5 (n.27).

30 Milne, Graeme J., 'British Business and the Telephone, 1878-1911', in *Business History*, vol. 49, no. 2 (March 2007); Milne, Graeme J., 'Business Districts, Office Culture and the First Generation of Telephone Use in Britain', in the *International Journal for the History of Engineering and Technology*, vol. 80, no. 2 (July 2010).

31 Milne, 2007, pg. 164 (n.30).

However, when examining telephone histories, I have found that many scholars addressing contemporary or historical themes relating to telephony have uncritically used Perry's narrative slant to sum up early British telephony as underdeveloped.<sup>32</sup> Whether the role of telephone history is incidental to the main narrative or the primary focus of the article, Perry's work, and his delay thesis, constitutes the received view of British telephone history. Perry's approach has therefore depressed interest in this rich but under-researched field. Indeed, Jeremy Stein noted a similar concern when he observed that Perry's delay thesis was problematic, and argued that in fact telephone use developed considerably during this period. Stein asserted that the conception of British telephone growth as having been delayed has resulted from an undue historiographical focus on Post Office involvement in telephony, and the belief that telephone development was impeded by government bureaucracy. He further noted that, because of this, telephone history has not been widely studied.<sup>33</sup> Thus I argue Stein implicated Perry in a delay in telephone historiography. However, my alternative use-centred approach, as presented in this thesis, enables a better appreciation of the technological changes and developments which occurred during this period. By reappraising Perry's work below I thus hope to encourage more research in this area.

To conclude this historiographical survey, although existing histories provide useful facts regarding the growth of telephony, and regarding comparisons between state and private telephony, nevertheless the emphasis is on an inevitable progression towards monopoly and nationalisation. The users of telephone systems, and the general public of non-users, have not been given much of a voice; where they are heard, for example in Stein, Marvin or Milne, their capacity to affect the development of the technologies with which they interacted has not been acknowledged. However, in this thesis I demonstrate the range

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32 Michie, R. C., 'The London Stock Exchange and the British Securities Market, 1850-1914', in *The Economic History Review*, new series vol. 38, no. 1 (February 1985), pg. 70; Foreman-Peck, James, 'The Privatization of Industry in Historical Perspective', in *Journal of Law and Society*, vol. 16, no. 1 (Spring 1988), pg. 135; Hall, Brian N., 'The 'Life-Blood' of Command? The British Army, Communications and the Telephone, 1877-1914', in *War and Society*, vol. 27, no. 2 (October 2008), pg. 45-8; Johnson, Valerie, 'Plus Ça Change...? The Salutary Tale of the Telephone and its Implications for Archival Thinking about the Digital Revolution' in the *Journal of the Society of Archivists*, vol. 32, no. 1 (April 2011), pg. 80-1; Menke, Richard, 'The Medium is the Media: Fictions of the Telephone in the 1890s', in *Victorian Studies*, vol. 55, no. 2 (Winter 2013).

33 Stein, 1996, pg. 27, 81 (n.26).

of possible ways in which telephony might have developed by considering the variety of opinions held by these users and non-users. I address gaps in the historiography by examining Post Office telephony in more detail, as well as the local independent companies. Likewise, I go beyond exchange telephony to examine the full gamut of different telephone uses in the first decade and a half of British telephony.

### 3. Re-evaluating the 'delay thesis'

I now use the historiographical context given above to criticise the received view of British telephone history. I discuss why Perry's historical rendering was inaccurate and misleading, and re-evaluate his conclusions. Perry explained the telephone's failure to “lessen the vicissitudes of time and space, bring loved ones together, and facilitate trade and commerce”<sup>34</sup> during this period as a regrettable delay, noting that: “[o]n an a priori basis, one might assume that the telephone should have had a greater impact.”<sup>35</sup> In doing so Perry problematised the non-use of the telephone during its early years in Britain; once telephony was available, Perry assumed that people would want to use it. He thus subscribed to a deterministic view of technological development and proliferation whereby progress along a certain path is to be expected. When he did not see this expected technological development in the case of British telephony, Perry looked for an explanation. Below, I address how the delay thesis arose from Perry comparing British telephony to the American case. I then discuss Perry's four methodological biases and the ways in which my use-focused approach leads me to invert these assumptions and to develop an alternative narrative of British telephone history. These methodological biases were Perry's focus on exchange telephony, his focus on London, his assumption that the telephone instruments and systems of the time were unproblematic to use and obviously beneficial, and his emphasis on Post Office involvement with the telephone.

#### 3.1. “Delay relative to what?”<sup>36</sup>

Perry's assertion of a delay implied the existence of a normative model from which he believed British telephony deviated; as Stein asked: “[d]elay relative to what?”<sup>37</sup> I argue that Perry assumed the way in which events developed in the US comprised a normative

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34 Perry, 1977, pg. 69 (n.8).

35 Ibid.

36 Stein, 1996, pg. 27 (n.26).

model, and thus he problematised discrepancies and deviations from this norm in other countries. Perry's paper was published as part of an edited volume called *The Social Impact of the Telephone*, produced to mark the telephone centenary. The majority of the contributions to this book were by Americans, about the US.<sup>38</sup> The section within which his paper was placed was entitled "Alternative paths of development: the early years." In this way these contributions were presented as exceptions to a normative example, US telephone history, on which most of the rest of the volume focused. The US was thereby established as the normative model for telephone development, and Perry tacitly assumed that the telephone should have developed in the same way in Britain; seeing that it did not, he sought to explain why.

Indeed, as an economic and administrative historian, Perry was coming from a discipline which requires such histories as this to be adjuncts to policy making in the relevant fields, and thus to inform practical decisions. When making such decisions about practical matters, it is invaluable to look back and determine what happened, in order that desirable outcomes might be repeated, and undesirable ones avoided. Such policy recommendations comprise the normative, or value-driven, part of economic theory, where decisions are made about how the economy ought to function, as opposed to positive economics, which is concerned only with describing and explaining observed economic phenomena.<sup>39</sup> Thus, in assuming that there was a way in which British telephony should have developed but did not, and allowing this to guide his narrative, I argue Perry conflated normative and positive approaches. However, the normative approach, which requires judging historical facts and classing them as desirable or undesirable, is not helpful for a historical analysis the aim of which is to understand what did happen, instead of explaining why something else did not happen. Instead of simply describing and explaining the situation he found, Perry sought to explain why it was not as he believed it ought to have been. His analysis was thus coloured by his search for what held British telephony back, instead of the appreciation that there was no reason that it should have been compared to the US in the first place.

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37 Ibid.

38 Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (MIT Press, 1977).

39 Keynes, John Neville, *The Scope and Method of Political Economy* (Macmillan, 1891), pg. 22. I am grateful to Gaston Yalonetzky for pointing out this distinction and directing me to the relevant source material.

In setting up the US as a normative case, and subsequently comparing Britain to this arbitrary ideal, Perry was not alone, and can be historiographically contextualised as an American scholar writing what essentially amounted to an economic history in which Britain was compared unfavourably to the US. For example, Martin Wiener's 1981 book *English Culture and the Decline of the Industrial Spirit*<sup>40</sup> presented a very broad economic history narrative, which first posited British economic decline and then attempted to explain this decline by blaming the British aristocracy for imbuing the industrial and commercial classes with their own anti-commerce and specifically anti-technology attitudes in the late nineteenth-century.<sup>41</sup> Wiener, in setting up his power struggle between the aristocracy on the one hand and the industrialists on the other, overlooked the fact that, during the late nineteenth-century, aristocrats were often very closely involved in promoting electrical technologies, as Graeme Gooday has noted with regard to electric lighting.<sup>42</sup> I argue that this was also true of telephony, with, for example, the Duke of Marlborough involving himself heavily in debates regarding the provision of exchange telephony in the 1880s and early 1890s. I discuss this in detail in chapter five.

Next, in 1983, Thomas Hughes' *Networks of Power*<sup>43</sup> set up a contrast between Britain and the US in terms of technology and economics with regard to the spread of electric power systems, in which Britain did not fare well.<sup>44</sup> Hughes also shared Perry's assumption about London as being representative of Britain as a whole, and noted how backwards the capital, and by association the entirety of Britain, was when it came to electricity in the late nineteenth-century. The problem, as Perry also posited in his own paper, was politics, and government interference in technology.<sup>45</sup> Indeed, this difference in

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40 Wiener, Martin, *English Culture and the Decline of the Industrial Spirit, 1850-1980* (Cambridge University Press, 1981).

41 Ibid., pg. 12, 158-9.

42 Gooday, Graeme, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (Pickering and Chatto, 2008), pg. 2, 33, 78, 117.

43 Hughes, Thomas, *Networks of Power: Electrification in Western Society, 1880-1930* (The Johns Hopkins University Press, 1983).

44 Ibid., pg. 257, 261.

45 Ibid., pg. 227.

the attitude displayed by the state towards new technologies was emphasised as the key point of departure between the two countries. These authors, Americans looking at British history, were writing within an American political climate which espoused laissez-faire capitalism and anticipated Britain moving closer to their position, with less government regulation of business and more freedom for industry. Perry's argument can thus be seen as the vanguard of this trend, attacking Post Office involvement in the telephone business and condemning government meddling in private industry.

### 3.2. Telephone exchanges, private wires and telephone innovations

In asserting that there was a delay in the uptake of the telephone in Britain, Perry did not specify that he was really only referring to exchange telephony, whereby multiple users communicated with one another via a central switching station, or exchange. In limiting himself to quantifying the users of exchange telephony, Perry inherited a tendency from the earliest telephone histories, which as noted above were written by exchange engineers. However, I distinguish between three types of telephony: exchange telephony, private telephony and telephone innovations. Exchange use has received the most attention in existing histories of telephony, as noted above. Private telephony, on the other hand, included any case of single wires being used to connect two premises together, or two rooms within one building or complex. What I have called telephone innovations were the uses of telephony as applied to purposes other than the transmission of speech, which were devised by users engaging with the technology and developing new applications which had not been foreseen by the promoters and suppliers. Such uses have received the least scholarly attention, but were nevertheless important and widespread throughout this period and are the focus of chapter two.<sup>46</sup>

Private telephony was important in encouraging people to join exchanges. Having had the chance to use to a private wire, a user might then desire to be connected up to an exchange. Nevertheless, as Milne has pointed out, and as I demonstrate in chapter four, not every private wire user who joined an exchange found it served their needs, and when this happened they might revert back to only using private lines again.<sup>47</sup> Indeed, private

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46 One exception is an article by Gabriele Balbi focusing on the early use of telephony in Italy, which listed a few examples. Balbi called these innovations “unexpected uses” (Balbi, Gabriele, 'The Idles Mattered: The Early Italian Telephone and its Users', in *Estudos em Comunicação*, no. 14 (December 2013), pg. 48-51).

47 Milne, 2007, pg. 171 (n.30); BT Archives, POST 30/406a, file 4, C. H. Sharples to Chetwynd, 18 May 1882.

telephony may have been the dominant form of the technology with which people engaged. As I note in chapter five there were many companies erecting private telephone wires around the country, but as these were not required to have licences from the Postmaster General they have been largely overlooked in the history of the telephone in Britain. As these companies were not as prominent as the exchange companies, it is difficult to estimate how many private wire users there were in the period covered by this thesis. I show in chapter two how various users innovated with telephone instruments by constructing new uses intended to improve the health or safety of users, or to save lives. These uses had not been foreseen by telephone promoters, and often did not involve the transmission of speech. As Gooday has noted, some men of science found that Bell's telephone instruments were so sensitive to very small electrical currents that they used them instead of galvanometers in research and experiments.<sup>48</sup>

Such uses as these increased the prominence of telephony, and demonstrate how focusing on exchange telephony prevented Perry from presenting a full picture of telephone use during this period. Although Perry assumed that the usefulness of exchange telephony would be immediately apparent, and that its ability to “lessen the vicissitudes of time and space, bring loved ones together, and facilitate trade and commerce”<sup>49</sup> would be both clear and desirable, this was not always true. Private telephony was often better suited to the needs of telephone users in the period covered by this thesis. Perry was not looking for such users as these, but by looking at private wires, and other innovative uses of telephone instruments, I can see people's first interactions with telephony. Some would later become exchange subscribers, but for others the telephone would simply remain a useful way to communicate between an office and a factory or warehouse, or within a large house.

### 3.3. The telephone in London and the provinces

Possibly influenced in part by Baldwin's opinion that “London was the main centre of telephone activity from the very first and has so remained”,<sup>50</sup> most of Perry's evidence was drawn from London, and he noted how people at the time compared London with other

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48 Gooday, Graeme J. N., *The Morals of Measurement: Accuracy, Irony and Trust in Late Victorian Electrical Practice* (Cambridge University Press, 2004), pg. 65.

49 Perry, 1977, pg. 69 (n.8).

50 Baldwin, 1925, pg. 91 (n.10).

major world cities.<sup>51</sup> Elsewhere he noted London prices and, when it supported his argument against the Post Office regulation of the telephone service, he noted how people complained about the service in the capital.<sup>52</sup> However, Perry did not discuss whether London was typical of the rest of the country. Indeed, London was not representative of other British telephone centres; as Milne demonstrated in his use-focused article on the employment of the telephone by British businesses, the most telephonically developed area in the country was actually the trans-Pennine corridor around Liverpool and Manchester.<sup>53</sup> The London telephone system was seen by those at the time as notoriously bad, and remained more expensive than the rest of the country for longer, although the NTC reduced the rates elsewhere in 1891.<sup>54</sup>

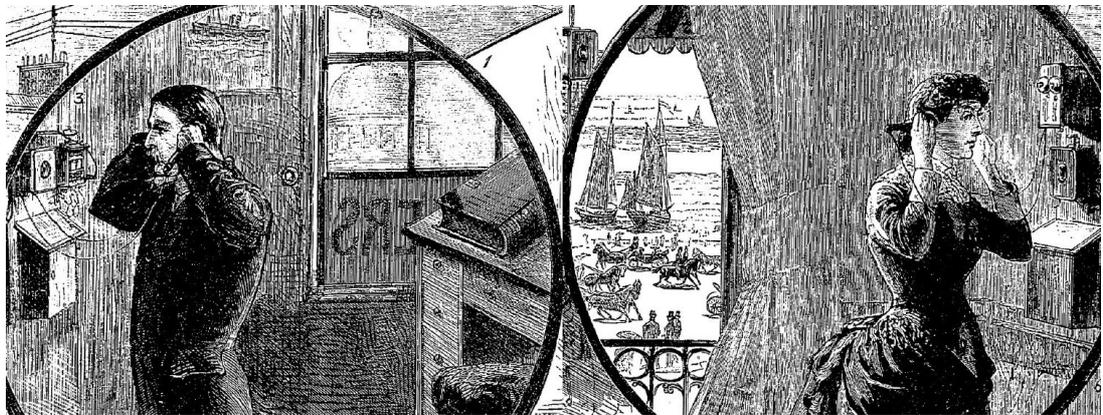


Figure 1.1. 'Talking Between London and Brighton'

Source: detail from 'The Telephone Exchange in London', in the *Graphic*, 1 September 1883, pg. 232-3

London had very few trunk connections to other towns and cities; it was not until December 1884 that its first trunk line, to Brighton, opened (Fig. 1.1.).<sup>55</sup> It was another six

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51 Perry, 1977, pg. 80 (n.8).

52 Ibid., pg. 75, 78.

53 Milne, 2007, pg. 166 (n.30).

54 Baldwin, 1925, pg. 605 (n.10).

55 Ibid., pg. 474. However, this trunk line was not very efficient: 'Telephone Systems of London, Manchester and Glasgow', in the *Electrician*, vol. 21 (1888), pg. 527. Figure 1.1., dated September 1883, depicted only a "prospective" conversation ('The Telephone Exchange in London', in the *Graphic*, 1 September 1883, pg. 218).

years before another line, this one to Birmingham, connected the capital to the provinces. Furthermore, this initiative did not even originate in London: in 1888 Birmingham subscribers provided the impetus for the project through their telephone provider, the NTC.<sup>56</sup> London was thus telephonically isolated from most of the country, and certainly from the heavily industrialised manufacturing regions of the north of England, for over a decade after the first exchanges in the country were established there. London was also different from provincial towns and cities in that it had a greater abundance of messengers available to take notes short distances. For example, the Corps of Commissionaires, an organisation started in 1859 to provide work for ex-servicemen, supplied messengers for business and domestic use in London.<sup>57</sup> In the late 1880s messenger companies were also established in the city, and by the early 1890s two of these were using electric call systems to allow their subscribers to summon messengers electrically to their homes or places of business. In 1891 in response to the companies, and very controversially, the Post Office also started to provide its own messenger service.<sup>58</sup> Therefore by the 1890s Londoners had access to a high-profile method of communication which was used to carry out some of the local functions for which they might otherwise have desired an exchange connection.<sup>59</sup> I discuss this further below and in chapter three.

It is for these reasons that I investigate provincial telephony. I focus on several provincial towns such as those which had independent exchange companies during the 1880s: Sheffield, Dundee, Swansea and Preston. I also look at some Post Office exchanges,

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56 Baldwin, 1925, pg. 479-81 (n.10); Tupling, R. E., *A History of the Birmingham Telephone Area* (Post Office, 1978), pg. 24.

57 Coase, R. H., 'The British Post Office and the Messenger Companies', in the *Journal of Law and Economics*, vol. 4 (October 1961), pg. 15-6; One of the Public, 'The Post Office and Private Enterprise', in the *Times*, 31 March 1891, pg. 9. This organisation still operates today under the name of Corps Security: <http://www.corpssecurity.co.uk/about-us/our-history.aspx> [accessed 12 June 2014].

58 This story is told in some detail in Coase, 1961 (n.57). See also: 'The Post Office and the Public', in the *Times*, 26 March 1891, pg. 4; ['When Sir James Fergusson'], in the *Times*, 12 August 1892, pg. 10.

59 ['Those Two Sluggish Institutions'], in the *Times*, 15 April 1891, pg. 9. The profile of these services was raised by the controversy surrounding the Post Office's treatment of the messenger companies, which generated much debate in Parliament and in the press.

such as Newport, which I argue was representative of medium-sized Post Office systems. Other important exchanges run by the UTC group include Glasgow, Bradford and Leeds, which were very busy telephone centres and are therefore worthy of note. In addition, Aberdeen merits attention: there for the first time, in 1883, the threat of a local company being established to compete with the NTC forced that company to reduce its rates, and subsequently exchange growth was very rapid. In chapter five I also examine the influential Mutual Telephone Company in Manchester; when this company began supplying cheap telephony after the main telephone patents expired, it effected a reduction in the NTC's subscription rates around the country. However, as specific evidence of telephone use is not common in the primary sources, as noted below, I have occasionally made use of important examples from other towns or cities to illustrate my argument.

Although the scope of this research project has restricted me to examining a limited number of towns and cities, this does not compromise the generality of my findings. Rather, focusing on key telephone centres around the country enables me to provide a more detailed picture of telephone development around the country, and to look geographically at British telephone history. The importance of thinking geographically about developments in the history of technology has been emphasised by Crosbie Smith and Jon Agar, who advocated a spatialised approach as an important method of understanding developments in the history of science and technology.<sup>60</sup> More recently a volume edited by David Livingstone and Charles Withers has demonstrated that where such developments take place can affect what science or technology is produced.<sup>61</sup> In the case of British telephone history, although London had more telephones by virtue of its larger population, it was not the telephone capital of Britain during this period. Thus I look elsewhere in order to provide a more comprehensive narrative of Victorian telephony.

#### 3.4. The heterogeneity of telephone instruments and systems

The way in which Perry treated the telephones of the period implied that they were as reliable, clear, and easy to use as modern instruments. However, appreciating their technical heterogeneity in the period is important for understanding what users and

60 Smith, Crosbie and Agar, Jon, 'Introduction: Making Space for Science', in Smith, Crosbie and Agar, Jon (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Macmillan Press Ltd., 1998), pg. 2-3.

61 Withers, Charles W. J. and Livingstone, David N., 'Thinking Geographically about Nineteenth-Century Science', in Livingstone, David N. and Withers, Charles W. J. (eds.), *Geographies of Nineteenth-Century Science* (University of Chicago Press, 2011), pg. 1.

potential users actually confronted when they first interacted with telephone instruments and systems, and also reveals the problems many encountered as they did so. There were many different models and designs, both of instruments and of telephone systems, and their performance also depended on factors such as the length, construction and quality of the wire and the switchboard in use at the exchange.<sup>62</sup> These factors are discussed at length in chapter three. For example, Perry described rather disparagingly a report given by John Tilley, the General Secretary of the Post Office, regarding an Edison telephone in January 1880, four months after the first Bell and Edison exchanges were opened in London. According to Perry, Tilley was a man who “should have known better”<sup>63</sup> nevertheless writing a bad report about his experience; Tilley's report to the Postmaster General, John Manners, noted that he could not make out a word of what was being said, and that the working of the instrument was very cumbrous.<sup>64</sup>

Although Perry interpreted this as Tilley's “skepticism [sic]” and “hostility”,<sup>65</sup> he did not appreciate that this was probably a very accurate account. The telephone instruments Tilley used were a carbon button transmitter and a chalk receiver, also called an electro-motograph. Both of these had been invented by Edison in order to avoid patent battles with the Telephone Company. Although praised by technical commentators, the receiver was not commercially successful.<sup>66</sup> The electro-motograph reproduced sounds very loudly, hence Tilley's comment that the resulting noise “strikingly resembled an exceedingly bad street Punch”,<sup>67</sup> and a handle on the side needed to be constantly cranked for the entire duration of the conversation in order to make it work, hence the comment about the

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62 For example, subscribers in Glasgow reported considerable difficulty in attempting to use their system: Bach, Albert, 'The Telephone', in the *Glasgow Herald*, 19 September 1893, pg. 3.

63 Perry, 1977, pg. 72 (n.8).

64 BT Archives, POST 30/398, file 6, Tilley to Manners, 13 January 1880.

65 Perry, 1977, pg. 72 (n.8).

66 'Telephonic Inventions of Gray, Bell, and Edison', in the *TJER*, vol. 5 (1877), pg.189-90; du Moncel, Theodore, *The Telephone, the Microphone and the Phonograph* (Harper & Brothers, 1879 [reprint, Kessinger Publishing edition]), pg. 76-8; 'The Rise and Progress of Telephony in the United Kingdom', in the *Electrician*, vol. 19 (1887), pg. 289.

67 Tilley to Manners, 13 January 1880 (n.64).

cumbrous working. Perry's assertion that this was evidence for Post Office reticence towards the telephone was an inaccurate interpretation of the source. However, this example has been influential, as it has since been included uncritically in other histories.<sup>68</sup>

In addition, compared with telegrams or letters, telephones had the disadvantage of not leaving a written record. In many official situations, or cases where lives were at stake, having a written record was a priority, and existing methods of communication were more appropriate for the purposes for which they were required. During this period exchange equipment, including the apparatus used by subscribers, was also not standardised around the country.<sup>69</sup> Subscribers in different cities such as Manchester, Liverpool, Glasgow, Nottingham and Birmingham thus encountered different exchange systems and different ways of using their telephones. These differences need to be taken into consideration when assessing responses to different telephone systems. The heterogeneity of different technologies, systems and conditions which users and non-users encountered when interacting with telephony throughout this period means that we cannot assume, as I believe Perry did, that using telephones was easy, intuitive or enticing. Sometimes it might just have been quicker, easier or cheaper to send a letter, messenger or telegram. I argue that it is far from obvious that many people would have wanted to adopt any form of telephony in these early years.

### 3.5. The Post Office, the companies and the users

Perry blamed the small uptake of the telephone largely on government bureaucracy, and particularly on the Post Office and the Treasury, but there were many reasons for this circumstance. Below I will demonstrate the importance of the attitudes of the companies, the telephone subscribers, and the general public of non-users of telephony. The companies, first of all, were blamed frequently in the press for charging too much and for not providing a sufficient service, as I will demonstrate further in chapter three. The *Financial News* attacked the UTC for the royalties it received over the first decade from its subsidiary companies for use of its patented instruments, noting: “[a]ll the directors do in connection with these is to sit still and receive the money, and then squabble with their children if they think they don't pay enough.”<sup>70</sup> The companies' rates were high, and

<sup>68</sup> Feuerstein, 1990, pg. 88 (n.25); Hall, 2008, pg. 46 (n.32); Johnson, 2011, pg. 80 (n.32).

<sup>69</sup> Baldwin, 1925, pg. 134 (n.10).

<sup>70</sup> BT Archives, TPF/2/12/2, pg. 20, 'The United Telephone Company', in the *Financial News*, 2 August 1888. See also pg. 16, 'Dawn at Oxford-Court', *Financial News*, 24 June 1888.

seemed to be reduced only under threat of competition, for example in Dundee, and after the Mutual Company began in Manchester, as I note in chapters four and five.<sup>71</sup> Perry's account did not emphasise quite how annoyed many people were with the companies.

In addition, Perry noted the attitude in the Post Office, expressed explicitly by Postmaster General Arnold Morley in 1895, that the telephone was a luxury not a necessity, and described officials holding this view as “short-sighted bureaucrats who regarded penny-pinching more highly than the needs of the public.”<sup>72</sup> However, although pointing out that this view was also expressed in the press once or twice, he neglected to mention that the large companies displayed the exact same attitude. For example, in 1882 the *Telegraphic Journal and Electrical Review* had concluded, from a review of the telephone companies' rates and activities, that their policy was to cater to the few at high rates rather than the many at low rates.<sup>73</sup> This attitude of the telephone as a luxury was not confined to the government. It is important also to remember that the cost of nationalising the telegraph in 1870 had been expensive, and was still increasing; by 1891 it had reached nearly £11 million.<sup>74</sup> This was a considerable sum of public money, and needed to be protected, for the sake of the tax-payers, against revenue losses from telephony. Thus, Perry's story of the Post Office holding up telephone development is again incomplete.

Many who did not use the telephone still had a lot of power over telephony. The attitudes of such individuals and groups towards telephony were often shaped by articles in periodicals, such as the widely read and respected examples given in the epigraphs above. In addition, public lectures and demonstrations exposed a broader section of the general public to the new technology. However, the opinions thus formed could be negative, for example that telephone use would intrude on daily life, and that overhead wires could be

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71 Baldwin, 1925, pg. 142, 192-7 (n.10).

72 Perry, 1977, pg. 75 (n.8).

73 'Lancashire and Cheshire Telephonic Exchange Company', in the *TJER*, vol. 11 (1882), pg. 318.

74 Kieve, 1973, pg. 180 (n.20). Additionally, in this respect Britain was more similar to Europe than the US; most European countries at this time also had nationalised telegraph systems, and felt a similar need to protect their telegraph revenues for the sake of the public (Wallsten, Scott, 'Returning to Victorian Competition, Ownership and Regulation: An Empirical Study of European Telecommunications at the Turn of the Twentieth Century', in the *Journal of Economic History*, vol. 65, no. 3 (September, 2005), pg. 697-8).

ugly and dangerous. In this respect, land owners and members of local authorities could particularly influence the spread of telephony by refusing the companies permission to run wires through or over their property. This happened on a local and a national scale, and is a key focus of chapter three.<sup>75</sup> Some telephone subscribers themselves restricted the size and growth of exchange telephony by keeping out smaller users. Cheaper flat rates, which encouraged more subscribers in places like London, Manchester and Dundee, were sometimes opposed; one subscriber argued that what was wanted was greater efficiency, not lower cost.<sup>76</sup> Noting briefly in an appendix that users themselves might have kept the rate of telephone dissemination low, Perry considered it paradoxical that business users of telephony would have impeded telephone growth.<sup>77</sup> However, my use-focused approach is able to explain this, as I demonstrate in chapter four.

#### 4. Thesis themes

Having demonstrated how I invert Perry's methodological biases I now present the three use-centred themes which guide the rest of my thesis and enable me to draw new conclusions about the development of British telephony. These themes have arisen from the use-focused methodology of my thesis, and are based on three late nineteenth-century discussions regarding ownership, entitlement and purpose. The question of telephone ownership mainly applied to exchange telephony, and specifically to who should provide exchange service. As Perry rightly pointed out, there was no consensus on how the telephone industry ought best to be structured, whether competition or monopoly was best, whether exchange provision should be run locally or nationally, or whether private companies or public bodies were best.<sup>78</sup> Possible options included private companies competing against one another or against the Post Office, or a monopoly, which could be in the hands of either a private company or the government. Furthermore, either public or private providers could be localised instead of national, as in the case of municipalities, which came to prominence at the end of the period covered by this thesis, or small local

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<sup>75</sup> BT Archives, TPF/2/12/2, pg. 15, untitled clipping from the *Nottingham Daily Guardian*, 6 June 1888.

<sup>76</sup> Subscriber, 'Municipal Telephones', in the *Manchester Guardian*, 15 February 1896, pg. 5.

<sup>77</sup> Perry, 1977, pg. 91 (n.8).

<sup>78</sup> *Ibid.*, pg. 81.

companies, discussed in chapter four. However, Perry did not consider the significant influence which the different opinions of the users had on this question, as I shall examine throughout this thesis. This was the most complex question because of the many alternatives available, and, as I demonstrate in chapters four and five, was affected not only by political or economic ideals held by users, but also by the specific uses to which they put exchange telephony.

The second question, entitlement, concerned who should be eligible to use telephony, and thus whose convenience, and financial means, ought to be considered when establishing exchanges, building private wires, and setting subscription rates. The main question here was whether telephony could be considered to be a luxury or a necessity, and for whom. I argue that regarding this question there was less of a variety of opinion. Some business users, for example merchants in Manchester, argued by the late 1880s that telephony had become for them a necessity. However, most telephone suppliers saw telephony as a luxury compared with the cheaper and more widely available alternatives of the letter post and telegraphy. They thus believed that telephony should be an exclusive technology, to be used by wealthy industrial firms, commercial concerns such as stockbrokers, merchants or newspapers, professional men such as lawyers, or by members of the upper-middle class or aristocracy. However, the views of users and non-users were important here, because where they agreed with the telephone suppliers they reinforced their views, but where they disagreed telephony began to develop differently.

Finally, through their actions and decisions users also decided the purpose to which telephony was to be put. Bell's early comment in September 1877 that the telephone was an embryonic technology,<sup>79</sup> and the fact that many people innovated and invented new uses for telephony, indicates that the purpose of telephony at this point was not fixed or certain, but fluid and in need of construction. This applied to all three categories of telephony, and the uses to which telephony was applied by those who employed it shaped the development of both telephone instruments and telephone systems. The innovations developed by various users or groups of users indicated a willingness to adapt and employ telephony when it was more efficacious than existing techniques and technologies. This is not apparent in existing histories. Although no consensus was reached regarding these three themes by the end of the period covered by this thesis, there was nevertheless some resolution. For example, regarding ownership, there was no more private competition amongst telephone companies after 1893; a private monopoly, albeit a generally unpopular one, provided telephony.

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<sup>79</sup> 'Oral Telegraphy', in the *Times*, 19 September 1877, pg. 4. I am indebted to my supervisor Graeme Gooday for pointing me towards this source.

However, a new option was also gaining prominence, that of local, public ownership by municipalities in competition with the NTC. I return to this point regarding the state of these three debates by 1893 in my conclusion.

## 5. Methodology

I now present the methodological and theoretical framework of this thesis. The novel methodological approach of my thesis is my application to telephone history of Nelly Oudshoorn and Trevor Pinch's emphasis on the role of users and non-users in shaping technological development.<sup>80</sup> I have also been influenced by Jon Agar's approach to users in relation to mobile telephony and Sally Wyatt's work on the importance on non-users of technologies in the case of the internet. Below I explain how I utilise this area of historical scholarship, including the limitations of using the categories of users and non-users, in order to highlight the theoretical issues which have guided my research. From these more general issues within the history of technology, I move on to discuss two further points more specific to the history of telephony which have guided my research. The first is the problems involved in studying international comparisons made between British telephony and telephony in other countries during the period covered by this thesis. The second is the importance of examining the context of existing communications methods. Finally, I note my engagement, primarily in my conclusion, with histories of other telecommunications technologies such as telegraphy and mobile telephony.

### 5.1. The importance of users

In looking at telephone users, types of use, and complaints about the new technology, I problematise the use of early telephony in a similar manner to that in which Agar also problematised the uptake of the mobile telephone.<sup>81</sup> In neither case was the use of the technology obvious or inevitable, but rather it requires explaining. My thesis thus applies Agar's methodology and focus to early telephony, and is also influenced by the emphasis placed on users by Oudshoorn and Pinch. When considering how technologies change over time, Oudshoorn and Pinch have emphasised the importance of seeing users and technology as “two sides of the same problem – as co-constructed.”<sup>82</sup> Thus, when a problem is raised regarding a technology, there are potentially two sides to the solution: one could alter either the technology or the users. In the case of telephony, when a problem was encountered the

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80 Oudshoorn and Pinch, 2003 (n.7).

81 Agar, 2013, pg. 19 (n.6).

resolution did not always ultimately come from the changing of the technology in the period covered by this thesis. The influence the users could have on the technology was balanced by the influence which the providers of the technology believed they could have in altering the users. As will be seen in chapter three, in the case of telephony this depended both on the specific complaint, and on who was expressing it. As telephony developed, it is important to understand that, where the technology itself did not appear to change, it may have been the users, or the non-users, whose expectations of the technology were being altered.

Nevertheless, users of exchange telephony arguably had more influence over their technology than users of other technologies; this was because the utility of exchange telephony relied specifically on other users with whom each subscriber could communicate. As I demonstrate in chapter four, it was not always true that a bigger exchange was better and more useful to its users. However, a group of users who desired communication with one another, and who formed a large percentage of the total number of subscribers on the network, could exercise a great deal of power and control over the providers of their service. When telephone companies believed that a larger exchange was what users would want, they were very keen to stress in their publicity how many subscribers were connected with their exchanges, and how many would be very soon,<sup>83</sup> because the number of users was itself a selling point. In this way, groups of users of a product became themselves a product. Therefore, if users desired to influence this technology, they had a strong potential to do so.

Like a few other technologies in the period – electric lighting and telegraphy, for example – telephony was a networked technology, a system which relied on many different components to all be working well in order that the whole might function efficiently. Hughes dealt with the spread and development of electric power in terms of a system, which “is constituted of related parts or components... connected by a network, or structure”.<sup>84</sup> However, as Gooday has pointed out, Hughes did not take into account the human users as equally important components of this system; it is not enough simply to assume that home-owners desired to have electricity, and indeed many did not. Thus a tension needed to be resolved whereby either the technology or the attitude of the public

82 Oudshoorn, Nelly and Pinch, Trevor, 'How Users and Non-Users Matter', in Oudshoorn and Pinch, 2003, pg. 3 (n.7).

83 'Mutual Telephone Company', in the *Electrician*, vol. 27 (1891), pg. 209.

84 Hughes, 1983, pg. 5 (n.43).

was altered in order for electric power to spread.<sup>85</sup> I argue that in exchange telephony, the role of the human user as a component in the overall system is even more important, as the efficacy and utility of the network is directly determined by the people using it. Perry, in examining telephony, also did not consider users as an important factor in the development of the system. In this thesis I go beyond Perry's work and do for telephony what Gooday has done for Hughes' treatment of electric lighting: I recover the user as an integral part of the system.

However, although I apply Oudshoorn and Pinch's categories of users and non-users to the Victorian period, these terms were not employed in this way at the time. For example, the UTC group often referred to “subscribers” and “non-subscribers”;<sup>86</sup> however, as this dichotomy applied primarily to exchange telephony, and solely to users of those companies' telephones, it did not include the range of individuals and groups that I address in this thesis. In public discourse, too, users were normally called subscribers.<sup>87</sup> The Post Office referred to its telephone users as “renters”.<sup>88</sup> Non-users were often known simply as “the general public”,<sup>89</sup> or, on occasions when telephone provision came into conflict with the rights of the public, the identity of these non-users as “ratepayers” was emphasised.<sup>90</sup> Nevertheless, the terms user and non-user allow me to analyse the effects which those who used or did not use all types of telephony had on the development of British telephony. Thus I apply these as useful categories throughout the thesis.

## 5.2. The importance of non-users

It was not simply users of telephony who were important in shaping and influencing its development. As Sally Wyatt has pointed out, using the example of a more modern

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85 Gooday, 2008, pg. 17 (n.42).

86 UTC, List of Subscribers, January 1883, pg. 17.

87 For example: 'The Development of the Telephone System', in the *Times*, 7 December 1882, pg. 3.

88 For example: BT Archives, POST 30/392c, Snell to Brodie, 10 February 1881.

89 For example: 'Notes', in the *Western Mail*, 24 April 1885, pg. 2.

90 For example: 'Proposed Telephone Extension', in the *Sheffield and Rotherham Independent*, 29 March 1888, pg. 2.

telecommunications medium, the internet, non-users are also important in determining how technologies develop and spread.<sup>91</sup> This becomes particularly apparent in chapter three. Non-users, Wyatt argued, are not a homogeneous group, neither are they always passive in their non-use. Rather, Wyatt listed four categories of non-user: the resister, who never wanted to use the technology in the first place, the rejecter, who began using the technology but decided to give it up, the excluded, who never had the chance to use the technology, and the expelled, who was forced to stop using it.<sup>92</sup> Only the latter two of these categories represent people who wanted to use a technology but were unable to; the other two, resisters and rejecters, made an active decision to remain non-users. Wyatt also stressed that historians should include non-users in order to understand the design process within the development of a technology, because producers designed technologies to entice non-users into becoming users.<sup>93</sup>

Wyatt also argued that to emphasise only the user was a type of technological determinism which assumed that the spread of a technology was inevitable: once the technology was available, either financially or geographically, people would use it.<sup>94</sup> In this case there would be little point in studying non-users. My research supports Wyatt by indicating that non-use of telephony was as much of a choice for some in this period as use; indeed, most non-users were users of other communications technologies, who often did not see any advantages to using telephones. Additionally, Stein has pointed out that telephone companies had trouble acquiring wayleaves, the permission granted by land-owners to place poles and wires on their property. This made completing connections difficult, and could mean users paid a greater sum for their connections.<sup>95</sup> Synthesising these two points, I argue that non-users were important in shaping the development of exchange and private telephony not necessarily because suppliers designed their products to entice non-users to become users, but rather because non-users had the power to prevent other non-users from becoming users. Thus, some excluded non-users remained as such because other non-users,

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91 Wyatt, 2003 (n.9).

92 Ibid., pg. 76.

93 Ibid., pg. 78.

94 Ibid., pg. 68-70.

95 Stein, 1996, pg. 29, 78, 151 (n.26).

be they excluded or resisters, kept them that way. I provide more evidence of this in chapter three.

I consider Wyatt's approach useful and important for noting this heterogeneity of non-users, for example willing and unwilling non-users, and also for highlighting that ignoring non-users essentially leads to a form of technological determinism. However, I see no further benefit in applying her categories to early telephone non-users. These categories are useful when assessing access to a current technology such as the internet, as Wyatt was doing; in this way such categorisation might conceivably aid policy decisions for the future by promoting a better understanding of target audiences. This is, however, less useful as an aid to historical investigation. Nevertheless, there is another benefit of Wyatt's approach: in emphasising the differences between willing and unwilling non-users – those who wanted and chose to be non-users, and those who did not – a parallel also emerges with regard to users. As I demonstrate in chapters three and four, it was possible for telephone users to be unwilling users, meaning that they used the technology but did not want to, and felt they had no choice. This was largely due to the pressures of the exchange subscriber communities of which they were part, and I argue that such unwilling users played an important role in the growth of telephone exchanges in this period.

### 5.3. The problems of international comparisons

Moving from general historiographical points to those more specific to telephone history, I now outline the reasons why I have avoided making systematic comparisons between British telephony and telephony in other countries. Although such comparisons were common during the period, and of course have subsequently formed the backbone of Perry's delay thesis, nevertheless I argue that those who made international comparisons during this period usually did so in order to attack the organisation, either the Post Office or the companies, whom they deemed responsible for the smaller number of exchange telephones in use in Britain in comparison with other countries. During the period of this thesis there were certainly fewer exchange telephones employed in Britain than in the US. By 1880, New York already had 1,500 telephones in operation,<sup>96</sup> whereas in the same year London had approximately 650 users listed in the August list of telephone subscribers.<sup>97</sup> An article from the *Times* in 1882 compared Chicago, with one telephone for every 200 residents, with London, which boasted only one telephone for every 3,000 residents.<sup>98</sup> By

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<sup>96</sup> Casson, 1910, pg. 60 (n.22).

<sup>97</sup> UTC, List of Subscribers, August 1880.

the end of 1887, there were 158,732 telephones in use across the US, but only 26,219 in Britain.<sup>99</sup>

However, in December 1887 the *Sheffield and Rotherham Independent* was very positive about British telephone exchange development relative to the rest of Europe.<sup>100</sup> It cited figures from 1883 to 1886 which showed that Britain had the largest number of exchange subscribers of any country in Europe throughout that period. Although the article did not discuss what the figures meant relative to the size of the population in each country, nevertheless this indicates that Britain had the most exchange telephony in Europe at the time. However, in May 1892, when Sheffield exchange subscribers were angry at the NTC for raising subscription rates, the Sheffield paper complained that the country was far behind the US and the rest of Europe in telephony.<sup>101</sup> No figures were cited, and it is possible that subscriber numbers in some European countries were at this point larger than in Britain. However, I believe that this complaint was motivated by a desire to attack the NTC, which had recently absorbed the Sheffield local exchange, of which the paper had long been an enthusiastic supporter.<sup>102</sup> Certainly the newspaper noted that it would prefer a nationalised telephone system under the Post Office to a system run by the NTC under the message rate tariff which the company wanted to institute in Sheffield.<sup>103</sup>

Chapter five also demonstrates how international comparisons such as those used against the NTC by Andrew Dryburgh Provand when promoting his Mutual Telephone Company tended to serve the purposes of those who employed them. From the UTC group side, Robert Raynsford Jackson, the chairman of the NTC, often noted that people complained that British telephone development was bad, but he used these admissions of

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98 Perry, 1977, pg. 80 (n.8).

99 Kingsbury, 1915, pg. 268-9 (n.5).

100 'The Extension of the Telephone', in the *Sheffield and Rotherham Independent*, 23 December 1887, pg. 2.

101 'Summary of News', in the *Sheffield and Rotherham Independent*, 16 May 1892, pg. 4. This controversy is addressed in detail in chapter four.

102 It had been one of the first subscribers ('The Use of the Telephone in Sheffield', in the *Sheffield and Rotherham Independent*, 27 November 1879, pg. 5).

103 The *Sheffield and Rotherham Independent*, 16 May 1892 (n.101).

his company's poor performance as opportunities to blame the Post Office.<sup>104</sup> In addition, for most of the 1880s the UTC pointed out that subscription in large cities around the world was actually higher than the £20 they charged for large towns and cities.<sup>105</sup> For example, lists of subscribers included the information that in New York the charge was the equivalent of £30 or £42.<sup>106</sup> Again, these figures were followed by the reminder that £2 out of every £20 went to the Post Office as royalty. This demonstrates that such international comparisons about national telephone systems have tended to be politically charged, and must be treated carefully. Throughout this thesis, and particularly in chapters three and four, I have made comparisons between different towns and cities around the country instead of looking to other countries. Thus, I have focused on telephone use in Britain on its own terms.

#### 5.4. The context of existing communications methods

In studying British telephone use, I recognise that the decision to adopt or reject telephony was taken against a background of existing, often very effective, communications alternatives. The British public had a choice of multiple communications methods, such as telegraphy, the letter post and messengers, in the same way that multiple options existed for printed communications, such as books, newspapers or journals. Indeed, when examining the introduction of a new technology, it is important to understand it as a new option amongst a range of existing options. David Edgerton has argued that often older technologies are favoured over newer innovations, and are used effectively for long periods of time without being superseded by rival technologies.<sup>107</sup> The use of new technologies in place of older technologies is thus contingent, not necessary, and depends on contingent factors. In the period covered by this thesis, these older communications alternatives were often more trustworthy and reliable than telephony, as I discuss in chapters two and three.

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104 BT Archives, TCB 304/2, unnumbered file in box 2, part 6, Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, and Address by Colonel Jackson with Relation to Telephonic Charges, pg. 7; 'The London Telephone Service', in the *Electrician*, vol. 28 (1892), pg. 436.

105 For example: UTC, List of Subscribers, February 1884, pg. [xi], September 1885, pg. xviii.

106 NTC, List of Subscribers to the Metropolitan Exchange System, September 1889, pg. xiii-xiv.

107 Edgerton, David, *The Shock of the Old: Technology and Global History Since 1900* (Profile Books, 2006).

One of the reasons I do not accept negative comparisons between Britain and the US in terms of telephony is because of the different contexts of existing communications methods. Perry specifically noted the quality and affordability of telegraphy in Britain, which was available to most of the population.<sup>108</sup> The standard price for telegrams at the beginning of the period covered by this thesis was one shilling. In October 1885 this was reduced to six pence, after which the number of messages sent increased dramatically from approximately 33 million in 1884-5 to over 50 million in 1886-7. Although this was still too expensive for most people to use for private purposes, it was very accessible for business purposes.<sup>109</sup> Additionally, the penny post service was cheap, widely used, and very efficient: in 1878 over 1,000 million letters were sent, thirty two for every person in Britain; by 1898 this had increased to 2,000 million, fifty per person, and continued to increase.<sup>110</sup> In 1879, when the first exchanges were established, London had twelve postal deliveries a day. Around the country messengers also comprised an important way of sending short notes, such as requests for business meetings or social invitations, within a local area.<sup>111</sup> Although there were only a very few companies which ever provided organised systems of messengers anywhere in Britain, it is likely that most businesses employed boys whom they might regularly send on such errands. Thus it is difficult to provide statistics regarding the use of messengers.<sup>112</sup>

Nevertheless, in early 1879 William Preece, the Assistant Engineer and Electrician of the Post Office, observed that there were many more messengers and servants available in

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108 Perry, 1977, pg. 75-6 (n.8).

109 Kieve, 1973, pg. 193-6 (n.20).

110 Ibid., pg. 236; ['Many Years Ago'], in the *Times*, 7 June 1879, pg. 11; Robinson, Howard, *Britain's Post Office: A History of Development from the Beginnings to the Present Day* (Oxford University Press, 1953), pg. 221.

111 For example: Subscriber, 'The Telephone in London', in the *Electrician*, vol. 16, (1886), pg. 232; Thoys, F. W., 'The Post Office and the Messenger Companies', in the *Times*, 25 March 1891, pg. 14.

112 There is very little secondary literature regarding messengers in Britain, but see Coase, 1961 (n.57), and Hindmarch-Watson, Katie, 'Male Prostitution and the London GPO: Telegraph Boys' "Immorality" from Nationalization to the Cleveland Street Scandal', in the *Journal of British Studies*, vol. 51, no. 3 (July 2012).

Britain than in the US, and so there was less demand, in either the business or the domestic sphere, for telephony. The availability of cheaper labour meant there was less incentive to adopt a labour-saving device.<sup>113</sup> Preece also noted that British telegraphy was faster than that employed in most other countries; whilst systems such as Morse or Hughes telegraphy had speeds of between 15 and 20 words per minute, Wheatstone high-speed telegraphy used by the Post Office achieved speeds of 300 words per minute or faster. The noise this produced on nearby telephone wires through inductive interference could make it impossible to speak through the telephone due to the “tremendous roar” of the telegraph.<sup>114</sup> I discuss this further in chapter three.

Although these reasons were given before the first British exchanges had been opened, they applied as much to exchange telephony, already available in the US, as to private telephony. As this was also before the Post Office claimed any legal right over telephony, Preece would not have been attempting to defend the Post Office at this point against later claims, noted by Perry, that the Post Office was restricting telephone development.<sup>115</sup> Preece later also noted that more Americans had been accustomed to electrical appliances, such as private telegraphs, in the workplace for longer than most British businessmen. He claimed that, because travelling around for business was more difficult for Americans, they appreciated the use of the telephone more than the British, despite their systems being generally more expensive than telephony in Britain.<sup>116</sup> The significance of these different contexts is something which informs my understanding of telephone use throughout this thesis, and especially in chapter two, where I discuss the introduction of different telephone innovations into different communities of users. These potential users then decided whether or not to adopt them based largely on the efficacy and accessibility of existing methods.

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113 Kingsbury, 1915, pg. 208 (n.5).

114 Ibid., pg. 209. See also Tucker, D. Gordon, 'François van Rysselberghe: Pioneer of Long-Distance Telephony', in *Technology and Culture*, vol. 19, no. 4 (October 1978), pg. 665.

115 Perry, 1977, pg. 85 (n.8).

116 UK Parliament, Report from the Select Committee on Telephone and Telegraph Wires, 1885 (188) XII.101, evidence of William Preece, q.2785-7.

### 5.5. Comparisons with other telecommunications technologies

The study of alternative communications methods is not only useful to provide context for the introduction of telephony. Such alternatives can also provide interesting parallels, and indeed can be themselves further illuminated by the study of early telephony. As noted above, my thesis approaches the social history of telephony in the late nineteenth-century in a similar manner to that in which Agar addressed the history of the mobile telephone in the late twentieth-century. Indeed, there are many parallels between the two areas: I show in chapter two that, like mobile telephones, early telephones were also marketed and adopted as tools to improve the health and safety of the user.<sup>117</sup> However, chapter three demonstrates that early telephones prompted concerns about the stress suffered by users, and about the increasing pace of life which resulted from the use of these technologies. Agar notes that the same was true of mobile telephones.<sup>118</sup> As I show in chapter four, different patterns of exchange telephony developed around the country, in a similar way to that in which different styles of mobile phone use would develop in the late twentieth- and early twenty first-century.<sup>119</sup> I also demonstrate in my conclusion the parallels between telephony and telegraphy in terms of the influences of the users on the use and development of these respective technological systems. In both cases the spread of the network was shaped by the uses to which it was put, and in neither case was the purpose of the technology initially obvious, but rather required construction. In this comparison I have been influenced by the works of Jeffrey Kieve, Iwan Morus and Roger Barton.<sup>120</sup>

## 6. Sources

Having presented the specific points of my methodology, I now address the sources which I have employed throughout this thesis. My focus on the use and non-use of technology requires the recovery of use-experience: what it was like to use telephony at the

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117 Agar, 2013, pg. 159-60 (n.6).

118 Ibid., pg. 145.

119 Ibid., pg. 2-3.

120 Kieve, 1973 (n.20); Morus, Iwan Rhys, 'The Electric Ariel: Telegraphy and Commercial Culture in Early Victorian England', in *Victorian Studies*, vol. 39, no. 3 (Spring 1996); Barton, Roger Neil, 'New Media: The Birth of Telegraphic News in Britain 1847-68', in *Media History*, vol. 16, no. 4 (2010).

time. This is difficult to determine without explicit and unbiased records of individuals' interactions with the technology. One way in which I have attempted to recover these use-experiences has been through examining materials in the BT Archives, the partner institution for my thesis. This has included records kept by the Post Office and the telephone companies, and also lists of exchange subscribers – early telephone directories – which have been digitised and are available online through the genealogy website Ancestry.<sup>121</sup> However, most of these archival sources are more concerned with the institutional and corporate contexts of exchange development. In this area they provide useful information about the building and running of exchanges, which I have used in particular in chapter three. Nevertheless, whilst some of these documents make passing references to early users and their experiences, the main strengths of these sources for examining use lie in the numerical data they provide about the numbers of exchange subscribers in different locations over time.

The lists of subscribers often make it possible also to identify the professions of early users, as well as their locations within a town or city. Such information can be useful when identifying groups of subscribers in densely telephoned areas or neighbourhoods. However, they do not provide a complete record across the country for this period, as only a few have been preserved. London enjoys quite a comprehensive record, but elsewhere it is possible only to take occasional peeks into exchange telephone development. These are nevertheless useful for what they reveal about how exchanges worked, as evidenced by the instructions to subscribers, which I have used extensively in chapter three. They also indicate general trends in telephone use by professions, trades and industries, which I have used in chapters four and five. It would not be possible, though, to reconstruct with any accuracy the growth of exchanges outside London in terms of specific users over the period covered by this thesis. However, over the course of my research I have discovered a list of subscribers for London which seems to have been previously unnoticed, and which was dated 27 November 1879, making it the earliest extant list of subscribers I have found referred to

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121 <http://www.ancestry.co.uk/>.

anywhere.<sup>122</sup> Thus it is possible that others also survive unnoticed elsewhere in the BT Archives.

However, Milne, in his work on the use of telephony by British businesses, has noted that, as exchange subscriptions were flat-rate, companies seldom kept records of telephone use, and users certainly did not; specific patterns of use are thus difficult to determine.<sup>123</sup> Indeed, the records in the BT Archives do not often reveal this kind of information, or the responses of specific users or groups of users to the technology. In addition, they have often been preserved in the BT Archives by the companies or the Post Office precisely because they were intended to fulfil a specific partisan purpose, and thus require careful historical treatment. Apart from the difficulties of determining use patterns, telephone use is itself difficult to study because no record is left of conversations, and historians must rely instead on written discussions about use. This is different to studying other communications media. My research has not therefore used archival resources in the same way as many historical projects, for example looking at correspondence.

Instead, I have looked for more specific accounts of telephone use-experience from various sources, and this project would probably not have been possible without the availability of many online digitised archives of nineteenth-century periodicals, of which I have made extensive use. When examining attitudes towards telephony and the different uses to which it was put, these resources are invaluable, especially as they make accessible many smaller, provincial publications. Online databases on which I have relied include Jstor, Gale Databases – including the Times Digital Archive, the Economist Digital Archive and 19<sup>th</sup> Century British Newspapers – ProQuest Historical Newspapers, Science Direct, Taylor & Francis Online, and Welsh Newspapers Online. To increase the range of periodicals which I have consulted I have also studied specialist electrical journals such as the *Electrician* and the *Telegraphic Journal and Electrical Review (TJER)*. I have used the medical journals the *Lancet* and the *British Medical Journal (BMJ)*, which together comprised the main forum for discussion within the medical community. The *Royal United*

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122 BT Archives, POST 30/402, file 1, Telephone Exchanges for the Metropolis, 27 November 1879. Kingsbury referred to three Telephone Company circulars from towards the end of 1879, the first was undated, but presumed to have been produced in September, the second was dated 10 November 1879, and the third 24 December 1879. However, he only mentioned that the last of these included a list of subscribers (Kingsbury, 1915, pg. 199 (n.5)). Whether they did or not, I have not found them. Baldwin believed that the first list of subscribers for London had been produced on 26 April 1880 (Baldwin, 1925, pg. 40 (n.10)).

123 Milne, 2007, pg. 169 (n.30); Milne, 2010, pg. 200 (n.30).

*Services Institution Journal* and the *Transactions of the Federated Institution of Mining Engineers* have also provided useful material for studying the use of the telephone by the British Army and by the mining community in chapter two.

I use a variety of local periodicals because these document local events which did not make national news, and also reveal local opinions. The *Times* is key to my research, because it was one of the most influential and widely read periodicals, read not only by those who shared its conservative political slant but also by those of all political views in the educated middle to upper classes.<sup>124</sup> Writing to the *Times* was a way for people to express opinions or raise arguments to a national readership. In using these sources to understand the telephone use-experience, I build on the work of the Science in the Nineteenth Century Periodical (SciPer) project, the publications of which focused on studying presentations of science in nineteenth-century newspapers and journals.<sup>125</sup> I have been particularly influenced by the work of this project, and my approach thus incorporates the understanding that such portrayals of telephony in periodicals were not simply neutral reports of the technology. Rather, by being part of the public discourse, periodicals comprised a part of the process of shaping the technology as they chose how to present it to various reading publics. Periodical articles were in this case part of the way in which the public encountered the technology; thus when using articles about telephony, I am not just studying telephones, I am studying the representation of telephones in the press.

I am aware that material found in such sources may be biased; for example people may only have written letters to newspapers when there was something they wanted to complain about, or material may have been produced or included expressly to promote telephony. Thus I have also noted passing references to telephones being used, for example in cases of fire or accidents, and also advertisements for firms which included telephone numbers. I have also found useful testimonies about telephone use in official publications such as the reports and minutes of select committees. I have referred to several of these, including the 1885 Select Committee on Telegraph and Telephone Wires, and the 1892

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124 Ellegård, Alvar, *The Readership of the Periodical Press in Mid-Victorian Britain* (Göteborg, 1957), pg. 17-18.

125 For example: Cantor, Geoffrey, Dawson, Gowan, Gooday, Graeme, Noakes, Richard, Shuttleworth, Sally and Topham, Jonathan R. (Eds.), *Science in the Nineteenth-Century Periodical: Reading the Magazine of Nature* (Cambridge University Press, 2004). The telephone is not a topic which has been addressed by the SciPer project; a search for 'telephone' on the online index returns only 14 results, and only 8 within the time frame of this thesis ([www.sciper.org](http://www.sciper.org)).

Select Committee on the Telegraphs Bill.<sup>126</sup> Although outside the time frame of this thesis, material from the 1895 Select Committee on Telephone Service and the 1898 report into the Glasgow exchange service has provided evidence which I argue is also applicable to my earlier period.<sup>127</sup> However, as Milne has noted, at the time of these later parliamentary enquiries criticism of the NTC was very widespread, and so such testimony must be treated carefully; nevertheless, these sources indicate how frequently certain subscribers used their telephones, and to whom they spoke.<sup>128</sup>

Secondly, I have attempted to reconstruct the use-experience through the evaluation of other factors, such as technical, political and social elements. Combining these factors has allowed me to compare comments from users against the specific technologies with which they were interacting. When describing details of specific telephone instruments in chapter two for example, I have consulted contemporary technical works such as Theodore du Moncel's 1879 book *The Telephone, The Microphone and the Phonograph*, and George Prescott's *Bell's Electric Speaking Telephone*, published in 1884.<sup>129</sup> The key early telephone histories, by Kingsbury and Baldwin, are also rich in technical detail.<sup>130</sup> Some use-experience details can also be gleaned from the collection of local histories, both published and unpublished, kept in the BT Archives. Many of these were produced to mark local telephone centenaries, and have been very useful for chapter four. I have also made extensive use of the British census, mainly from 1881 and 1891, when attempting to trace the names of telephone users when they appear in newspaper articles, and have thus been able to ascertain their professions. These are available online through Ancestry.<sup>131</sup>

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126 Telephone and Telegraph Wires, 1885 (n.116); UK Parliament, Report from the Select Committee on the Telegraphs Bill, 1892 (278) XVII.729.

127 UK Parliament, Report from the Select Committee on the Telephone Service, 1895 (350) XIII.21; UK Parliament, Telephone Exchange Service in Glasgow, 1898 (C.8768-9) XLIX.1.

128 Milne, 2007, pg. 169 (n.30).

129 du Moncel, 1879 (n.66); Prescott, 1884 (n.11).

130 Kingsbury, 1915 (n.5); Baldwin, 1925 (n.10).

131 <http://www.ancestry.co.uk/>.

## 7. Structure of the thesis

I now summarise the content of the following chapters. Most of my discussion and analysis begins after Preece's 1877 telephone demonstration in Plymouth, as it was not until this point that telephony appeared in Britain as a practical commercial possibility.<sup>132</sup> My thesis then stops at 1893 for three main reasons: firstly the most important telephone patents ran out between December 1890 and 1893, which meant that supplying telephone service was easier and cheaper. In addition, the decision to nationalise the long trunk lines connecting cities had been taken in 1892. This was an important step in the debate about telephone ownership, and specifically regarding the provision of exchange telephony. Finally, the last private company in competition with the monopolising NTC was absorbed by the dominant company in 1893. This gave the NTC a virtual monopoly over British telephony with no foreseeable prospect of opposition from private companies. Taken together, these meant the close of one era of telephone history in Britain. However as one ownership option, that of private competition, ceased to appear viable, a new opportunity began to take shape: municipal telephony. In my conclusion I apply my three themes to this development to demonstrate their value as an explanatory methodological tool.

My chapters are thematic, and the topics covered are arranged roughly in chronological order. Thus, the innovative uses of telephones discussed in chapter two and the problems with telephone use addressed in chapter three pre-dated the exchanges examined in chapter four. These in turn opened before those covered in chapter five. Nevertheless, each chapter covers most of the duration of the period covered by the thesis, namely 1877 until 1893. Throughout this thesis I focus on mainland Britain, to the exclusion of Ireland, because the two were only connected by submarine telephone cables after the trunk lines were nationalised.<sup>133</sup> Below I give an overview of the chapters, including which of my three thesis themes each one addresses.

**In Chapter Two – Improving health and saving lives: the telephone innovations of medical, mining and military users** I address the question of telephone purpose, and note that the promoters of the telephone considered it to be in an embryonic state in its first few years, and needed to construct uses for it in order to make it into a viable commercial proposition. This they did alongside attempting to market it to users whose adoption of the new technology would itself serve as a good advertisement for the effectiveness and reliability of telephony. However, telephone promoters were not the only ones shaping

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<sup>132</sup> See n.5.

<sup>133</sup> Feuerstein, 1990, pg. 156 (n.25).

telephone purpose: independently of exchange telephony, innovative uses were found for telephone instruments within the medical profession, the mining industry, and the military. Many of these uses did not involve the transmission of speech, but rather made use of the fact that the telephone could be used to make a noise which could be modulated, or used to detect very small variations in current.

Members of the medical profession were quick to apply telephones as diagnostic instruments, although not all medical men used the new instruments. Uptake depended not only upon the efficacy of the instrument, but also upon political divisions within the profession. In the mining community telephone instruments were used to improve safety in the mine shafts, although there were concerns about electrical equipment leading to fires or explosions due to sparking. The British Army, which has often been seen as a conservative institution not favourably disposed towards new technologies, also examined telephony, adopting it for some purposes and rejecting it for others, depending on its strengths and weaknesses and those of existing alternatives.

In these circumstances I demonstrate that telephones were most readily employed when they contributed to a demonstrable improvement in the health, safety or security of users. These uses in turn acted to further market telephony as an important, reliable technology. In addition, such innovative uses indicate that access and exposure to telephone instruments was wider than existing histories such as Perry's would indicate. For example the use of telephones in mines made it possible that working-class miners might have used them, whereas I argue that few working-class people would otherwise have had such an opportunity in this period. This chapter also illustrates important cases of discretionary use; these users did not simply adopt telephony because it was new and modern, but rather had concerns about its safety, especially in mines where the use of electricity in general carried the risk of sparking and the igniting of firedamp. Thus these users thought, probably more carefully than most, about whether or not the telephone was suitable for their needs.

**Chapter Three – Telephony as a problematic technology: complaints, solutions, and the specificity of use-experience**, focusing on purpose and on entitlement, discusses the problems which users faced when they encountered telephone instruments and exchange systems. This chapter problematises use and demonstrates that telephones were not always effective, thus countering the telephone essentialism demonstrated by Perry. I address four categories of problems: problems with instruments, problems with systems and infrastructure, problems with the influence of communities of both users and non-users, and, finally, problems of the cultural aspects of telephone use. In doing so I show that

telephones were not always fit for the purposes for which users or promoters intended them, and users and non-users were often confused by the technologies with which they were presented.

For nearly all users during the period of this thesis, inductive interference was a problem; this was electrical noise which was audible on the telephone line as a loud buzzing or crackling, and could be caused by the strong currents of nearby telegraph lines. As a result, speaking over a telephone for most UTC group subscribers was difficult and there were many complaints. The wires also gave rise to a different set of complaints, mostly from non-subscribers: overhead wires were considered a serious problem because of their appearance and because of the perceived danger that they might fall and injure someone. In addition, exchanges could be frustrating to use because of the interactions with the operators, who it was often complained were inattentive, slow and rude. This chapter also shows that complaining to the companies about telephone service during this period was frequently ineffective, which resulted in some subscribers giving up their exchange connections.

This chapter demonstrates the extent to which non-users had an influence in determining entitlement to telephone use through permitting or prohibiting the construction of telephone infrastructure. By denying companies the right to erect wires and poles on their property, non-users restricted telephone use or made it more expensive for subscribers. However, users could also restrict use for other users by preferring that rates be kept high so as to maintain a smaller, more exclusive network. Overall, the different instruments and exchange systems in use around the country during this period indicate that telephone use-experience was quite heterogeneous, and this needs to be considered when looking at responses to telephony from both users and non-users: the geography of use and non-use was very important.

The focus of **Chapter Four – Diverse experiences of exchange telephony: the Post Office, the UTC group and the 'Independents'** is exchange telephony, and its uses and provision. Thus I address questions of ownership and purpose, and ask who provided exchange telephony and what subscribers used it for. I examine the construction of exchanges to reveal how they were established and how companies persuaded people to subscribe. Exchange growth has hitherto been largely unquestioned in existing scholarship, with the notable exception of Milton Mueller's article on American exchanges.<sup>134</sup> I demonstrate the contingent use-based factors which drove exchange development by

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<sup>134</sup> Mueller, Milton, 'The Switchboard Problem: Scale, Signaling and Organization in Manual Telephone Switching, 1877-1897', in *Technology and Culture*, vol. 30, no. 3 (July 1989).

examining the three providers in this period, the Post Office, the UTC group and the independent companies, the first and last of which have not received extensive attention in existing histories.

In this chapter I look at two different uses of exchanges: open networks and closed networks. Open network users wanted to be able to speak to as many people as possible, and benefited from indefinitely large exchanges. Such users also often used their telephones as a marketing tool to advertise their business or trade. Closed network users on the other hand desired only to speak to a certain, clearly defined, number of other users, such as other members of their trade or profession. Thus, for such users larger exchanges were not necessarily beneficial. Regarding the three different exchange providers in this period, I argue that Post Office exchanges tended to be closed networks, independent exchanges were more open networks, and different UTC group exchanges fell somewhere between these two.

A desire for an open or a closed network also made a difference to users' views regarding the best model of telephone ownership. Open network users would be adversely affected by competition, because they would need to subscribe to both systems in order to be able to speak with everyone. However, closed network subscribers were not disadvantaged by competition as long as those users with whom they wished to speak were on their exchange. I discuss this with reference to a case of controversy in Sheffield in 1892. In this way this chapter demonstrates how ideas regarding telephone purpose shaped models of telephone ownership in a way not indicated by existing histories.

**Chapter Five – Opposing the monopoly: dissatisfied users in London and Manchester** focuses on questions of ownership and entitlement by examining later telephone supply companies, established when there was already a large, dominant company in the area in which they began to provide service. These companies actively opposed monopoly in telephone supply, thus representing an alternative model of ownership compared to the UTC group. They also embodied a different ideal with regard to entitlement, namely that more people should be able to access telephony than could at the time. The four companies were the London and Globe Telephone and Maintenance Company, the Mutual Telephone Company – a co-operative company based in Manchester – and the New Telephone Company, of which there were two incarnations. The London and Globe Company competed briefly against the UTC in London from 1882 until 1884, but I argue that the negative conduct of the two companies towards one another did nothing to improve the public perception of telephony.

The Mutual Company was established on different principles to any other exchange company; its subscribers were its shareholders, and it was founded on the basis that telephony should be cheap and affordable. Its promoters thus held a much broader conception of telephone entitlement than most in this period. As I demonstrate in this chapter, this company also operated a high-quality exchange system. The first incarnation of the New Telephone Company supplied private wire telephony from 1885 until 1889, and I argue that this company was representative of many others at this time which did the same. However, these companies have not been well represented in existing histories; this is partly because they did not require Post Office licences to conduct their business, which made them less visible both at the time and historically, and partly because most histories have focused on exchange telephony.

The second New Telephone Company was started in 1891 by the Duke of Marlborough, a vocal critic of the UTC group, with the intention of competing with the NTC around the country. I argue that it was largely due to Marlborough and his company that the decision to nationalise the trunk lines was taken in 1892. Together these companies demonstrate the dissatisfaction of users with the existing supply of telephony by the UTC group companies and by the Post Office over the period of this thesis. This dissatisfaction led in each case to competition as the preferred model of telephone ownership, because these users believed that this was the best way to ensure a good telephone service. Thus, at the end of the period the decision was taken to nationalise the trunks in order to optimise conditions for competition without compromising subscribers' convenience, as the Post Office would provide intercommunication between different companies' exchanges.

In **Chapter Six – Conclusions**, I summarise the powers of users and non-users over telephone development in relation to the themes of ownership, entitlement and purpose. I use this evidence to argue that a reliance on Perry's 'delay thesis' conceals the agency that users and non-users had at the time to influence the development of telephony. Nevertheless, I also note the limitations of this control. I project my three themes onto aspects of telephone history which lie outside the immediate geographical or historical scope of this thesis, such as the comparison between British and US telephony which comprises the heart of Perry's delay thesis, and also municipal telephony. This demonstrates their efficacy as a broader methodological tool.

Finally, in order to demonstrate how my findings are applicable to telecommunications history more generally, I draw out parallels between telephony and preceding and succeeding telecommunications technologies: telegraphy, as studied by

Jeffrey Kieve, Iwan Morus and Roger Barton,<sup>135</sup> and mobile telephony, as examined by Jon Agar.<sup>136</sup> In particular I note the ways in which use also shaped the development of the national telegraph network in a similar manner to telephony; although the uses and development were different in each case, I argue that use and development were related to one another in the same way for both technologies. I also demonstrate the similarities between the development of telephony and of mobile telephony, for example the emergence of different styles of use in different locations.

## 8. Conclusions

In this chapter I have shown that Perry's delay thesis has influenced the writing of telephone history, and that, by focusing on users and non-users of telephony, my research can invert his assumptions to reveal a more nuanced narrative behind the development of telephony in Britain up until 1893. Instead of emphasising the Post Office and the supply side of telephony, I focus on how telephony appeared to those who encountered it and decided whether or not to use it within a context of existing communications methods. As noted in the epigraphs to this chapter this reveals both a diverse range of attitudes towards telephony, and also some important problems with using it. I also consider the companies and their attitudes towards telephony, and reveal how their policies discouraged widespread telephone use around Britain. Additionally, because London was not representative of the situation in the rest of the country, my account benefits from investigating telephonic developments in provincial towns and cities which often influenced telephony elsewhere. My emphasis on private telephone lines and telephone innovations as well as telephone exchanges demonstrates the diversity of uses to which telephony was put during this period. Telephone innovations comprised some of the earliest purposes for which telephone instruments were used, and thus are the focus of the next chapter. Overall in the remainder of this thesis I present a detailed picture of the attitudes of the public and of telephone developments around the country. I demonstrate how the former shaped the latter through contributions to the debates about telephone ownership, entitlement and purpose. In applying these methods and demonstrating these conclusions, I hope to encourage scholars to look again at the history of British telephony, in which interest has been depressed by Perry's influential thesis, but which I argue offers a rich field for study and examination.

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135 Kieve, 1973 (n.20); Morus, 1996 (n.120); Barton, 2010 (n.120).

136 Agar, 2013 (n.6).

## **Chapter Two: Improving health and saving lives: the telephone innovations of medical, mining and military users**

### 1. The telephone as an embryonic technology

“[Bell] frankly admitted to his audience at [the meeting of the British Association for the Advancement of Science in] Plymouth that his invention was only as yet in its embryo state, and that he could not tell what form it might ultimately assume.”

The *Times*, September 1877<sup>1</sup>

“[The telephone] can be used for any purpose and in any position – for mines, marine exploration, military evolutions, and numerous other purposes... between the manufacturer's office and his factory; between all large commercial houses and their branches; between central and branch banks; in ship-building yards, and factories...”

William Reynolds's 1877 telephone circular<sup>2</sup>

In this chapter I begin to examine the theme of telephone purpose - what the telephone was for - by demonstrating how the uses to which early telephony could be put were not obvious, and needed to be constructed. These first uses, which pre-dated exchange telephony, were not for sociable conversation, and often did not involve the transmission of speech. Rather, the first applications were often in areas where telephone use could improve individuals' health or safety, and were often initiated by users themselves. I investigate in turn three key groups of users who, within a year of the technology being introduced to Britain in August 1877, innovated with telephone instruments in ways intended to improve health, well-being, safety, or security. These were the medical profession, the mining community, and the British Army. Some of these uses could mean the difference between life and death, for example in military situations, or in a colliery. It is not surprising, therefore, that such users were amongst the first to innovate with the new technology, investigating whether or not it might be employed to treat disease or minimise safety risks. I will focus here primarily on user-driven telephone innovations, but in the conclusion I will briefly compare these to supplier-driven health and safety uses of exchange telephony as employed by fire brigades and the police.

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1 'Oral Telegraphy', in the *Times*, 19 September 1877, pg. 4.

2 William Reynolds's 1877 telephone circular, reproduced in Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925), pg. 696.

When Bell's telephone was first successfully demonstrated in Britain at the Plymouth meeting of the BAAS in 1877, Bell noted that he did not know how the instrument would ultimately be used.<sup>3</sup> His belief that the telephone was then in an embryonic state highlights the uncertainties which even its inventor harboured regarding the uses to which it might be put and the ways in which users might innovate with it. Contemporary commentators, such as the anonymous author of the article from which the first epigraph has been taken, also speculated on this topic, suggesting for example that telephones might be beneficially employed within hotels.<sup>4</sup> In the first few years of the telephone's commercial existence many individuals and groups contrived new uses for telephone instruments. The historiography of telephony has tended overwhelmingly to focus on exchange telephony, for reasons discussed in chapter one. However, I argue that this process of the active, creative usage of telephony, independently of exchanges, needs to be recovered; this will provide a more complete picture of the ways in which telephony spread and developed during this period, and the reasons why it was taken up in the form of private or exchange telephony by businesses and professional men.

As my second epigraph demonstrates, the early producers and promoters of telephony were busy imagining uses for the telephone which they could sell to the public. The American Colonel William Reynolds, Bell's agent in Britain, said in his 1877 circular that “where-ever conversation is required between the principal and his agents or employés, or between the superintendent and his leading men, there the Telephone will find place and employment.”<sup>5</sup> What Reynolds was promoting was a vision of a communication system which would fit within the hierarchical structure of business, ensuring that those at the top could always keep tabs on those beneath them. No mention was made of employees communicating amongst themselves. However, Reynolds experienced great difficulties in attempting to convince people to use or invest in telephony. In March 1878, he succeeded in inspiring a group of capitalists, and in June the Telephone Company was incorporated.<sup>6</sup>

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3 See first epigraph. For Bell's earlier comments that the telephone was “an embryo invention”, see Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 52.

4 For more on the use of telephones within hotels and other private establishments, see chapter five, section 4.1.

5 Reynolds's 1877 telephone circular (see n.2).

6 Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990), pg. 55-9.

In March 1878 Bell wrote a letter to the founders of the new company suggesting a wide variety of uses which he believed they ought to promote.<sup>7</sup> Bell suggested the same groups of users as Reynolds had done, and added to the list police offices, fire stations, hospitals, railways, retailers, water companies and newspaper offices.<sup>8</sup> In these areas the promoters argued that the telephone performed better than existing methods and technologies, for example telegraphy, largely because it was simple to use. I argue also that the promoters' early suggestions for telephone use were mainly areas which would serve as good marketing for the new technology: the fact that the queen and assorted members of the aristocracy had telephones was highlighted to give the instrument status and respectability.<sup>9</sup> Telephone use by merchants and bankers demonstrated how it was playing a vital role in the economy. In mining, in hospitals, in diving operations, in the fire service and elsewhere the employment of telephones demonstrated its ability to improve safety and save lives. Overall these examples demonstrate the ways in which telephone promoters such as Bell and Reynolds had to construct uses for the telephone in order to make it into a viable commercial proposition.

However, the producers and promoters of the technology were not the only ones creating uses, or purposes, for telephony. Some users also experimented with new applications which then developed alongside those which Bell, Reynolds and others had suggested, and, later, alongside exchange telephony. Such users often constructed their own instruments for this purpose.<sup>10</sup> Whether these user-driven innovations were successful

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7 Reproduced in Feuerstein, 1990, pg. 458-62 (n.6).

8 By this time the first exchanges had begun to open in the US, so this function of the telephone had become a commercial reality which could be sold to potential investors (Feuerstein, 1990, pg. 64 (n.6)); Bell encouraged the capitalists to work towards providing exchange telephony as a universal utility, in the same way that gas and water were supplied, and that all these users could be connected up via central exchanges.

9 Feuerstein, 1990, pg. 54 (n.6).

10 Many people were interested in making their own telephones. As well as lecturers on telephony who demonstrated how telephones could be made cheaply from readily available materials, a couple of pamphlets were published, in 1878 and 1880 by a science teacher in Brighton and an Oxford don respectively, which described how to construct telephones from simple household tools and materials (Stein, Jeremy, 'Ideology and the Telephone: The Social Reception of a Technology, London 1876-1920' (Ph.D. thesis, University College London, 1996), pg. 70; Garner, Samuel, *The Telephone: Its History, Construction, Principles, and Uses, with Definite Instructions on the Making of Telephones* (Simpkin, Marshall, and Co., 1878), pg. 22-25)). Garner noted that "hundreds are trying to make their own Telephones" (pg. 22). Examples of people doing this abound in the periodical press, for example in London: 'London Correspondence', in the *Western Mail*, 15 March 1878, pg. 3; in Preston: 'Scientific Marvels', in the *Preston Chronicle*, 24 August 1878, pg. 5; and in Swansea: 'District Intelligence', in the *Western Mail*, 12 November 1877, pg. 3. An Army officer, Lieutenant Arthur W. Bagnold,

or not depended largely on the efficacy of existing methods for carrying out the same task, as will be discussed below. I examine which new uses were proposed and implemented and by whom, and how they were received and developed. Some uses succeeded immediately and continued, such as the application by the Army of telephone instruments to ballooning. Other uses were never widely adopted, such as telephone stethoscopes. Some applications succeeded at first but later went out of use, such as the employment of telephone instruments as galvanometers, and others were not broadly adopted at first, but became widespread in a different form much later, such as the audiometer.

Stein wrote that the dominant conception of the telephone during this period was as a business device; he argued that although alternative uses did exist which show how the telephone could have developed differently, the importance of these uses should not be exaggerated.<sup>11</sup> However, as I demonstrate in this chapter, the application of telephony to situations where it could be seen to improve health or save lives – mainly implemented by users and independently of exchanges – provided good marketing for the new technology. The importance and visibility of these uses contributed to public trust in telephony, and encouraged further uptake and innovation. Thus, whilst these innovating users played a key role in the debate regarding telephone purpose they were also helping to improve confidence in the technology itself.

## 2. Innovating instruments: medical practitioners and the telephone

It is arguable that the first purpose to which the telephone was ever applied was a matter of health and safety. Sidney Aronson has pointed out that the first telephonic communication, by Alexander Graham Bell himself on 10 March 1876, was in effect a call for medical assistance from Thomas Watson: he had spilt sulphuric acid from the wet battery powering the transmitter onto his clothes and needed help.<sup>12</sup> Within a couple of years, members of the medical profession were amongst the first in Britain to employ

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R.E., also made his own telephones in November 1877: Bridge, Maureen and Pegg, John, *Call to Arms: A History of Military Communications from the Crimean War to the Present Day* (Focus Publishing, 2001), pg. 186.

11 Stein, 1996, pg. 71 (n.10).

12 Aronson, Sidney H., 'The *Lancet* on the Telephone 1876-1975', in *Medical History*, vol. 21, no. 1 (January 1977), pg. 69. Christopher Beauchamp has noted that the wording, often misquoted, was "Mr. Watson – come here – I want to see you." ('Who Invented the Telephone? Lawyers, Patents, and the Judgements of History' in *Technology and Culture*, vol. 51, no. 4 (October 2010), pg. 854).

telephones as conversational instruments.<sup>13</sup> Evidence from the *British Medical Journal* (*BMJ*) and the *Lancet* indicates that from the beginning of 1878 physicians were also thinking about the potential of telephone instruments to be used in medical practice as new or improved diagnostic tools.<sup>14</sup> This aspect of use has not been extensively addressed in existing histories of telephony, and historians of medicine have not focused on the role of the telephone in medical instrumentation;<sup>15</sup> most histories of medical instrumentation tend to focus on twentieth-century developments, with little written about nineteenth-century antecedents.<sup>16</sup> Thus, this section examines the use of telephones as medical instruments in order to contribute both to the history of telephony and to the history of medicine.

### 2.1. A divided community: the context of the late nineteenth-century medical profession

Before examining specific instruments, it is important to consider the context of the late Victorian medical profession. Jonathan Reinartz, in a recent study of medical technologies, recalls Langdon Winner's maxim that artefacts have politics.<sup>17</sup> This is especially pertinent when considering nineteenth-century medical technologies. In the

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13 Baldwin, 1925, pg. 96 (n.2); Bennett, A. R., 'On the Telephoning of Great Cities', in the *Electrician*, vol. 27 (1891), pg. 475.

14 Together these journals comprised the main forum in which medical professionals across the country discussed such developments, and thus they form the main body of my research into medical telephony.

15 Reiser, Stanley Joel, *Medicine and the Reign of Technology* (Cambridge University Press, 1978); Davis, Audrey B., *Medicine and its Technology: An Introduction to the History of Medical Instrumentation* (Greenwood Press, 1981); Lawrence, Christopher, 'Moderns and Ancients: The "New Cardiology" in Britain 1880-1930', in *Medical History*, Supplement No. 5 (1985); Reiser, Stanley Joel, 'The Science of Diagnosis: Diagnostic Technology', in Bynum, W. F. and Porter, Roy (eds.), *Companion Encyclopedia of the History of Medicine*, volume 2 (Routledge, 1993); Borell, Merriley, 'Training the Senses, Training the Mind', in Bynum, W. F. and Porter, Roy, *Medicine and the Five Senses* (Cambridge University Press, 1993).

16 For example: Pickstone, John V. (ed.), *Medical Innovations in Historical Perspective* (Macmillan, 1992); Blume, Stuart S., *Insight and Industry: On the Dynamics of Technological Change in Medicine* (The MIT Press, 1992); Bud, Robert, Finn, Bernard and Trischler, Helmut (eds.), *Manifesting Medicine: Bodies and Machines* (Harwood Academic Publishers, 1999); Stanton, Jennifer, 'Making Sense of Technologies in Medicine', in *Social History of Medicine*, vol. 12, no. 3 (1999) (this reviews books which focus on the twentieth-century); Timmermann, Carsten, and Anderson, Julie (eds.), *Devices and Designs: Medical Technologies in Historical Perspective* (Palgrave Macmillan, 2006).

17 Reinartz, Jonathan, 'Mechanizing Medicine: Medical Innovations and the Birmingham Voluntary Hospitals in the Nineteenth Century', in Timmermann and Anderson, 2006 (n.16), pg. 38; for Winner's original explication, see his book, *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (University of Chicago Press, 1986), pg. 19-39.

Victorian medical profession, the status of the practitioner depended less upon his medical skill and abilities and more upon his perceived standing as a gentleman, who was expected to be of good breeding, and well learned in the arts and in literature.<sup>18</sup> However, changes were occurring in which new technologies played an important role. To understand these it is important to consider three important, overlapping divisions within the late nineteenth-century medical community.

The first was between general practitioners, often with small, provincial practices, who earned little and often struggled to get by, and hospital consultants, who lived in big cities, moved in respectable and often wealthy circles, and earned a lot of money, prestige and status. The second division was between both of these previous groups, which both advocated generalist approaches to medical practice, and the new specialist practitioners who focused on particular diseases, areas of the body, or demographic groups. The generalists disliked the growth of new specialist hospitals being established to treat, for example, conditions of the ears, nose and throat, or women or children, and tried to discourage and undermine it where possible.<sup>19</sup> However, the growth of specialism fuelled another trend in medical practice, the increased use of science and technology in diagnosis and treatment. This comprised the third important division. Christopher Lawrence, in an influential 1985 essay, noted the differences between practitioners who saw medicine as a craft knowledge based upon a practitioner's knowledge of people and individual experience, and those who advocated a scientific approach, promoting research and technological solutions.<sup>20</sup>

In the mid-nineteenth-century, many older physicians were still expressing concerns that too much reliance on instruments such as the thermometer, and even the stethoscope, could devalue the clinical skill of the practitioner.<sup>21</sup> These medical men were opposed to the reduction of the art of medicine to a mechanical skill, to, in Lawrence's words, “*merely an applied science*”.<sup>22</sup> However, the more specialised practitioners became, the more they

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18 Peterson, M. Jeanne, *The Medical Profession in Mid-Victorian London* (University of California Press, 1978), pg. 4.

19 Ibid., pg. 259-64, 272-9.

20 Lawrence, Christopher, 'Incommunicable Knowledge: Science, Technology and the Clinical Art in Britain 1850-1914', in the *Journal of Contemporary History*, vol. 20, no. 4, Medicine, History and Society (October 1985), pg. 505-7; Peterson, 1978, pg. 49 (n.18).

21 Lawrence, 1985, pg. 513-5 (n.20).

22 Ibid., pg. 517 (original emphasis).

engaged with clinical research and technological innovation.<sup>23</sup> Lawrence argued that practitioners advocating the use of instruments often promoted specialism, or demanded more emphasis in the British medical curriculum on experimental physiology, a more continental, scientific style of medicine. As a result, instruments may have been advocated at times not because they were valuable clinical tools, but simply because they were the result of the experimental sciences.<sup>24</sup> It did not help the cause of the scientifically and technologically orientated specialists that applications of electricity to medicine had a long history of being associated with quack therapies throughout the nineteenth-century, with many charlatans marketing treatments of little curative value. As a result many conventional medical practitioners were often very suspicious of electrical innovations in medicine.<sup>25</sup>

Thus, medical technologies derived from the telephone as will be discussed below were introduced into a highly politicised context in which they would be evaluated, promoted or rejected not solely on their technical, diagnostic or curative merits, but also on how far they furthered or detracted from practitioners' beliefs about ideal medical practice. I argue that the use of such new and sophisticated medical technologies was perceived as a statement in favour of medical practice as clinical science instead of craft knowledge, and of the new specialising trend within the medical profession. I will now discuss the inventors and users of four telephonic innovations: the telephone stethoscope, the audiometer, the sphygmophone and the induction balance. Some of these users were specialists and others general practitioners, but the fact that they innovated in this way indicated a willingness to apply cutting edge technological equipment to medical diagnosis. Given the context as discussed above, this was a significant statement to make. It is therefore important to understand the positions of these individuals within the medical profession in order to appreciate their interactions with telephony, and whether they responded positively or negatively to the new technology.

## 2.2. The first innovations: the telephone as a stethoscope

In January 1878, a few months after the first successful British demonstration of the telephone in August 1877, some physicians were considering the use of the telephone as a

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23 Ibid.; Peterson, 1978, pg. 280 (n.18).

24 Lawrence, 1985, pg. 517 (n.20).

25 Morus, Iwan Rhys, 'Batteries, Bodies and Belts: Making Careers in Victorian Medical Electricity', in Bertucci, Paola and Pancaldi, Giuliano, *Electric Bodies: Episodes in the History of Medical Electricity* (Università di Bologna, 2001), pg. 209, 214-5.

stethoscope. A couple of medical men wrote to the *Lancet* suggesting this.<sup>26</sup> In addition to its potential use as a stethoscope, one of these men wondered if the telephone might be useful for demonstrating and studying the sounds of muscles during contraction, with electrodes being applied directly to the muscle. Although there is no indication that it was ever followed up, this suggestion implies a technologically aware physician with an appreciation for scientific investigation. It indicates an interest in experimental physiology which might have led this anonymous writer to consider the application of telephone instruments to medical practice.

One London medical man wrote to the *BMJ* in June 1878 to describe how he had made his own Bell telephone at the beginning of that year and had begun experimenting with it for auscultation on his family and his patients. However, he had to report that, although his instrument could convey the sounds of the voice: “[o]n applying the telephone to the chest of a healthy person, no sounds, whether of breathing, voice, or cough, are communicated. The same is the case with regard to the normal sounds of the heart.”<sup>27</sup> He continued that a loud cardiac murmur might be audible through the instrument, but had to conclude that no sound could be heard through the telephone which could not be heard just as well, or better, through the stethoscope. He acknowledged, though, that this was only the telephone in its current state of development, and that the situation might improve.

This last letter demonstrates that it is likely that these types of instruments were not widely used in this period, if at all, as they offered no appreciable improvement over existing methods of auscultation. This pattern shall appear again with the audiometer, as shown below. Whilst most of the correspondents may not have constructed their own instruments, they nevertheless recommended that course of action to others. Indeed, as evidenced in the last letter, the physician in question, J. Foster Palmer, joined the growing ranks of those who constructed their own telephones for the purposes of investigation, experiment, and pure curiosity during this period. These experimenters included amateurs and those who dealt with electrical apparatus as part of their trade, and these letters indicate that we should include in their number medical professionals who were also inspired to investigate the potential of the embryonic telephone.<sup>28</sup>

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26 A. B. M., 'The Telephone', and Sanders, F. H., 'The Telephone', both in the *Lancet*, vol. 111 (1878), pg. 221.

27 Palmer, J. Foster, 'Medical Uses of the Telephone', in the *BMJ*, vol. 1 (1878), pg. 807.

28 See n.10.

### 2.3. A complicated solution: the audiometer

In the telephonic stethoscopes described above, the telephone on its own was used as a medical instrument. However, in 1879 Professor David Edward Hughes attempted to incorporate the telephone as one part of a more complicated instrument when he invented the audiometer, a device intended to measure the power of a person's hearing (Fig. 2.1.). This subsequently became the most common way to use telephony in medical instrumentation, as will be seen below. Hughes's audiometer comprised a horizontal bar with a coil of wire fixed at each end. A moveable third coil was mounted on the bar for the user to slide along it from one end to the other. The two fixed coils, which were wound in opposite directions, with one bigger than the other, were in circuit with a battery and a microphonic key. The movable coil, called the induction coil, was attached to a telephone, and when it was moved along the bar, while the operator pressed the microphonic key, a current passed through the two fixed coils and set up an induction current in the movable coil which was audible as a tone in the telephone instrument. When the induction coil was closest to the larger coil, the sound was loudest, and when it was at the other end of the bar, by the smaller coil, the telephone was silent. The bar was divided into 200 gradations so that the position of the induction coil could be read off accurately, and the person whose hearing was being tested held the telephone to their ear while the operator moved the induction coil to see the point at which the patient could no longer hear the tone.<sup>29</sup>

The instrument was first presented to the Royal Society in May 1879 by Dr. Benjamin Ward Richardson, an elite physician, and not a specialist, but who nevertheless had a scientific education before studying medicine, and had been interested from an early age in invention, innovation and scientific research.<sup>30</sup> Richardson's paper described his experiments with the instrument, which led him to conclude that “[f]or good observation, the room in which the experiment is made should be large, and all external causes of sound,

29 Richardson, Benjamin Ward, 'Some Researches with Professor Hughes' New Instrument for the Measurement of Hearing: The Audiometer', in *Proceedings of the Royal Society of London*, vol. 29 (1879), pg. 65-6. Another way in which Hughes innovated and engaged with the telephone was to use telephone instruments instead of galvanometers in many of his experiments ('Professor Hughes' New Discoveries', in the *Electrician*, vol. 16 (1886), pg. 270). Gooday has also noted this use by other men of science in this period due to the ability of the Bell telephone to detect very small electrical currents (Gooday, Graeme J. N., *The Morals of Measurement: Accuracy, Irony and Trust in Late Victorian Electrical Practice* (Cambridge University Press, 2004), pg. 65).

30 'Obituary: Sir Benjamin Ward Richardson, Kt., M.D., F.R.S., F.R.C.P.', in the *BMJ*, vol. 2 (1896), pg. 1612; 'Obituary: Sir Benjamin Ward Richardson, M.A., M.D., LL.D. St. And., F.R.C.P. Lond., F.R.S., &c.', in the *Lancet*, vol. 148 (1896), pg. 1575-6. In 1876 he wrote, regarding maladies otherwise incurable by the physician's art: “[h]appily, however, science has supplied art with the means to avert these phenomena in certain instances” (Richardson, Benjamin Ward, *Diseases of Modern Life* (Macmillan and Co., 1876), pg. 50).

such as the ticking of clocks, the vibrations of windows and doors, the moving of feet and the singing from gas jets, should be silenced.”<sup>31</sup> He suggested that it would be useful for determining differing degrees of deafness in either ear, good for measuring improvements in a person's hearing, useful in categorising types of deafness, and would enable researchers to gauge the efficacy of different designs of artificial tympanums for some deaf patients.<sup>32</sup> Although Richardson advocated the use of the instrument, his recommendation represented the first indication that the audiometer would not be easy to use.

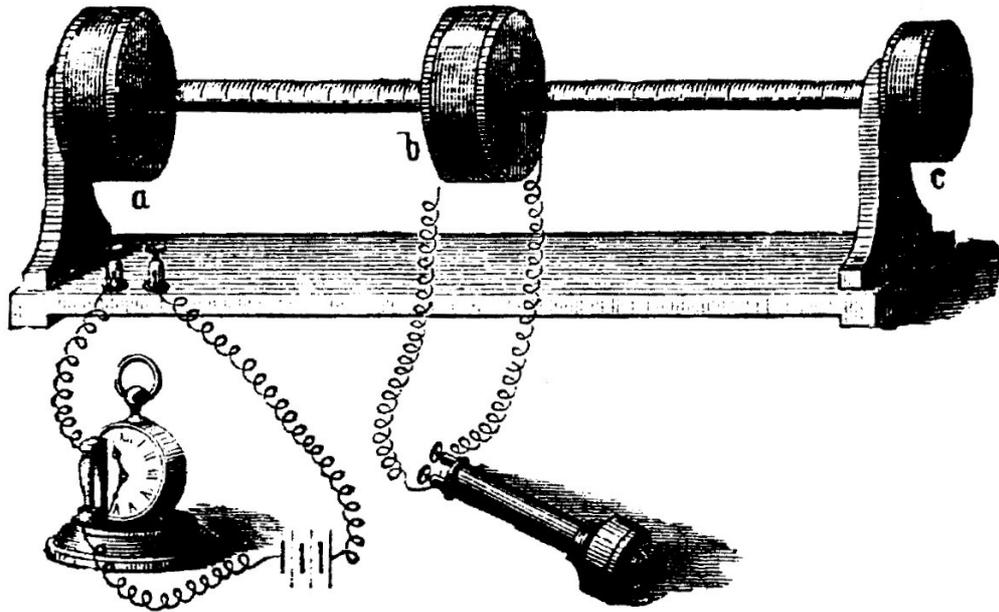


Figure 2.1. Hughes's audiometer

Source: Stephens, 1979c, pg. 11 (n.55)

Initially the instrument received a positive editorial response from the *Lancet*,<sup>33</sup> and subsequently it was exhibited often, and received much publicity.<sup>34</sup> However, after some experience many physicians reported negatively on its performance. For example, at a meeting of the Otology Section of the British Medical Association meeting in August 1879, some physicians claimed it was very difficult to create the necessary conditions for its use,

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31 Richardson, 1879a, pg. 66 (n.29).

32 Ibid., pg. 67-9.

33 'The Audiometer', in the *Lancet*, vol. 113 (1879), pg. 783.

34 'Conversazione at the Royal College of Physicians', in the *Lancet*, vol. 114 (1879), pg. 23; 'The Audiometer as an Exact Test of Hearing', in the *BMJ*, vol. 2 (1879), pg. 330-1.

namely the degree of silence Richardson said was required, in an average practice; others noted that it was no better than their existing methods using watches and clocks.<sup>35</sup> Proponents of the audiometer tended to be specialists who had both the opportunity to become accustomed to using the instrument frequently and the facilities to enable them to create the optimal conditions to test it. One example was Dr. Lennox Browne, who exhibited and demonstrated it at the 1879 British Medical Association meeting.<sup>36</sup> Browne was a specialist who founded the Central London Throat, Nose and Ear Hospital in 1874.<sup>37</sup> Other advocates included Dr. F. M. Pierce, of Manchester's Institution for Ear Disease,<sup>38</sup> and Sir William Dalby, an aural surgeon who specialised in ear disease at St. George's Hospital in London.<sup>39</sup> However, most non-specialists did not find it a practical instrument.<sup>40</sup>

I argue that the promotion of the audiometer by Richardson, an eminently respectable physician, served to grant it credibility in the wider medical community.<sup>41</sup> Had it been

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35 The *BMJ*, vol. 2 (1879), pg. 331 (n.34).

36 *Ibid.*, pg. 330.

37 'Obituary: Lennox Browne, F.R.C.S.Edin.' in the *BMJ*, vol. 2 (1902), pg. 1565-6.

38 The *BMJ*, vol. 2 (1879), pg. 331 (n.34); Pierce, F. M., 'The Telephone and Diseases of the Ear', in the *BMJ*, vol. 2 (1879), pg. 162.

39 'Instrument for Accurately Measuring and Registering Variations in Hearing', in the *Lancet*, vol. 123 (1884), pg. 439; Stephens, S. D. G., 'David Edward Hughes and his Audiometer', in the *Journal of Laryngology and Otology*, vol. 93, no. 1 (January 1979), pg. 4; Bunch, C. C., 'The Development of the Audiometer', in *Laryngoscope*, vol. 51, no. 12 (December 1941), pg. 1103; 'Obituary: Sir William Bartlett Dalby, M.A. Cantab., F.R.C.S Eng', in the *Lancet*, vol. 193 (1919), pg. 83; 'Obituary: Sir William Bartlett Dalby, M.B.Cantab., F.R.C.S Eng.', in the *BMJ*, vol. 1 (1919), pg. 60.

40 For example: Ogston, Alexander, 'Abstract of the Cavendish Lecture on Unrecognised Lesions of the Labyrinth', in the *Lancet*, vol. 136 (1890), pg. 114-7; Woakes, E., 'The Use of Electricity in Ear-Disease' in the *BMJ*, vol. 2 (1881), pg. 73; 'Discussion on the Therapeutic Value of Electricity in Ear-Disease', in the *BMJ*, vol. 2 (1880), pg. 390; the *BMJ*, vol. 2 (1879), pg. 331 (n.34).

41 Although Richardson called it an audiometer, it was also known as a sonometer, Hughes' original name, and this may have made it difficult for historians to properly appreciate the true significance of this instrument (Stephens, S. D. G., 'Some Early British Contributors to the Development of Audiology', in the *British Journal of Audiology*, vol. 8, no. 4 (January 1974), pg. 127). C. C. Bunch, writing in 1941, noted that it was also known as an acumeter and an acoumeter (pg. 1100 (n.39)). The role of the telephone in making the audiometer possible has not been explored by historians of medicine, and indeed the audiometer itself remains under-researched; in one essay dealing specifically with medical technologies a history of the audiometer was included but the date of its invention was given as 1919 (Davis, Audrey B., 'Medical Technology', in Williams, Trevor I. (ed.), *A History of Technology, volume VII: The Twentieth Century, c.1900 to c.1950, Part II* (Oxford University Press, 1978), pg. 1348-9). However, the importance of the telephone to audiometry has not been forgotten by practitioners

advocated instead by a less well-known medical man, as the stethoscope ideas noted above, it may not have secured as wide an audience. Nevertheless, I argue that in the 1880s and 1890s it was not easy for a general practitioner to become proficient in the use of the audiometer because of the conditions required to get the best performance from it. Alternative methods were tried and tested and readily available; for example, the simple ticking of a watch was a popular method, and in addition tuning forks were widely used to measure hearing from the 1860s until well into the twentieth-century.<sup>42</sup> What these lacked in scientific rigour and empirical quantification of measurement, they made up for in simple convenience. Although from 1879 until the early 1880s the audiometer was a prominent application of telephony to medical technology, most general practitioners probably had neither the time nor the inclination to master this new instrument.<sup>43</sup>

#### 2.4. Innovating for scientific research: the sphygmophone

In May 1879, at the same time as he presented the audiometer, Richardson also presented an instrument of his own to the Royal Society. Called the sphygmophone, it was inspired by his work with the audiometer, and was intended to make the movement of the pulse audible. Richardson did this by modifying a sphygmograph, which was an instrument used to trace onto a piece of paper a pattern representing the movement of the pulse. Richardson effectively added a Hughes microphone and a Bell telephone to this instrument, placed it over the wrist of the patient, and was thus able to hear the sound of the pulse.<sup>44</sup> He described the experience like this: “the sounds heard are three in number, one long sound and two short... The sounds are singular, as resembling the two words, 'bother it.'”<sup>45</sup> The

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who make use of more modern audiometers; in several short historical articles in specialist audiology and otology journals the significance of the Bell telephone in making possible these first audiometers was fully acknowledged (Bunch, 1941 (n.39); Stephens, S. D. G., 'Audiometers from Hughes to Modern Times', in the *British Journal of Audiology*, vol. 13, supplement no. 2 (January 1979); Stephens, 1979b (n.39); Feldmann, H., 'Development of Diagnostic Hearing Tests', in the *International Journal of Audiology*, vol. 22, no. 4 (January 1983)).

42 Ng, Matthew and Jackler, Robert K., 'Early History of Tuning-Fork Tests', in the *American Journal of Otology*, vol. 14, no. 1 (January 1993), pg. 102-3. I am indebted to Jaipreet Viridi for directing me to this source.

43 However, it is worth noting that the audiometer would later become more widely used in the twentieth-century.

44 Richardson, Benjamin Ward, 'Note on the Invention of a Method for Making the Movements of the Pulse Audible by the Telephone. The Sphygmophone.' in *Proceedings of the Royal Society of London*, vol. 29 (1879), pg. 70.

45 Ibid.

response of the *Lancet* to this news was that this was “[n]ot a bad commencement for a talking pulse.”<sup>46</sup>

Richardson later described how different diseases caused variations in the pattern of tones produced by the pulse, for example in some cases one of the three sounds was stronger or weaker relative to the other two, or on occasion there might be heard a fourth short sound, which he said was very useful. He also emphasised the value of the instrument for teaching, pointing out that a whole class could listen at once to the sounds of healthy or diseased pulses and become familiar with some of the differences.<sup>47</sup> Richardson had a few years earlier emphasised the importance of listening to the sounds of the pulse; in a book published in 1876 called *Diseases of Modern Life* he described how the sound of different patterns of the pulse could indicate the state of the heart.<sup>48</sup> Thus I argue that his advocacy of the sphygmophone was an attempt to make it easier to demonstrate these different patterns.

However, the responses to this new innovation were somewhat lukewarm; the *Lancet* commented that “[a]t first sight Richardson's sphygmophone does not seem to offer much that is of practical gain.”<sup>49</sup> The key was practicality; whilst happy to acknowledge that it might be a useful teaching aid, physicians nevertheless found the sphygmophone, unlike the sphygmograph, to be of no practical use in the everyday process of diagnosing disease.<sup>50</sup> Even regarding the sphygmograph, generally accepted as being more useful, Lawrence wrote that it was really only the passion of a few specialists in this period, as the technique was difficult to master and it did not really add much more knowledge than could be gained by palpation or inspection. Indeed, he argued, the positive reception of the sphygmograph by these specialists was probably because they were trying to emulate continental experimental physiology, and in the process over-valuing the investigative potential of an instrument which did little to aid diagnostic skill.<sup>51</sup> I argue that something similar may have

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46 'The Sphygmophone', in the *Lancet*, vol. 113 (1879), pg. 750.

47 'Medical Society of London: The Sphygmophone in Diagnosis', in the *Lancet*, vol. 114 (1879), pg. 618.

48 Richardson, 1876, pg. 134 (n.30).

49 'The Sphygmophone', in the *Lancet*, vol. 114 (1879), pg. 623.

50 Macleod, George H. B., 'Address in Surgery', in the *Lancet*, vol. 132 (1888), pg. 254.

51 Lawrence, Christopher, 'Physiological Apparatus in the Wellcome Museum: 1. The Marey Sphygmograph', in *Medical History*, vol. 22, no. 2 (April 1978), pg. 199-200.

occurred in the case of Richardson and his sphygmophone; as noted above, he was indeed keen to advance the field of scientific research in medicine.<sup>52</sup>

Richardson's previous interest in the sounds of the pulse leads me to infer that the sphygmophone was an attempt to further this specific research agenda. Through the application of telephone instruments he aimed to make research in this area more practicable, and pedagogy easier. However, whereas the invention of the audiometer was an application of the telephone to an existing problem, the sphygmophone was an attempt to find a use for the telephone for its own sake. There was no preferred existing technique for performing the work of the sphygmophone. Thus, in promoting it Richardson may have appeared to more conservative practitioners of the art of medicine to be an over-enthusiastic experimental physiologist trying too hard to argue for the usefulness of scientific and technological advances. This would explain why no further mention of Richardson's sphygmophone appears anywhere in the *BMJ* or the *Lancet*. In this comparison between the audiometer and the sphygmophone, the tensions of the period between the experimental physiology of the continental tradition and the British anatomical tradition become apparent. Ultimately, although this was an innovative application of the telephone, it did not generate much of an impact.

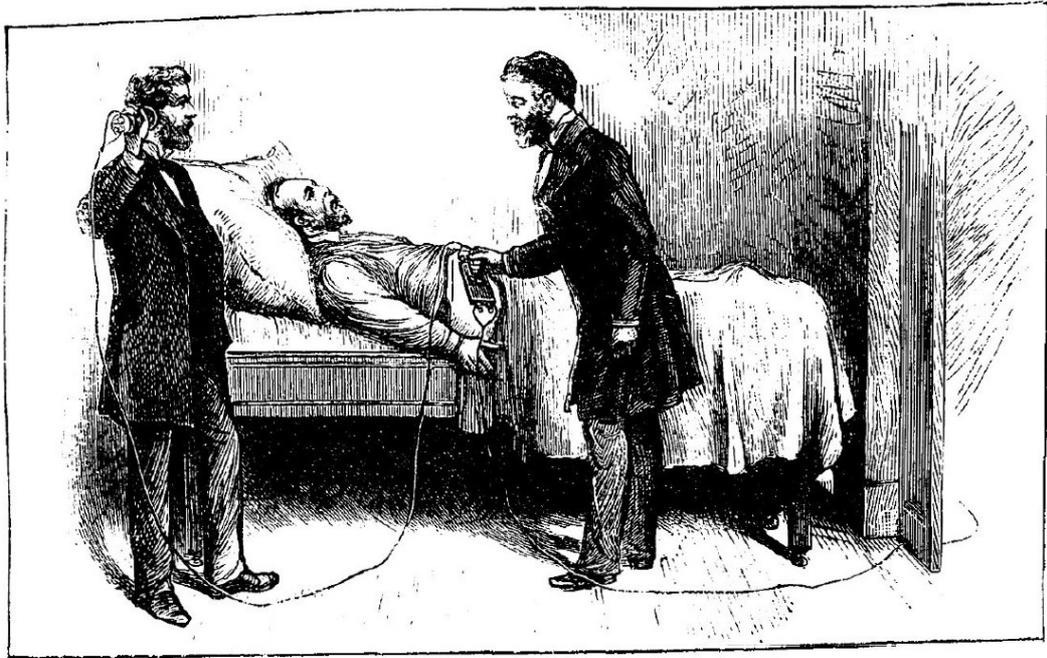
#### 2.5. The technician's instrument: the induction balance as a metal detector

Whilst the previous instruments offered few benefits over and above existing methods, this last instrument performed a function which had not previously been possible. When the US President James Garfield was shot in July 1881, Alexander Graham Bell devised an instrument intended to detect the bullet lodged in his body (Fig. 2.2.). This instrument was adapted from Hughes's induction balance, from which the audiometer was also developed, and comprised two flat coils parallel and partly one on top of the other so that the edge of one sat over the centre of the other. The primary coil had a current from a battery running through it, and the secondary coil was in circuit with a telephone instrument. If a metallic body was brought near the overlapping part of the coils, a sound was heard in the telephone, the intensity of which depended on the nature and shape of the metallic body, and on its distance from the coils. It was also possible to know the depth at which the metallic body lay within the patient, if its shape was known.<sup>53</sup> I now examine an account of its use in Britain, given in the *Lancet*, which provides interesting details about the interactions of medical men with new technologies.

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<sup>52</sup> See n.30.

<sup>53</sup> 'Graham Bell's Bullet-Finder', in the *Lancet*, vol. 118 (1881), pg. 846.



SEARCHING FOR THE BULLET WITH PROFESSOR BELL'S INDUCTION BALANCE

Figure 2.2. 'Searching for the Bullet with Professor Bell's Induction Balance'

Source: the *Graphic*, 24 September 1881, pg. 317

In 1887 a man came to the Westminster Hospital with a pain in his thumb; he had been scrubbing a floor and felt something sharp enter the ball of his thumb.<sup>54</sup> Believing a needle to be stuck in there, he had previously been to the hospital but a surgeon, probing the small wound, had found nothing. Two surgeons, Mr. Davy and Mr. Lownds, went with the man to see Thomas Hawksley, the instrument maker to see if the induction balance might help to locate the source of the problem.<sup>55</sup> Hawksley, first making sure that the telephone part of the instrument was silent, ran the searching part in parallel lines over the man's hand until a noise was heard, at which point the search was continued at right angles to the original lines. After finding what was thought to be the problem, Mr. Davy tested Hawksley by pushing two bits of a needle into a dead hand while the latter was out of the room. Hawksley found these easily, and Davy subsequently operated on the man and found part of a needle which had been buried in an awkward position. Davy was very impressed, noting that “[t]he use of the induction balance and telephone... was undoubtedly of the greatest value in proving the presence and localising the position of the foreign body.”<sup>56</sup>

54 'Westminster Hospital: Case Illustrating the Value of the Induction Balance for Detecting a Needle in the Thumb', in the *Lancet*, vol. 130 (1887), pg. 215-6.

55 Hawksley also made and sold Hughes's audiometers (Stephens, S. D. G., 'Hughes' Audiometer', in the *British Journal of Audiology*, vol. 13, supplement no. 2 (January 1979), pg. 12; Stephens, 1979b, pg. 4 (n.39)).

56 The *Lancet*, vol. 130 (1887), pg. 215 (n.54).

Davy noted, however, that it would not be much use to the military surgeon in the field, as it was too delicate. Nevertheless, for cases when the object had been lodged for some time and could not be found any other way, this was a very useful technique. The revealing facts about this case are that the surgeons and the patient went to visit Mr. Hawksley, not the other way around, and that, having done so, the actual operating of the diagnostic equipment was left to a specialist technician and not carried out by a surgeon. The use of the instrument appears from the description to have been quite complicated; it may not have been something that most surgeons would have wanted to master themselves, and so this pattern may have represented the way in which this instrument was employed for quite some time. Unfortunately it would probably be quite difficult to ascertain just how many people Hawksley himself, or other instrument makers like him, helped to treat during this period. However, it appears that this telephone-based medical technology was not initially used by medical men specifically, but by technical men. In addition, from the account given it appears that the use of the induction balance in this way was more efficacious than previous methods, namely feeling and probing for pieces of metal, and it was certainly less invasive than surgery.

## 2.6. Summary

In most of the examples given in this section the telephone was used as a component part of another instrument, and as such the role of telephone instruments themselves in certain areas of medicine has been largely unacknowledged in most histories of medicine. In 1993, Harry Marks pointed out that, whilst good histories of common, well-known technologies such as microscopes, stethoscopes and x-rays have been written, very few histories deal with more specialist or shorter-lived technologies.<sup>57</sup> As shown above, this is especially true of the nineteenth-century. He then argued “[u]ntil we have more studies of technological successes and failures, we shall be handicapped in judging the truth of the histories being written.”<sup>58</sup> The telephone provides examples of just such technologies; telephones as stethoscopes were tried but rejected, no immediate use was seen for the sphygmophone in diagnosis, and the audiometer was too complicated in its first incarnations to be widely used.

The difference in reception between the audiometer or the induction balance on the one hand and the sphygmophone and the stethoscopes on the other illustrates the tensions

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57 Marks, Harry M., 'Medical Technologies: Social Contexts and Consequences', in Bynum, W. F. and Porter, Roy (eds.), *Companion Encyclopedia of the History of Medicine*, volume 2 (Routledge, 1993), pg. 1592-3.

58 *Ibid.*, pg. 1596.

between the two groups Lawrence referred to, namely those who preferred to keep technology and instruments out of the medical art if possible and those who specifically wanted to reform medical practice to make it more scientific.<sup>59</sup> For example, those who initially supported the introduction of the audiometer tended to be specialists, who also tended in general to be more receptive to technological developments in medical practice. I also argue that the use of the induction balance by a technical man, rather than a medical practitioner, did less to impinge on the skills of the practitioner, as it was only resorted to when existing methods of searching for foreign bodies had failed, and the actual surgical procedure which followed was not affected. The fact that these early users were inspired by the telephone to design new instruments demonstrates how the purpose of telephony was not fixed from its inception. Rather, the telephone was an instrument for which uses were made by a variety of different actors.

Uses of the telephone by the medical community for the transmission of speech also impacted on broader telephone development. The use of the telephone by the medical profession in Glasgow resulted in one of the earliest exchanges in Britain, the Douglas exchange, which connected hospitals, doctors and other medical professionals.<sup>60</sup> In addition, hospitals with infectious patients found an important use for telephone instruments. Amongst several testimonial letters included in the Telephone Company's February 1880 list of subscribers was a letter from the Lady Superintendent of the Hospital for Sick Children in Manchester, which described how happy the hospital was with the use of the telephone in the fever ward.<sup>61</sup> Telephony enabled conversation between patients and their families without risking infection either by direct contact or by breath passing along a speaking tube. This aided quarantine measures, enabling human interaction whilst keeping people safe from contagious diseases. The inclusion of this letter in the Telephone Company's list of subscribers indicates that this use for telephone instruments was a valuable marketing tool; the company's early lists of subscribers did not just serve as directories for existing exchange subscribers, but also as advertisements of its services to prospective users. Therefore, I argue this use served as an important advertisement of the usefulness and reliability of telephone instruments.

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<sup>59</sup> Lawrence, 1985, pg. 505-7 (n.20).

<sup>60</sup> Baldwin, 1925, pg. 96 (n.2). Although Baldwin said that he was informed by David Graham, the proprietor, that this medical exchange – which connected local doctors, chemists, hospitals and infirmaries twenty four hours a day, seven days a week – was opened in March 1879, I can find no corroborating evidence of this. From newspaper sources such as the *Glasgow Herald*, it appears to me more likely that it occurred in late 1879.

<sup>61</sup> UTC, List of Subscribers, February 1880, pg. 19.

### 3. Monitoring ventilation and starting fires: telephones and safety concerns in the mining industry

Some of the first practical uses of the telephone were in the mining industries. This second section explores the uses for which telephony was suggested in coal and metal mining during this period, and those to which it was actually put. As in the cases of the medical profession and the military, these uses did not always involve the dialogue which existing histories emphasise, tacitly or otherwise, as being the key function of the instruments, and did not always involve the transmission of speech at all. In this section I consider the absence of historical investigation in this area and examine applications of the telephone to mining during the period covered by this thesis. I then discuss concerns raised at this time regarding the use of telephony, and electricity more generally, in mines.

#### 3.1. The telephone as a forgotten technology

Although mining was one of the earliest applications of telephony, this is not represented in existing histories. Directly inspired by Preece's August 1877 telephone demonstration at the Plymouth meeting of the BAAS, successful telephone trials were carried out at a mine in Cornwall by a representative of the London-based India-rubber, Gutta-percha, and Telegraph Works Company the following September.<sup>62</sup> In November 1877 the *Times* commented that the telephone was being used extensively in the mines of Pennsylvania and California,<sup>63</sup> and by August 1878 could note its employment in various mines in Britain for “effecting communication between those at the surface and those underground.”<sup>64</sup> In March 1878 Bell's own encouraging letter to the capitalists of the Electric Telephone Company, later simply called the Telephone Company, stressed that the telephone should be promoted for use in mines,<sup>65</sup> and by 1879 the French writer Theodore du Moncel called this “[o]ne of the earliest and most important applications of the telephone”.<sup>66</sup> By the 1900s many books on electrical engineering took the utility of telephones in mines as a given, and their integral role in the efficient running of mining

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62 'Mining and the Telephone', in the *TJER*, vol. 5 (1877), pg. 216-7.

63 'The Telephone', in the *Times*, 16 November 1877, pg. 3.

64 'Recent Developments in Acoustical Science', in the *Times*, 19 August 1878, pg. 4.

65 Feuerstein, 1990, pg. 458-62 (n.6).

66 du Moncel, Theodore, *The Telephone, the Microphone and the Phonograph* (Harper & Brothers, 1879 [reprint, Kessinger Publishing edition]), pg. 231.

operations required no further discussion.<sup>67</sup> Nevertheless, in subsequent histories of telephony and of mining its significance has been forgotten.

The potential of telephony to improve the safety of workers in mines was discussed widely by Victorian commentators, who noted for example that the telephone would allow medical personnel to be summoned to the scene of an accident more quickly.<sup>68</sup> Nevertheless, Catherine Mills, in her 2010 book *Regulating Health and Safety in the British Mining Industries, 1800-1914* did not mention telephony.<sup>69</sup> Even works dealing specifically with mining technology, and even electrical technology in particular, refer only briefly to the telephone.<sup>70</sup> Histories of telephony do not discuss in much detail the introduction of telephony into mines, or its impact. Probably due to his predominant focus on exchange telephony, Kingsbury did not mention telephones in relation to mining at all, and neither did Baldwin or subsequent histories which have followed this exchange-centric historiographical approach.<sup>71</sup> More recently one or two scholars have made brief reference to the use of the telephone in mines, but without context or analysis.<sup>72</sup> Peter Young, in his international social history of telephony, noted briefly that mines were early users of point-to-point telephonic systems, and that they were good in emergencies; he mentioned as an

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67 Lupton, Arnold, Parr, G. D. Aspinall and Perkin, Herbert, *Electricity as Applied to Mining* (Crosby Lockwood and Son, 1903), pg. 212-3; Walker, Sydney F., *Electricity in Mining* (Harper and Brothers, 1907), pg. 37; Duncan, W. Galloway and Penman, David, *The Electrical Equipment of Collieries* (Scott, Greenwood & Son, 1908), pg. 269-70.

68 For example, 'The Telephone in Mines', in the *Electrician*, vol. 16 (1885), pg. 82; 'The Telephone in Mines', in the *Leeds Mercury*, 24 September 1880, pg. 4; Marsh, F. S., 'One Use for the Telephone', in *Transactions of the Federated Institution of Mining Engineers*, vol. 3 (1891-2) pg. 1007-8.

69 Mills, Catherine, *Regulating Health and Safety in the British Mining Industries, 1800-1914* (Ashgate, 2010).

70 Burt, Roger, *A Short History of British Metal Mining Technology in the Eighteenth and Nineteenth Centuries* (De Archaeologische Pers Nederland, 1982), pg. 104; Jones, A. V., and Tarkenter, R. P., *Electrical Technology in Mining: The Dawn of a New Age* (Peter Peregrinus Ltd. in association with the Science Museum, London, 1992), pg. 54.

71 Kingsbury, 1915 (n.3); Baldwin, 1925 (n.2); Robertson, J. H., *The Story of the Telephone: A History of the Telecommunications Industry of Britain* (Sir Isaac Pitman and Sons, Ltd., 1947); Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977).

72 Feuerstein, 1990, pg. 41, 436 (n.6).

example an inspector of mines in Cornwall who installed a link from the mine office to the pit and on to a doctor's house.<sup>73</sup>

The overlooking of this particular area of telephone use is, however, similar to the situation with regard to medical and military use of the telephone, and also to the way in which early telephone use in the office environment has also been neglected, as Graeme Milne has pointed out.<sup>74</sup> In many areas, historiographically the telephone has been a neglected technology. However, although the application of telephony to mining has not been fully explored, it is important because of the ways it improved safety and efficiency in many mines in which it was employed. More so than the medical or military applications discussed in this chapter, I argue it would also have comprised an important way in which a broader segment of society, including the working classes, was exposed to the new technology. In addition, the employment of the telephone in mining was used by the telephone companies to help market their exchange services. Therefore, because developments in telephony in the context of mining had a wider impact, it is important to examine this area of use in more detail.

### 3.2. Telephones and ventilation in mines

This section provides some context regarding the dangers of the mining industry during this period, and then considers two telephone innovations intended to reduce the risks to miners. Mining was a very dangerous occupation, with frequent accidents and large-scale fatalities.<sup>75</sup> However, it is important to demarcate between collieries, where coal was mined, and metalliferous mines, which produced metals such as iron or tin. These comprised two different types of mining operations which were prone to slightly different problems. In collieries the leakage of dangerous gases such as methane and carbon dioxide from the coal seams was always a concern.<sup>76</sup> Such gases, known as firedamp, are highly explosive in certain mixtures and concentrations, and especially in the presence of coal dust. Many large explosions were caused by the ignition of such gases during the period covered by this thesis, for example at Seaham Colliery in Durham in 1880, where over 160

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73 Young, Peter, *Person to Person: The International Impact of the Telephone* (Granta Editions, 1991), pg. 15.

74 Milne, Graeme J., 'Business Districts, Office Culture and the First Generation of Telephone Use in Britain', in the *International Journal for the History of Engineering and Technology*, vol. 80, no. 2 (July 2010), pg. 199-200.

75 'Explosions in Mines', in the *TJER*, vol. 5 (1877), pg. 301.

76 Mills, 2010, pg. 12 (n.69).

people died.<sup>77</sup> Additionally, accumulations of carbon dioxide could cause death by suffocation.

In metalliferous mines the long-term inhalation of silica dust particles could produce a deadly scarring of the lungs, leading to shortness of breath, known as miners' asthma, and could increase the risk of contracting a tubercular infection.<sup>78</sup> In addition, breathing in the gases produced by the explosive compounds used in metalliferous mining could cause “unpleasant sensations in the head, and in extreme cases, noises in the ears, with, sometimes, bleeding of the nose.”<sup>79</sup> Although the risks and dangers of metalliferous mining were not so great as those in collieries, nevertheless the problem was also one of ensuring air was kept as safe as possible, and of providing good ventilation for the mine shafts.<sup>80</sup> In 1884 Robert Hunt, in his historical, scientific and technological study *British Mining*, commented that in the future “[p]ure air should *at any cost* be secured in the deepest mines.”<sup>81</sup>

This need gave rise to an important user-driven telephone innovation. A key part of ensuring good ventilation was by monitoring airflow in mines using an anemometer, a rotating device which indicated wind-speed. One example of such an instrument described by Robert Hunt was a rotating circular fan comprising six vanes mounted on a centre moving freely within a brass ring.<sup>82</sup> Around November 1877, only three months after Preece's telephone demonstration, Henry Hall, an Inspector of Mines, adapted the anemometer to enable ventilation to be monitored remotely by using a Bell telephone to audibly reproduce at the surface the clicks of the instrument as it rotated.<sup>83</sup> This he did in conjunction with Arthur Le Neve Foster, an electrician from the India-rubber, Gutta-percha,

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77 Ibid., pg. xx.

78 Ibid., pg. 34.

79 Hunt, Robert, *British Mining: A Treatise on the History, Discovery, Practical Development and Future Prospects of Metalliferous Mines in the United Kingdom* (Crosby, Lockwood and Co., 1884), pg. 863.

80 Ibid., pg. 607.

81 Ibid., pg. 881 (original emphasis).

82 Ibid., pg. 615.

83 'The Telephone', in the *Times*, 29 November 1877, pg. 6; Hall's full name and address obtained from the 1881 English census.

and Telegraph Works Company.<sup>84</sup> On 5 November 1877 this new innovation was successfully tested at a colliery in Prescot, where Hall lived. Possibly due in part to the presence of Sir William Thomson, this experiment was reported in the *Times*, which was influential and had a wide, wealthy national readership, as noted in chapter one.<sup>85</sup> This meant that many wealthy businessmen would have been aware of this early use of telephony, and these were precisely the types of telephone users Bell and Reynolds wanted to attract, as noted above.

Furthermore, later that November Bell gave a paper at the Society of Arts during which he demonstrated this new innovation as an illustration of how useful the telephone could be. This was also reported in the *Times*, providing further exposure at an early stage for telephony as a technology which could improve safety underground and save lives.<sup>86</sup> Bell gave many such lectures around Britain in the latter half of 1877, all intended to raise public awareness of and support for his telephone.<sup>87</sup> The exhibition, and indeed, endorsement, of this telephone innovation at such a prominent marketing event for his telephone instrument demonstrates that Bell believed this use comprised a key advertisement for telephony. This user-driven telephone innovation was therefore important in the early marketing of Bell's telephone as a useful, practical technology. The publicity it received in the *Times* would then have made a broader audience of possible customers aware of this innovation in particular, and of the potential of telephony more generally. Although subsequently it is unclear how widespread this use of the telephone was, du Moncel noted in 1879 that it was being widely employed.<sup>88</sup>

An application with a similar intention was proposed in 1882; the *Times* reported an innovation whereby a combination of a microphone and a telephone could be used to detect firedamp.<sup>89</sup> Explosions due to firedamp, it explained, were often preceded by undulations in the surrounding air, and it was these vibrations which the microphone, in circuit with a

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84 'Mining and the Telephone', in the *TJER*, vol. 5 (1877), pg. 217; 'The Telephone in Practical Operation', in the *Manchester Guardian*, 5 September 1877, pg. 4.

85 'The Telephone', in the *Times*, 16 November 1877, pg. 3.

86 The *Times*, 29 November 1877, pg. 6 (n.83).

87 For more on these talks given by Bell to promote the telephone at this early stage, see Feuerstein, 1990, pg. 40-1 (n.6).

88 du Moncel, 1879, pg. 231 (n.66).

89 'The Microphone and Fire Damp', in the *Times*, 12 September 1882, pg. 7.

telephone receiver, could detect and make audible. When exposed to a node in such a column of vibrating air, the telephone emitted a rumbling sound, similar to that caused by an induced current. A network of such devices in mines might enable accumulations of these gases to be detected and thus accidents averted. However, as above, it is not clear how widely this idea was implemented. Nevertheless, it does demonstrate a willingness to innovate with the new technology, applying it to existing problems and concerns regarding occupational health and safety. In addition, articles about these two applications of the telephone to mining, published in the *Times*, served to increase public awareness of the usefulness of telephony amongst those whom telephone promoters such as Bell and Reynolds considered to be potential telephone users. I therefore argue that such innovative telephone uses played a key role in making the telephone appear to the public to be a practical and useful technology.

### 3.3. The telephone as a signalling system

The use of telephones in mines for the transmission of speech was also used as an important advertisement for telephony. When Reynolds produced a circular, quoted in the second epigraph to this chapter, as an advertisement for Bell's telephone in late 1877, he listed a number of areas where people might benefit from being able to speak through telephones; mines were the first on the list.<sup>90</sup> From February 1882 the UTC noted in its list of subscribers that telephones were being used in mines “as a means of safeguard and protection against accidents”.<sup>91</sup> These lists of subscribers acted not only as directories for existing users, but also as advertisements aimed at potential users of the company's services. This demonstrates that the employment of telephones in mines was also used to market exchange telephony; I argue that the UTC believed potential subscribers would be impressed by the way in which telephony was used to improve safety, and would thus be more likely to consider using telephones in the business or domestic sphere.

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<sup>90</sup> Reproduced in Baldwin, 1925, pg. 696 (n.2).

<sup>91</sup> UTC, List of Subscribers, February 1882, pg. 11.

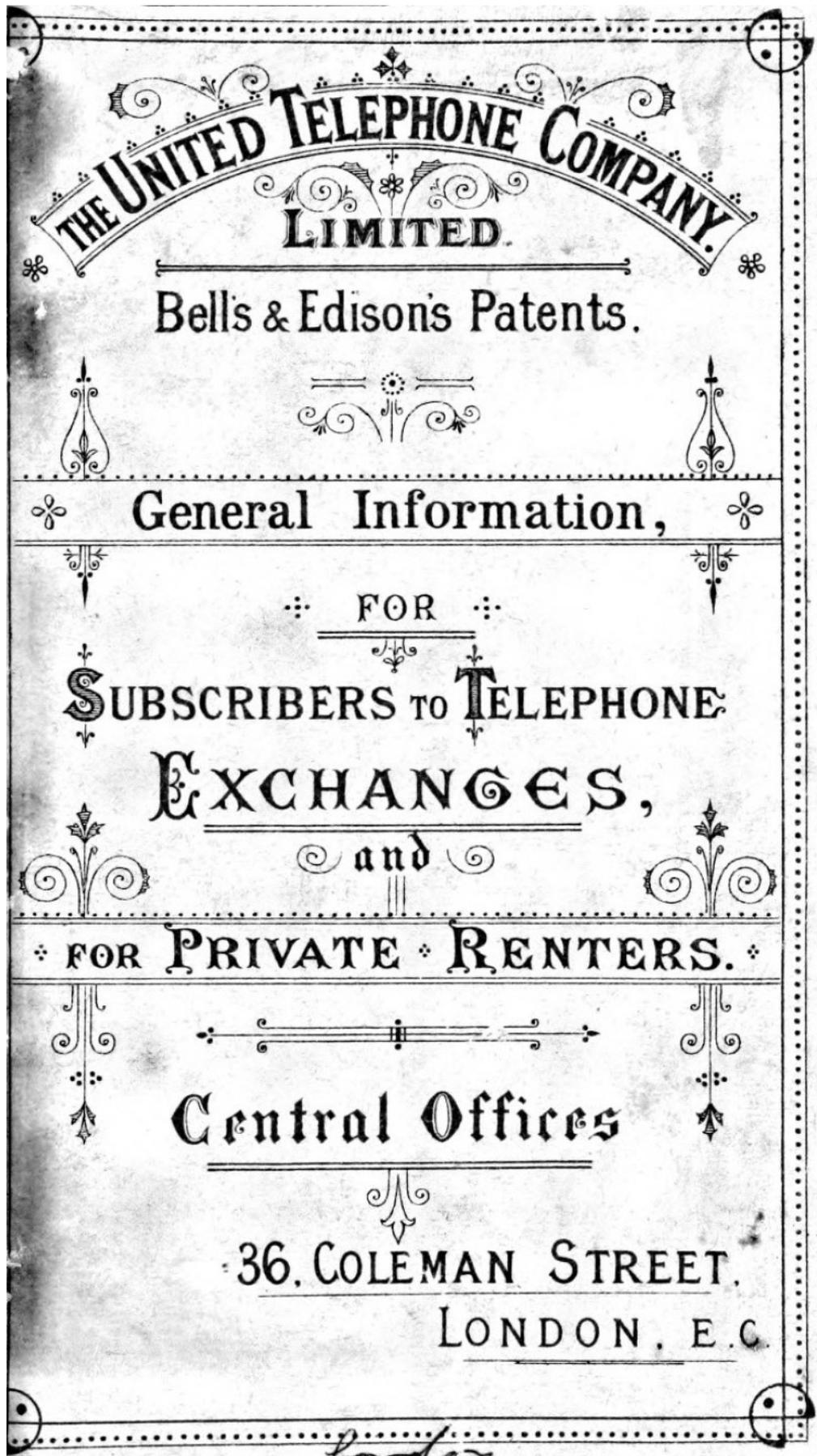


Figure 2.3. Title page of the UTC's August 1880 list of subscribers

Source: UTC, List of Subscribers, August 1880, [pg. 1]

Regarding the use of telephony as part of electrical signalling systems in many mines during this period, mining historian Roger Burt noted that several Cornish mines, which mainly produced tin, installed telephones from 1881 onwards.<sup>92</sup> In 1885 the NDTC issued a circular offering cheap telephony for local collieries, and noted the great utility of these instruments in recent accidents. Suggested connections to be made with the instruments included between “the manager's house and the colliery office, and from the colliery office to the bottom of the shaft”.<sup>93</sup> The specific telephone instruments offered had even been designed especially for use in mines, in response to safety concerns which will be discussed in more detail below.<sup>94</sup> This telephone company, whose area included a lot of mining districts, certainly believed that there was a market for such equipment.

Nevertheless, although one report in the *Leeds Mercury* in September 1880 noted the use of telephones in a Scottish colliery and in a Yorkshire iron mine, in the latter case there was a potential legal problem with the specific instrument employed.<sup>95</sup> These were Hunnings transmitters, which worked on the same principle of variable resistance as Edison transmitters, both of which are described in more detail in chapter three. The system was installed by Mr. Harrison of Darlington, but his firm, Harrison, Cox-Walker and Co., soon came under fire from the UTC in 1882 for infringement of their patents. The UTC succeeded in securing an injunction preventing the Darlington company from producing some of the instruments it had previously been supplying, and it is likely that such instruments as had been installed in mines, such as the one reported in the *Mercury*, would subsequently have been considered illegal infringements.<sup>96</sup> If so, they may have needed to be removed. Thus, the patent situation would have affected the cost and practicability of installing telephones in mines.

In 1883, the *TJER* cited the *Mining Journal* saying that the telephone had been tried in mine signal systems but had been given up,<sup>97</sup> it is not clear why, and certainly by the

92 Burt, 1982, pg. 104 (n.70).

93 The *Electrician*, vol. 16 (1885), pg. 82 (n.68).

94 'The Telephone in Mines', in the *Electrician*, vol. 16 (1885), pg. 103.

95 The *Leeds Mercury*, 24 September 1880, pg. 4 (n.68).

96 Baldwin, 1925, pg. 66-8 (n.2); UTC, List of Subscribers, October 1883, pg. vi, vii-viii. For more on early telephone patent disputes, see Arapostathis, Stathis and Gooday, Graeme, *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain* (The MIT Press, 2013), chapter 4.

97 'Underground Signalling in Mines', in the *TJER*, vol. 12 (1883), pg. 436.

1890s telephones were being used successfully alongside older electrical signal bells. Speaking to a meeting of the North of England Institute of Mining and Mechanical Engineers in February 1892, one engineer reported that he had recently installed an electrical system in a colliery near Durham, which included “a combined telephonic and signal-bell system... laid throughout the whole pit, by means of which telephonic communication can be kept up between any of the electric-power stations underground, and the engine-house at bank.”<sup>98</sup>

Another engineer, F. S. Marsh, described in June 1892 how he employed telephones in the Birch Coppice Colliery in the Midlands.<sup>99</sup> On the engine roads – shafts through which trains of wagons full of coal were hauled along tracks out of the mine – he had experienced difficulties signalling to the engine-driver on the surface when something temporarily went wrong. He had used the existing system of electric signal bells which connected the engine room with the shaft to give the signal to stop the engine hauling the wagons. However, sometimes people along the tunnel gave the signal to start again, either because they did not know that anything was wrong, or “sometimes for mischief”.<sup>100</sup> Because of the existing electrical system anyone could give this signal, and because the engine-driver did not know who had given it, he would start the engine up again. This happened, Marsh said, more than once, and with unpleasant consequences.

The solution he adopted was to use a telephone hooked onto the signal wires; this way, since he was the only person who had a transmitter, he could tell the engine-driver precisely what was wrong, and, although anyone could still give the signal to stop if something went wrong anywhere, only he could give the signal to start the engine again. The telephone thus solved the problems of the anonymity of the telegraphic start signals, and represented authority; in addition, it was not being used for two-way conversation, but it was sufficient simply for the engine-driver to listen to instructions. By this time both the Bell and Edison patents had expired, which may have encouraged engineers to experiment with such systems; Marsh recommended a small, portable transmitter which was a variation of the Bell instrument and could be carried around in a little leather pouch. Essentially a

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98 Bigge, D. Selby, 'The Practical Transmission of Power by Means of Electricity, and its Application to Mining Operations', in *Transactions of the Federated Institution of Mining Engineers*, vol. 3 (1891-2), pg. 295.

99 Marsh, 1891-2, pg. 1007-9 (n.68).

100 Ibid., pg. 1007.

small flat disk that could be held easily in the hand, it weighed less than half a pound and had two short wires with little hooks which could be attached to the signal wires.<sup>101</sup>

This system had been in use at Marsh's colliery on three roads between one and two miles long for many months, had worked very well, and was also useful for summoning medical assistance quickly. It was a recommended investment if mines were already using wires for electric signalling purposes.<sup>102</sup> It is likely that those mines which had already begun to employ private telegraphy possessed the infrastructure to use telephones, and indeed by 1882 Robert Galloway, in his history of British coal mining, noted that electric signalling on engine roads had been in use for many years.<sup>103</sup> However, it is possible that before the important patents started to run out at the end of 1890, many mine owners decided it was not worth the expense of purchasing telephone instruments. After this date, though, many mines could begin to use them instead of, or alongside, existing electric signal bell systems. The use of telephones on engine roads certainly did become common; in his 1907 textbook on electricity in mining, Sydney Walker commented that the most useful application of telephony in mines was on these engine roads.<sup>104</sup>

### 3.4. The dangers of telephones in mines

Whilst the uses examined above appear to have been widespread, it is important to take seriously the concerns raised during this period by engineers and mine owners regarding the application of telephony in mines. One reason miners were reluctant to use telephones was the danger of starting fires if the instruments sparked. Fires were a constant source of worry for mine owners, miners, and engineers during this period; as mentioned above, they were particularly common in coal mines, where firedamp could be easily ignited, and were frequently lethal.<sup>105</sup> To help reduce the risks, specific air-tight telephones

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101 Ibid., pg. 1008-9; 'Discussion on Mr. F. S. Marsh's Paper, "One Use for the Telephone."', in *Transactions of the Federated Institution of Mining Engineers*, vol. 4 (1892-3), pg. 430.

102 Marsh, 1891-2, pg. 1009 (n.68); *Transactions of the Federated Institution of Mining Engineers*, vol. 4 (1892-3), pg. 429 (n.101).

103 Galloway, Robert L., *A History of Coal Mining in Great Britain* (Macmillan and Co., 1882 (reprinted, David & Charles Reprints, 1969)), pg. 264.

104 Walker, 1907, pg. 39-40 (n.67).

105 Jones and Tarkenter, 1992, pg. ix (n.70); 'Discussion on Mr. Albion T. Snell's Paper on "The Distribution of Electrical Energy over Extended Areas in Mines."', in *Transactions of the Federated Institution of Mining Engineers*, vol. 2 (1890-1), pg. 154-6.

were designed, such as those offered by the NDTC in 1885, mentioned above.<sup>106</sup> These sets comprised a Bell receiver, a Blake transmitter, a magneto ringer to draw attention to a call, and a generator for the transmitter, the last of these being contained within an air-tight compartment, to prevent any explosion of firedamp by sparking.

As historians P. J. Povey and R. A. J. Earl have pointed out, even the tiny movements of the carbon granules in telephone transmitters could produce minute sparks which could ignite firedamp, so electrical components of telephones were sealed in air-tight cases, with the wires entering through air-tight glands, and seals were fitted around the edges of the diaphragms of transmitters and receivers in order to keep the telephone air-tight.<sup>107</sup> The instruments which would have posed the highest risk would have been those based on carbon particles or granules, such as the aforementioned Hunnings transmitter; unfortunately this was also acknowledged to be one of the best telephones available in terms of clarity of speech.<sup>108</sup> The particulars of various telephone instruments in use during this period are examined in more detail in chapter three.

The implication is that Bell instruments, which operated on electromagnetic principles, without any carbon particles or granules to produce sparks, would have been safer for use in such environments. However, Bell instruments did not possess the same power of transmission as those which worked on the principle of variable resistance, but these latter instruments also required batteries, and thus carried the increased risk of sparking as noted above. Indeed, it was a variant of the Bell instrument which Marsh recommended employing for his proposed system of electric signalling in collieries, and for the distances which he mentioned, two miles being the longest, the Bell variant instruments would have sufficed.<sup>109</sup>

### 3.5. Summary

Looking back over thirty years of involvement in the practical application of electricity to mining work, engineer Sydney Walker commented in 1907 that for much of that period he had fought “a very uphill battle against the natural conservatism of mining

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106 The *Electrician*, vol. 16 (1885), pg. 103 (n.94).

107 Povey, P. J., and Earl, R. A. J., *Vintage Telephones of the World* (Peter Peregrinus Ltd., 1988), pg. 80.

108 Ibid., pg. 22-4; Baldwin, 1925, pg. 68 (n.2).

109 Marsh, 1891-2, pg. 1009 (n.68).

engineers and mine managers".<sup>110</sup> Another textbook decried the slow uptake of electricity in mines, attributing it to prejudice.<sup>111</sup> However, the initial response to introducing telephones was enthusiastic, at least towards tests of the apparatus, but miners became more reticent as the potential dangers from sparking became more apparent. I argue that concerns about fire shaped attitudes towards electrical equipment in general, and telephony in particular. It is within this context that the introduction of telephony into mines needs to be seen. Nevertheless, three factors helped to increase uptake by the end of this period. Firstly, more specialised telephones were designed for this particularly volatile environment, secondly telephone instruments became available for use in ways which supplemented existing electrical systems, and lastly instruments also became cheaper as patents expired.

Telephony did have advantages over existing electrical signalling systems during this period. Telephones were much easier instruments to use than existing forms of telegraphic communications. The *Manchester Guardian* noted that experiments had demonstrated that telephones could be used by those who had never seen them before.<sup>112</sup> It was thus more intuitive for miners to use telephones than existing signalling systems. Users also knew who was communicating with them. However, in a mining environment, especially in collieries, lives were at stake, and thus novelty or increased economic efficiency alone were not sufficient factors to encourage the uptake of the telephone; engineers were very careful to ensure that the introduction of this new technology did not further endanger the lives of the workers. The specific instruments used – for example electromagnetic Bell instruments or variable resistance transmitters – would have determined how safe the system was, and how free from risks of sparking.

Such uses as did become prevalent also had an impact on other industries, as the air-tight telephone units which were designed for use in mines also found application in oil storage depots, explosives factories and chemical plants.<sup>113</sup> Thus, lessons learned from employing telephony in mining were beneficial elsewhere as well. In addition, as noted above, telephone promoters such as Bell and Reynolds, and subsequently the UTC, included the use of telephony to improve safety in mines as part of their marketing strategy for telephone instruments and exchanges. The remote telephonic monitoring of

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<sup>110</sup> Walker, 1907, pg. v (n.67).

<sup>111</sup> Duncan and Penman, 1908, pg. x (n.67).

<sup>112</sup> The *Manchester Guardian*, 5 September 1877, pg. 4 (n.84); du Moncel, 1879, pg. 231 (n.66).

<sup>113</sup> Povey and Earl, 1988, pg. 80 (n.107).

anemometers was an important example of this, and Bell employed this user-driven telephone innovation to improve public confidence in the reliability of the new technology.

#### 4. Discretionary use and non-use: the Victorian Army and the telephone

The British Army also made use of the telephone in ways not appreciated in existing histories. As a group of users, the Army had an often overlooked potential to influence the broader development of British telephony. Below I shall consider attitudes within the Army towards the telephone from its introduction into Britain in 1877, through several military campaigns in the 1880s, and then into the 1890s. Army telephone use has received a similar historiographical treatment to that afforded British telephony more generally: it was slow to develop and people were reluctant to use telephones. However, as Perry's work on British telephony in general requires reappraisal, so too does the current historiographical attitude towards Army telephony. Army officers noticed the limitations of the technology and chose how best to employ it accordingly. To demonstrate how users engaged with a technology which had distinct advantages and disadvantages, I shall examine how the Army used telephony and why, and the ways in which these specific uses contributed to the broader development of British telephony.

##### 4.1. The historiography of military telephony

Although over the 1880s and 1890s the Army successfully employed the telephone during small colonial wars in South Africa, Afghanistan, Egypt, Sudan and Burma,<sup>114</sup> Victorian Army telephony has not been extensively examined or documented. Only a few works address British Army use of the telephone, but do not give specifics of how it was used, and often highlight the reluctance of officers to use telephones either in peace time or in war.<sup>115</sup> One 2008 article, whilst promising to treat Army use of the telephone from 1877-1914, spent little time on the period before the Second Boer War of 1899-1902; even of this conflict the author, Brian Hall, conceded only that “the British Army did make limited use of the telephone”.<sup>116</sup> For background information on the context of British civilian

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114 Nalder, R. F. H., *The Royal Corps of Signals: A History of its Antecedents and Development (Circa 1800-1955)* (Royal Signals Institution, 1958), pg. 24-5, 27-31.

115 For example, Bridge and Pegg, 2001, pg. 32 (n.10); Nalder, 1958, pg. 25 (n.114); Young, 1991, pg. 40-1 (n.73).

116 Hall, Brian N., 'The 'Life-Blood' of Command? The British Army, Communications and the Telephone, 1877-1914', in *War and Society*, vol. 27, no. 2 (October 2008), pg. 51.

telephony at the time, Hall relied heavily on Perry's account,<sup>117</sup> which I argue led him to expect to find a delay in the Army use of the telephone, as noted in chapter one.<sup>118</sup>

In general, because existing histories of telecommunications have focused on the civilian population, the use of the telephone by the military has been omitted. Even Daniel Headrick, who has written extensively on telecommunications, war and imperialism during this period, did not discuss telephony.<sup>119</sup> One exception was Stein, who noted Victorian discussions about the potential usefulness of the telephone to the Army, but then downplayed its actual significance.<sup>120</sup> Military histories, even those focusing on Victorian military technologies, have also not gone into detail about the use or impact of telephony.<sup>121</sup> Thus, as histories of military technologies tend not to discuss telephony, and existing histories of telephony rarely note military use in this period, an important and innovative early user of the telephone is absent from the narrative. This section will examine the alleged Army reluctance to employ the telephone, demonstrating the Army's importance as an early user of telephony and the ways in which this use shaped the development of the fledgling technology.

Indeed, combining military history and the history of the telephone yields benefits for both. My use-focused approach demonstrates within the Army a range of uses for and opinions regarding the telephone, which were discussed in some detail. Because in the field of battle lives were at stake, careful consideration was necessary regarding the employment of a new technology. Thus the Victorian Army provides for the history of telephony a valuable case study of measured, discretionary use, and well-reasoned non-use. This demonstrates that there was no blanket adoption or rejection of the telephone amongst military personnel, and highlights the agency and discretion of users driving technological propagation. For the field of military history, studying telephony builds on the point raised by the military historian Ian Beckett that the Victorian Army has traditionally been seen by historians as conservative and resistant to technological change. However, he argued against this received wisdom, noting that the Army was not blind to applications of

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117 Perry, 1977 (n.71).

118 Hall, 2008, pg. 45-9 (n.116).

119 Headrick, Daniel, *The Invisible Weapon: Telecommunications and International Politics, 1851-1945* (Oxford University Press, 1991).

120 Stein, 1996, pg. 66-8 (n.10).

121 Bailes, Howard, 'Technology and Tactics in the British Army, 1866-1900', in Haycock, Ronald and Neilson, Keith (eds.), *Men, Machines & War* (Wilfrid Laurier University Press, 1988), pg. 40; Beckett, Ian F. W., *The Victorians at War* (Hambledon and London, 2003).

technology, but was simply selective in those applications.<sup>122</sup> Beckett provided a broad picture of Army interactions with technologies during this period, and my focus on the telephone supports his argument.

#### 4.2. Communications options in the Victorian Army: telegraphy, visual signalling, and orderlies

This section examines the military context into which the telephone was introduced, including existing alternative communications technologies and techniques with their own advantages and disadvantages. As the received view of a delay in telephone use in Britain in the civilian sphere is not accurate, so the Victorian Army as an institution was not guilty of irrational technophobia with regards to the telephone; rather they were selective, and even innovative, in their application of telephony. The telephone was introduced against a background of many alternative communications methods which the Army could use. For example, the telegraph enabled very rapid communications over long distances, and was an integral part of Army communications.<sup>123</sup> However, there were many disadvantages to its use. Laying the line required heavy equipment, and working it required skilled operators.<sup>124</sup> Having thus been laid, the wire was vulnerable to the elements, to animals, and to curious natives.<sup>125</sup> There was also the danger that the wire might be tapped by the enemy, who could then not only receive secret messages, but could also send their own misleading messages back again.<sup>126</sup> Because this could compromise battlefield intelligence, the laying of wires had to be carefully considered.

An alternative to telegraphy was visual signalling. At the Army's disposal were flags for semaphore and heliographs, which reflected the light of the sun using mirrors. Either of these would send a message over the heads of the enemy without the need for a vulnerable wire connecting the points between which communication was required.<sup>127</sup> The equipment was light and could be used to communicate between selected points without any

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122 Beckett, 2003, pg. 179-80, 182 (n.121).

123 Preece, W. H., 'The Telephone and its Application to Military and Naval Purposes', in the *Royal United Services Institution Journal*, vol. 22, no. 94 (1878), pg. 209.

124 Ibid., pg. 210.

125 Bridge and Pegg, 2001, pg. 25 (n.10); Nalder, 1958, pg. 23 (n.114).

126 'The Electrical Exhibition', in the *Times*, 5 October 1881, pg. 8.

127 Kennedy, C., 'Army Signalling and its Use in War', in the *Royal United Services Institution Journal*, vol. 41, no. 234 (1897), pg. 971.

previously prepared connections. Nevertheless, this form of communication was not much use in a climate with poor visibility, or little sunshine. In addition, it could be readily detected by the enemy, leaving operatives vulnerable. It was also slow.<sup>128</sup> Often the most reliable and effective form of communication was a mounted orderly carrying a written message.<sup>129</sup> This way, the message would be delivered directly to its intended destination, the orderly could return quickly with the reply, and a clear and accurate record of the correspondence would be kept. Anyone could be sent, without specific training, and, as with signalling, there was no vulnerable wire connecting the two points. However, this method was also not without its downsides: sending orderlies decreased the numbers of available fighting men, and they could be captured or killed, or simply get lost.<sup>130</sup>

A commanding officer considering how best to send a message across a battlefield thus had several potential methods at his disposal. These would be employed depending on the specific circumstances with which he was confronted. The less technologically intricate methods, visual signalling and the sending of messengers, were still in use well into the twentieth-century, despite advances in telephony, wireless telegraphy and radio technologies.<sup>131</sup> Within this context, it is unreasonable to expect that the new and untested telephone would immediately have replaced all other methods of communications. Even when its technical efficiency had improved, it was still one medium out of many the British Army had to choose between.

#### 4.3. Applications of telephone instruments

The Army was first introduced to the telephone in December 1877, at a demonstration at Aldershot and a lecture the following week by William Preece.<sup>132</sup> These events marked the beginning of a close relationship between Army and Post Office telephony. Before the invention of the telephone the Post Office and the Army had a history of telecommunications co-operation which went back to 1870, when the Post Office

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128 Ibid., pg. 972-3.

129 Nalder, 1958, pg. 19 (n.114).

130 Kennedy, 1897, pg. 973 (n.127).

131 Bridge and Pegg, 2001, pg. 22 (n.10); Hall, 2008, pg. 44 (n.116).

132 'Naval and Military Intelligence', in the *Times*, 11 December 1877, pg. 10; 'The Telephone', in the *Times*, 22 December 1877, pg. 10. Alexander Graham Bell was also present for the demonstration, as he was travelling around Britain demonstrating his telephone to potential buyers, and the military were a group he thought worthy of special consideration (Feuerstein, 1990, pg. 40-2 (n.6); on Bell's focus on selling the telephone to the Army, see his letter of March 1878, reproduced on pg. 458-62).

took over the telegraph network. At this time, the War Office loaned the Postmaster General two companies of Royal Engineers in order to help work the telegraph system.<sup>133</sup> These two units also saw active service in a few colonial wars in the 1880s, and thus formed a connection between Army and civilian telephony.<sup>134</sup> Although the cross-over is difficult to measure in terms of inventions or innovations passing from one to another, expertise gained in the one sphere was almost certainly employed in the other. Indeed, around the same time as Preece gave his lecture, in December 1877, the field telegraph detachment of the Bengal Sappers and Miners, based at Roorkee, built a 30 mile telegraph route on which they used Bell telephones they had manufactured themselves in their school of signalling. According to Bridge and Pegg, this was the first recorded use of telephones in war in the British and Indian armies.<sup>135</sup>

#### 4.3.1. The telephone as a telegraph

However, it was not as transmitters and receivers of speech that telephone instruments were first utilised by the Army, but rather as telegraph receivers. In May 1879, C Troop, the division of the Royal Engineers in charge of laying and maintaining telegraph lines,<sup>136</sup> were sent to render assistance in the Zulu War, and there used the telephone on a large scale for the first time.<sup>137</sup> They erected telegraph lines, some on poles, others with the wires on the ground, and when they found that the wire insulation was defective, or that there was a lot of dew on the ground, they realised they could work their lines using a Morse sounder as a transmitter and a Bell telephone as the receiver. Because the telephone was a more sensitive instrument than standard Morse receivers, responding to smaller currents, this arrangement was perfect for conditions where the line, constructed hastily and under a lot of pressure, was poor or faulty.

In 1882, Lieutenant Philip Cardew invented the vibrating sounder for use with a telephone receiver.<sup>138</sup> This was an improvement on the Zulu War system, and was designed

133 Nalder, 1958, pg. 21 (n.114).

134 Ibid., pg. 22-5.

135 Bridge and Pegg, 2001, pg. 27-9 (n.10).

136 Ibid., pg. 25.

137 Ibid., pg. 29-30.

138 Gunter, E., 'Von Löbell's Annual Reports on Changes and Progress in Military Matters. Vol. XXV. Jubilee Number. 1874-1898', in the *Royal United Services Institution Journal*, vol. 44, no. 264 (1900), pg. 165; Vetch, R. H., 'Cardew, Philip (1851–1910)', rev. James Lunt, *Oxford Dictionary of National Biography* (Oxford University Press, 2004)

to optimise the reception of telegraphic Morse signals on a telephone instrument. It was ideal for holding communications on wires where other methods of working would fail, such as bare wires on the ground, or wires immersed in water.<sup>139</sup> This system was widely used as the standard method of working such wires until at least 1892.<sup>140</sup> Because the telephone produced a musical tone, messages could be keyed in by Morse code and read by ear at the other end. As Preece later noted in 1889, it was particularly useful to be able to use a simple, low battery power telephone instrument when normal instruments were unworkable.<sup>141</sup> As a receiving instrument the telephone also never required adjustment, in contrast with normal Morse sounders, which, if the current strength altered from time to time, needed to be readjusted, causing delay.<sup>142</sup>

Cardew's system even found a civilian use in the aftermath of the great snowstorm of December 1886, when telegraph wires had been badly damaged, and were worked using his instruments.<sup>143</sup> Although this is one of very few instances when a military innovation in telephony benefited the civilian sphere, and even if it was only used in this one case, it was nevertheless an available alternative which could be used by civilian telegraphy services in case of emergency. This provides a key example of a way in which a user of the early telephone confronted the technology, and upon appraising it found that certain aspects were beneficial and others not; in using the telephone as a telegraph receiver, the British Army officers adopted and employed the telephone on their own terms, and not necessarily as its promoters had expected. This is similar to the example of those in the medical community who employed telephone instruments as devices for measuring hearing.

#### 4.3.2. The telephone in ballooning

The other main use of telephone instruments by the Army, which did see them utilised for their capacity to transmit speech, was in surveillance balloons. This also began in 1879 when, in November, the Military Balloon Committee, formed in April of that year

[\[http://www.oxforddnb.com/view/article/32287\]](http://www.oxforddnb.com/view/article/32287), accessed 28 May 2014].

139 Beresford, C. F., 'The Telephone at Home and in the Field', in the *Royal United Services Institution Journal*, vol. 36, no. 170 (1892), pg. 349.

140 Beresford, C. F. C., "'The Field Telegraph,'" its Use in War and its Employment in the Late Expeditions in the Soudan and South Africa', in the *Royal United Services Institution Journal*, vol. 30, no. 135 (1886), pg. 581.

141 Preece, William Henry and Maier, Julius, *The Telephone* (Whittaker and Co., 1889), pg. 452-5.

142 Beresford, 1886, pg. 598 (n.140).

143 Vetch, 2004 (n.137); 'The Snow Storm', in the *Times*, 29 December 1886, pg. 8.

to investigate the tactical potential of balloons, demonstrated its Saracen balloon to officers of the Royal Artillery and Royal Engineers.<sup>144</sup> This was a large hydrogen balloon attached to a wagon which, at 2,000 feet up, provided a portable surveillance platform from which a sentry could spy out enemy positions or observe the terrain.<sup>145</sup> The best way to communicate with the person up in the basket of the balloon when it was deployed on the battlefield was by telephone, with the wire running through the main rope.<sup>146</sup> Flags for semaphore were also an option, but it is reasonable to assume that the introduction of the telephone at this juncture made military ballooning a much more practical tactical exercise.

Such balloons became standard issue, and were used in campaigns for the next few decades. They were used in Army training exercises, such as those in Brighton in 1880,<sup>147</sup> and it had been proposed to acquire forty such balloons; as of 1883 twenty had been manufactured, all designed to use telephones for communication with the ground. Three balloons were going to be sent out to Egypt during the campaign there in 1882, but there were delays and the decisive battle was fought before they left England.<sup>148</sup> Here the Army found a situation in which the telephone was the best suited communications medium for the job, and it was employed accordingly.

#### 4.3.3. The telephone in training and logistics

Over the next decade, telephones would also be applied to other military tasks. Telephones were used in army exercises around the country,<sup>149</sup> and on artillery and rifle ranges telephone lines were run from firing points to target areas so that the results of fire could be gained more quickly.<sup>150</sup> In 1888, when a new very long range rifle was being tested, the telephone was vital in ensuring the smooth running of the proceedings on the firing range, for example to confirm the accuracy of shots fired. The telegraph would not

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144 'Naval and Military Intelligence', in the *Times*, 20 November 1879, pg. 6.

145 Baden-Powell, B., 'Military Ballooning', in the *Royal United Services Institution Journal*, vol. 27, no. 122 (1883), pg. 735.

146 'Military Ballooning', in the *Times*, 9 February 1892, pg. 3.

147 Baden-Powell, 1883, pg. 742 (n.145); 'The Brighton Volunteer Review', in the *Times*, 31 March 1880, pg. 3.

148 Baden-Powell, 1883, pg. 743 (n.145).

149 The *Times*, 31 March 1880, pg. 3 (n.147); 'The Easter Volunteer Manoeuvres', in the *Times*, 12 April 1884, pg. 6; 'The Operations at the Needles', in the *Times*, 10 July 1890, pg. 7.

150 'National Artillery Association', in the *Manchester Guardian*, 13 August 1884, pg. 8.

have been as quick or efficient in this situation.<sup>151</sup> Telephones were used for internal communications in permanent army camps,<sup>152</sup> and by 1892, Major C. Beresford, Royal Engineer and staunch advocate of telephone use, could say that the telephone had gone from being a novelty to being common-place,<sup>153</sup> and was employed in all garrisons and dockyards.<sup>154</sup> Harbours and dockyards, for example Portsmouth, also used the telephones as part of their defence systems, with groups of guns connected with nearby observing rooms via telephones.<sup>155</sup>

Telephone exchanges were also established quickly; while existing histories such as those of Nalder and of Bridge and Pegg claim that the first military switchboard was not installed until 1896,<sup>156</sup> Beresford noted in 1892 that an exchange had been established at the Portsmouth garrison by 1882, that Aldershot had been using an exchange for over five years, and Plymouth for three years. Naval dockyards also all had exchanges.<sup>157</sup> The telephone was put to work in the 1880s by an army which was, largely, keen to see what it could do to improve its performance. The unusually large number of campaigns over the course of this decade meant more opportunities to test the new technology in the field, and thus the negative responses from some officers which have been noted by historians<sup>158</sup> were not just theoretical speculations, but representative of practical problems which had arisen during active service. These concerns, some of which were similar to those encountered in the civilian sphere, as discussed in chapter three, will be addressed and evaluated below.

#### 4.4. The problems with telephony

I now consider the concerns raised by military men about telephony and its applications. In March 1879, with telephone instruments having been the subject of military experiments for just over a year, Major Charles Webber, R.E., later president of the

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151 'Experiments with the New Rifle at Aldershot', in the *Times*, 22 September 1888, pg. 8.

152 'Naval and Military Intelligence', in the *Times*, 7 May 1880, pg. 5.

153 Beresford, 1892, pg. 347 (n.139).

154 *Ibid.*, pg. 353.

155 'Volunteer Artillery', in the *Manchester Guardian*, 27 December 1886, pg. 8.

156 Nalder, 1958, pg. 34 (n.114); Bridge and Pegg, 2001, pg. 40 (n.10).

157 Beresford, 1892, pg. 355 (n.139).

158 Nalder, 1958, pg. 25, 34 (n.114); Young, 1991, pg. 41 (n.73); Bridge and Pegg, 2001, pg. 29, 32 (n.10).

Society of Telegraph Engineers, voiced some of the concerns that would continue to limit the Army's use of the telephone for speech purposes into the twentieth-century. He was worried that “however efficient the apparatus, the person talking can be heard by those near him, and, without very special precautions being taken, every *order* communicated would be known to everyone in the neighbourhood of Head Quarters”.<sup>159</sup> Webber, however, was no conservative technophobe; on the contrary, he was later very involved in civilian telephony as a managing director of the UTC in London, and was even in favour of broadening access to exchange telephony to a wider public than most.<sup>160</sup> His criticisms can therefore be seen as a realistic appraisal of the limitations of the technology. William Preece also worried about the wisdom of entrusting a message to the “stentorian lungs of an ordinary soldier”.<sup>161</sup> This would have been bad enough at a permanent base, but in the field it would be completely inadmissible.

Nalder also noted a technical difficulty, that there was no such thing as a telephone repeater during this period.<sup>162</sup> Whereas on telegraph lines one could install a repeater – the technology for which had developed alongside the instruments – and thus transmit messages over long distances even on hastily constructed temporary lines, there was no equivalent technology for telephony at this stage. Telephony suffered from greater problems of attenuation over distance than did telegraphy, and the more robust permanent lines which would have helped to mitigate this effect would have taken a lot longer, and been more expensive, to construct in the field. As a result, telegraphy was better than telephony for long distance communication until the twentieth-century.

A key problem for telephony was the lack of a written record of correspondence. Military communications required a written record which could be referred to later, sometimes to see what had gone wrong. This was the reason that orderlies with written messages were considered the optimum medium for military messages long after the introduction of telephony,<sup>163</sup> and it was this which bothered General Archibald Alison when he wrote in August 1886, in a letter to General Fielding: “the man holding the cups of a telephone and receiving a message has his hands fully employed. He cannot *take down* the

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159 Webber, C. E., 'Orders in the Field and the Means of Communicating them', in the *Royal United Services Institution Journal*, vol. 23, no. 101 (1879), pg. 647 (original emphasis).

160 Webber, C. E., 'The Development of the Telephone', in the *Times*, 24 August 1892, pg. 9.

161 Preece and Maier, 1889, pg. 450 (n.141).

162 Nalder, 1958, pg. 33 (n.114).

163 Hall, 2008, pg. 44 (n.116).

message he receives, but must call it out, to be taken down by a second man (involving two men) or repeat it at its close by memory only. A good telegraph clerk will take a message down (keeping a record of it while doing so) and be sending off another sometimes at the same moment.”<sup>164</sup>

Alison was concerned that telephone operators would not be as efficient as telegraphists, and his reasoning is best understood by considering the specific instruments to which he was referring, and the use to which they were being put. His reference to holding the cups of the telephone implies that the telephone instruments he meant were the Gower-Bell telephones, which comprised a receiver which, although recognised to be very efficient, was so large and heavy that it needed to be mounted on the wall, and two hollow tubes extended from it to carry the sound to the ears.<sup>165</sup> The unit was set in a box with the transmitter on top, and thus the user needed to stand by the wall with both hands occupied in holding the tubes to his ears in order to utilise the telephone. Indeed, these were the type originally installed in the Army's permanent camps.<sup>166</sup> I discuss these in more detail in chapter three.

Whereas Alison did think it would be beneficial for telephones to be used where no previous telegraphic communication had been employed, such as in manoeuvres, between commanders or brigadiers and their brigades or regiments, or within a permanent camp, he was against replacing existing telegraphic systems with telephones. Where the need existed for specific people to communicate with one another, the telephone might be employed, but not for general communications. Apart from anything else, he noted, “the constant ringing of the bell is a decided nuisance. You could not have telephone operators at work within two or three feet of clerks engaged in their ordinary work of writing or calculating – in the same way as you have telegraph operators in our present Hd Qrs office. It would worry everyone to death. A special room would be required.”<sup>167</sup>

Alison's concerns, however, were not for want of trying the telephone; it is important that he also mentioned a previous experiment to run a telephone between Aldershot and Pirbright, but stated that “the telephone was a failure – constantly getting out of order and having eventually to be abolished”.<sup>168</sup> He did not rule out the possibility that technical improvements might change the situation in future, but at this point the Army had attempted

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164 Alison to Fielding, 27 August 1886, reprinted in Nalder, 1958, pg. 34 (n.114) (original emphasis).

165 Baldwin, 1925, pg. 125 (n.2); Beresford, 1892, pg. 350 (n.139).

166 The *Times*, 7 May 1880, pg. 5 (n.152).

167 Alison to Fielding, 27 August 1886, reprinted in Nalder, 1958, pg. 34 (n.114).

to use the telephone, but had found it not fit for purpose in these particular circumstances. Similar points were raised during discussions on papers which concerned telephony at the Royal United Services Institution.<sup>169</sup> In 1892, Colonel Frederick Charles Keyser, Inspector of Signalling, pointed out that commanding officers did not want to act upon spoken messages, and did not feel comfortable until it was written down.<sup>170</sup> Although military men were keen to use the best tool for the job, like civilian users they found that the telephone did not always answer their needs.

#### 4.5. Summary

Through examining specific uses of telephones, as well as the alternative communications methods available at the time, the attitudes of the British Army towards the telephone demonstrate useful points for both the history of technology and for military history. For the history of technology, the power of user discretion in the selective adoption or rejection of a technology becomes evident. The Army used telephones on its own terms and not always in the ways in which telephone promoters had intended them to be used. This highlights the agency of users to shape their technologies. For military history, this case study strengthens Ian Beckett's thesis that the Victorian Army was not as conservative as it has been claimed to be. Rather, it was progressive in its engagement with new technologies, but when it did not find them fit for purpose it did not feel compelled to employ them. The reticent voices that did make themselves heard were mainly speaking from experience, but there were also some very progressive and innovative voices, who engaged with telephony and encouraged its use where appropriate. Indeed, considering the telephone was not very widespread in civilian circles, I argue that the Army was fertile soil for interaction with the telephone.

The use of the telephone within the Army impacted in a couple of ways on civilian telecommunications. On a direct, practical level, Cardew's vibrating sounder was useful on damaged telegraph wires after snowstorms, as noted above. Additionally, some Royal Engineers worked on the Post Office telegraphs and telephones as well as serving overseas. Thus they would have gained experience in both spheres which they could apply to the other. For example, Charles Webber, noted above as voicing concerns in 1879 about the use of telephony by the Army for the transmission of speech, was a strong connection between military and civilian telephony. A Royal Engineer and formerly a Divisional

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168 Ibid.

169 For example: Beresford, 1886, pg. 600 (n.140).

170 Beresford, 1892, pg. 364 (n.139).

Engineer of the Post Office telegraph system, he was also briefly a managing director of the UTC. Thus, his expertise in telephony came largely from interactions with telephone instruments through the Army, and he later went on to advocate broadening access to exchange telephony through competitive provision.<sup>171</sup> I argue that without appreciating his military interactions with and opinions on telephony, it is not possible to understand fully his role in civilian telephony, such as his support for the Duke of Marlborough's attempt to compete with the NTC, discussed in chapter five.

The attitudes expressed by Army users, curious but cautious, were also representative of telephone use in the wider civilian community; although civilian users found cost more of a barrier than did the Army, they were also willing to try the telephone where they could but did not always find it fit for purpose. Indeed, some, such as those in the medical community, engaged practically in determining what the purpose of the telephone should be. As Milne notes, many businesses decided the telephone was only appropriate for internal communications, and not for conducting negotiations with other firms.<sup>172</sup> This was also discretionary use. The problems these users encountered when using telephony led to adaptations of telephone instruments and exchange apparatus. For example, as demonstrated above, the Gower-Bell telephone model, although a very efficient instrument, was not practical for many situations due to the fact that its use occupied both hands. The telephone systems which eventually emerged, in the military sphere and for different applications by civilians, were thus shaped by the specific requirements of certain groups of users and non-users, and not simply by the expectations of the telephone providers.

## 5. Conclusions: the many purposes of telephony

This chapter has emphasised some of the earliest uses which were made for telephone instruments by three different groups with concerns for health and safety, and which often worked in situations where immediate decisions meant the difference between life and death. I argue that it is not surprising that such potential users would have investigated a new technology which might have assisted in the identifying of problems, or in the rapid and efficient deployment of necessary resources. In each of the three cases, however, it is notable that the producers and marketers of telephones did recommend their use in these areas. William Reynolds encouraged telephone use in mines and by the military in late 1877, and in March 1878 Bell himself encouraged the newly formed Electric Telephone

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<sup>171</sup> Webber, 1892 (n.160).

<sup>172</sup> Milne, 2010, pg. 202, 204, 206 (n.74).

Company to sell telephones to all three groups discussed here, as well as others.<sup>173</sup> The instances of use discussed could thus be seen as the result of successful marketing strategies. However, it is important that members of these groups took telephone instruments and innovated with them, creating purposes for telephony which the original producers had not foreseen. Indeed, in the case of the British Army the use of the telephone for speech transmission was to remain limited throughout this period for the reasons discussed above.

It is worth also considering briefly other groups with the same interest in rapidly responding to emergency health and safety situations: the police and the fire departments. Although both groups connected their stations up to local exchanges, and also used private wires to connect stations together,<sup>174</sup> they did not innovate with the telephone in the same way as the other groups. One common use of the telephone by both emergency services was to build an internal network, connecting stations with the offices and houses of officers and officials; fire departments in this way ensured that their officers could be summoned quickly from their homes if necessary. At Nuneaton in 1889, the potential to improve the town's fire response systems was a key factor in plans to have an exchange established; a local newspaper noted that nearby Birmingham had been served very well in this respect.<sup>175</sup>

Fire brigades across the country were often some of the earliest exchange users.<sup>176</sup> In Sheffield, from March 1880, when the main Fire Brigade Office was connected up to the exchange, the fire brigade records demonstrated that many serious fires were reported rapidly by telephone.<sup>177</sup> However, as I will demonstrate in chapter four, Sheffield possessed

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173 Reynolds's 1877 telephone circular (n.2); see also Alexander Graham Bell's March 1878 letter to the capitalists of the Electric Telephone Company, reproduced in Feuerstein, 1990, pg. 458-62 (n.6).

174 'The Telephone in Dundee', in the *TJER*, vol. 12 (1883), pg. 188; 'Telegraphic and Telephonic Communication', in the *TJER*, vol. 13 (1883), pg. 287; 'The Telephone in Nottingham', in the *TJER*, vol. 15 (1884), pg. 33; 'The Western Counties Telephone Company at Swansea', in the *Electrician*, vol. 21 (1888), pg. 519.

175 BT Archives, TPF/2/12/2, pg. 51, untitled clipping from the *Nuneaton Chronicle*, 13 September 1889.

176 For example, in Glasgow: 'Telephonic Exchanges', in the *Glasgow Herald*, 17 January 1881, pg. 1; Preston: 'Preston Local Telephonic Exchange', in the *Preston Chronicle*, 16 April 1881, pg. 4; Dundee: the *TJER*, vol. 12 (1883), pg. 188 (n.174); Nottingham: 'Fire Alarms', in the *TJER*, vol. 13 (1883), pg. 287; Cardiff: the *TJER*, vol. 13 (1883), pg. 287 (n.174); Manchester: 'Telephone Communications with Fire Stations', in the *TJER*, vol. 14 (1884), pg. 291; and Swansea: 'Notes', in the *Western Mail*, 24 April 1885, pg. 2.

177 'The Sheffield Telephone Exchange Company', in the *Sheffield and Rotherham Independent*, 25 March 1880, pg. 8; 'The Telephone in Case of Fire', in the *Sheffield and Rotherham Independent*, 24 September 1889, pg. 2.

an unusually large number of exchange subscribers during the 1880s. Indeed, the utility of the telephone to the police and fire services, insofar as the reporting of emergencies was concerned, relied on public access to telephones, and this was generally not widespread. Thus, the telephone was useful to police and fire departments for internal organisation and for mobilisation, but until more people used exchange telephones, the usefulness of the instrument for responding to emergencies would, in most towns, have been limited. However, I argue that the use of exchange telephony to report fires was an application of the technology which was becoming more visible in this period; people in larger telephone centres in the 1880s would have begun to notice this more in their everyday lives, and it was probably an important factor in subscription for users in such areas.

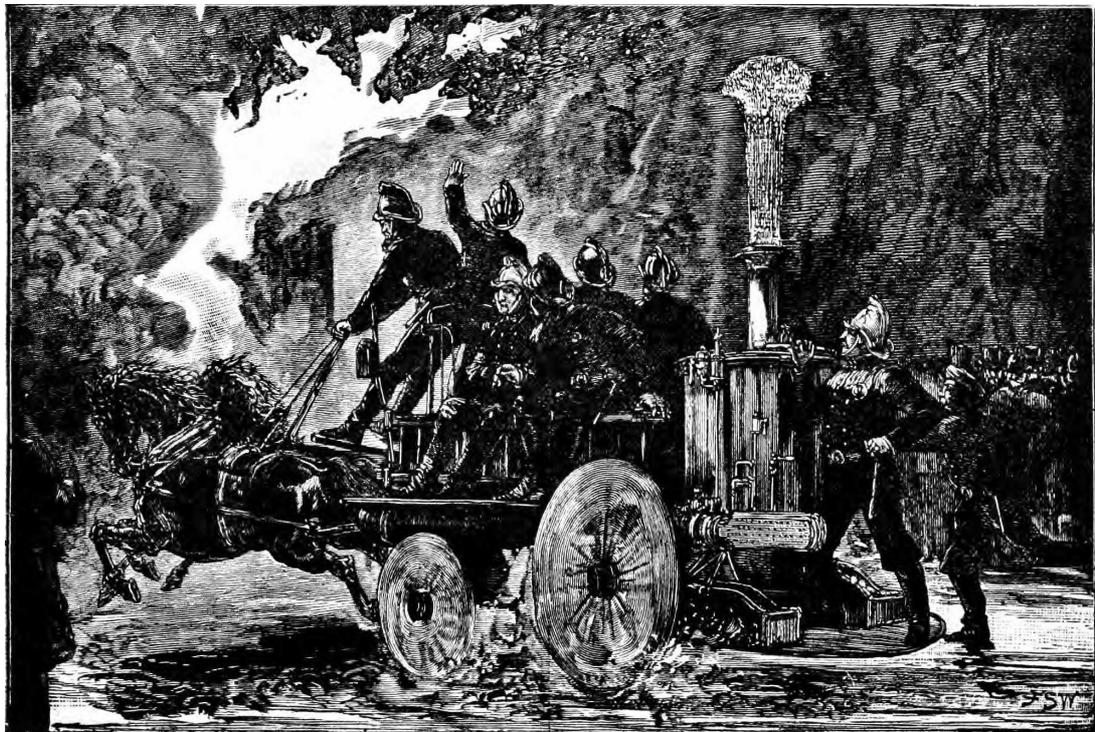


Figure 2.4. 'In case of fire, call for fire brigade'

Source: UTC, List of Subscribers, January 1889, [pg. xviii]

This brief comparison serves to highlight the reasons why the three groups discussed in this chapter used the telephone in the first place: whilst all dealt with matters of health and safety, or life and death, they did not require an exchange to gain new benefits from the use of telephone instruments. The telephone converted small electrical impulses into tones which could be produced and manipulated at will to make previously invisible electrical processes audible. This meant it could be used in any situation where the detection of small electric currents was required, such as in military telegraphy or the induction balance, or where the production and manipulation of sound was required, such as in the audiometer or

anemometer. Where rapid, short range communication of complex ideas was required, such as in mine shafts or in military ballooning, the telephone was also unrivalled.

Telephone use by these three groups impacted on the development of exchange networks in several ways. Through the use of telephones in such dangerous or emergency situations where efficiency and reliability were crucial, the public profile of telephony was raised, and faith and trust in telephone instruments and systems was increased. The employment of telephones in sick rooms was used by the Telephone Company to market their services, as noted above. Thus the telephone was seen to be the technology by which people were kept safe and their conditions as patients were improved. Early demonstrations of telephony in mine shafts allowed the telephone to be portrayed as a practical instrument which could improve the safety of workers, for example by Bell in his promotional lectures.<sup>178</sup> Subsequently the UTC noted in its lists of subscribers how important telephony was for preventing accidents in mines. In the case of the military, Cardew's sounder could be used on the civilian telegraph and telephone systems to work faulty lines, and thus telephone instruments were seen as effective and reliable emergency instruments or alternatives to the telegraph. As a result of these examples I argue people might have been more willing to have telephones in their homes or businesses.

There were however problems with some of these uses; in the mines there was concern for electrical sparking, in medicine there were concerns that technologies might undermine the values of traditional practice, and in the military telephonic communication was not always preferable to simply sending a messenger. With exposure to telephony came a greater appreciation of its advantages and disadvantages, and as telephone use spread problems began to arise. Solving these problems meant navigating the various groups and interests involved, and this shaped the development of emerging telephone systems in different ways in different places around the country, as will be seen in chapter three.

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<sup>178</sup> 'The Telephone: Experiments near Liverpool', in the *TJER*, vol. 5 (1877), pg. 274-5; 'The Telephone', in the *Times*, 29 November 1877, pg. 6.

## **Chapter Three: Telephony as a problematic technology: complaints, solutions, and the specificity of use-experience**

### 1. Examining negative responses to telephony

“I am very glad to see from the letters which have appeared in your paper that there is a dissatisfaction with the present system of working these telephones. As far as I am concerned I find my telephone almost useless, as I occupy more time in communicating through it than I should do if I went to the offices or places of business of nine out of ten of the persons with whom I wish to communicate. I have consequently given notice of my intention to discontinue the use of it when the term for which my subscription is paid ceases.”

Clifford Dunn, Leeds telephone exchange subscriber, December 1888<sup>1</sup>

“...the telephone has tried the patience of everybody from its inaudibility, while the primitive system of exchanges and the fewness of these exchanges have made the delays in 'getting through,' as it is called, on the telephone simply intolerable. Every one who has got a telephone in his house to-day is in open revolt against the instrument, on account of its irritating bell and its subsequent failure to make itself efficient as a means of conversation.”

Duke of Marlborough on the London system, August 1891<sup>2</sup>

The previous chapter focused on specialised uses of telephony which were intended to improve health or safety, or to save lives. This chapter moves on to examine more generalised uses of both private and exchange telephony, the marketing of which was aided by the successful specialised telephone uses noted in chapter two. The use of those telephone innovations could be problematic, and the problems users encountered when engaging with them determined to a large degree the uptake of each specific telephone innovation. In this chapter I demonstrate that using generalised private and exchange telephone systems in the period covered by this thesis was also problematic. Understanding problems with telephony explains the variety of responses to the technology at the time; complaints, such as those voiced in the epigraphs, reveal the use-experience of individuals and communities as they originally encountered telephone instruments. In addition, the ways in which these problems were addressed shaped the development of the country's telephone systems.

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1 BT Archives, TPF/2/12/2, pg. 31, 'Leeds Telephones', in the *Yorkshire Post*, 26 December 1888.

2 Marlborough, 'The Telephone', in the *Times*, 29 August 1891, pg. 7.

My analysis of these problems and complaints serves three functions. Firstly, whereas previous histories have assumed that using telephones was intuitive and easy, my approach problematises telephone use. Studying the problems people faced when attempting to use telephones helps us to understand non-use in cases where people saw no benefit in engaging with telephony. Thus I am able to ask why people used telephony at all. Secondly, I demonstrate how non-use of the telephone could be a witting, discretionary choice by those who either attempted to use telephones and subsequently gave them up, or decided not to use them in the first place. Finally, these complaints reveal the extent of the impact which non-users had on the development of telephony, for example by preventing companies from placing poles and wires on or over their land.

One example of these complaints from users, given in the first epigraph above, was voiced in December 1888 by Clifford Dunn, a solicitor in Leeds. Dunn wrote to the *Yorkshire Post* about the poor service he had been receiving as a subscriber to the town's telephone exchange, run by the NTC. He had given notice to give it up when his subscription expired: "I find my telephone almost useless, as I occupy more time in communicating through it than I should do if I went to the offices or places of business of nine out of ten of the persons with whom I wish to communicate."<sup>3</sup> He was not alone; over the previous few days other similar letters had also appeared expressing extreme discontent at the state of telephony in Leeds.<sup>4</sup> Throughout the period of this thesis, subscribers around the country frequently became frustrated with their telephones for a number of reasons. Many non-users also found telephone systems, especially overhead wires, to be a particular source of discontent. Indeed, although I focus in this chapter on the problems of users and non-users, it is worth noting briefly that telephony, especially telephone exchanges, could also be a source of frustration for those supplying the service.<sup>5</sup>

Of my three main themes, this chapter addresses the questions of telephone purpose and entitlement. I show how users often complained that early telephone instruments and

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3 The *Yorkshire Post*, 26 December 1888 (see n.1).

4 BT Archives, TPF/2/12/2, pg. 30-2.

5 For example, in early 1881 the Swansea Postmaster attempted to encourage local firms who used Post Office Wheatstone ABC private telegraph instruments to subscribe to the new Post Office telephone exchange; he found that certain companies would only join if they knew certain others would also, and if one pulled out others would too. The problem was that in a networked system such as a telephone exchange, the efficacy of the system to each subscriber depended on other subscribers, and thus potential subscribers affected each other's decisions. However, this was, I argue, the first time this had ever been encountered. The resulting situation was so distressing that the Postmaster wrote: "I never had so much bother in my life as I have had over these blessed Telephones." BT Archives, POST 30/392c, Snell to Brodie, 15 February 1881.

systems were not suitable for the purpose for which they were marketed by companies. Whereas telephone companies led users to believe that an exchange subscription would enable them to converse with other subscribers conveniently and easily, many users, as illustrated in the epigraphs above, argued that this was not the case. As a result, such users often gave up their exchange telephones, which negatively impacted on the growth of the system. Regarding telephone entitlement, I demonstrate how some exchange subscribers believed that only large business users should be able to use exchanges. This exclusive view of telephone entitlement led them to desire to restrict access to telephony through keeping exchange subscription prices flat-rate, and high, and also by opposing the establishment of public call offices.

Different problems and complaints raised around the country were often the result of the different telephone instruments and systems employed by different providers. These differences imply a broad heterogeneity of use-experiences in this period, which this chapter maps out in various British towns and cities. Existing histories of British telephony have tended to assume that telephones were not difficult to use. The simplicity of the instruments and systems, and the ease with which anyone could use them, was emphasised in all early telephone marketing<sup>6</sup> and has been a feature of subsequent histories ever since.<sup>7</sup> I have noted in chapter one how Perry in particular assumed this, describing the Secretary of the Post Office John Tilley as someone who “should have known better”<sup>8</sup> when he gave a negative report of the workings of an Edison telephone. However, the problems studied in this chapter demonstrate that early telephone use in Britain was neither easy nor intuitive, but rather required some practice before telephone instruments could be used proficiently.

As discussed in chapter one, Oudshoorn and Pinch emphasised that users and technologies are “co-constructed”;<sup>9</sup> when users complain about technologies, there are two potential solutions: either alter the technology, or alter the users. As I demonstrate below, the problems with early telephony were often resolved not by changing the technology but

6 William Reynolds's 1877 telephone circular, reproduced in Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925), pg. 696; Bell's letter to the capitalists of the Electric Telephone Company, March 1878, reproduced in Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990), pg. 458-62.

7 For example: Robertson, J. H., *The Story of the Telephone: A History of the Telecommunications Industry of Britain* (Sir Isaac Pitman and Sons, Ltd., 1947), pg. 13; Young, Peter, *Person to Person: The International Impact of the Telephone* (Granta Editions, 1991), pg. 6, 8.

8 Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977), pg. 72.

by reconfiguring the expectations of the users. Whether telephone suppliers decided to meet or to modify users' expectations depended on who was complaining, whether or not they were large or influential users, and how many subscribers were acting together. Some specific difficulties which certain users, for example, the mining community and the British Army, encountered when they attempted to employ certain telephone instruments have already been discussed in chapter two. In this chapter, I analyse in more detail the general problems that arose with early telephony by dividing them into four categories: problems with communicating, problems with connecting, problems with communities, and problems with culture. Although such problems were not categorised in this way at the time, nevertheless I believe this a helpful way to consider them, as each category expands outwards from the initial point of use – the telephone instruments themselves – to incorporate a larger group of people than the previous one, similar to a set of concentric circles.

Firstly, problems with communicating were the difficulties encountered by users when conversing over either a private or an exchange line using different telephone instruments, which possessed different strengths and weaknesses. This category incorporates the smallest section of society, namely those who were able to use or test telephone instruments. Next, the category of problems with connecting considers the problems users encountered when they attempted to negotiate the telephone infrastructure which was constructed in order to allow them to communicate. In the case of exchange telephony the equipment of the exchange had to be learnt, and particular concerns arose over the safety and appearance of overhead telephone wires.<sup>10</sup> Non-users are also included within this category as they were often bothered by the wired infrastructure. Concerns about the cost of subscription to the system also fit in here.

Thirdly there were the problems with communities. Using a telephone exchange, inherently a network technology, made individual users heavily reliant upon each other. In addition, the surrounding community of non-users also influenced the telephone use-experience of the individual, leading to different, localised encounters with telephone systems. Key factors were attitudes towards adopting certain rental models such as flat rates or measured tariffs, and towards granting wayleaves – the permission to erect poles

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9 Oudshoorn, Nelly and Pinch, Trevor, 'How Users and Non-Users Matter', in Oudshoorn, Nelly and Pinch, Trevor (eds.), *How Users Matter: The Co-construction of Users and Technologies* (MIT Press, 2003), pg. 3.

10 On safety: 'United Telephone Company, Limited', in the *TJER*, vol. 14 (1884), pg. 74-5; on appearance: Bennett, A. R., 'Twisted Telephone Lines', in the *Electrician*, vol. 27 (1891), pg. 85-6.

and wires.<sup>11</sup> Finally, the introduction of telephony catalysed the formation of a new culture: a specific telephone culture. This required new sets of norms to deal with the novel social situations which began to arise, and occasionally clashed with the existing culture and its assumptions and expectations, especially regarding social conduct and interactions. This section considers how users began to integrate the telephone, or at least the idea of the telephone as a physical possibility, into their lives.

## 2. Problems with communicating

As this thesis focuses on how use affects technological development, it is important to start by looking at people using telephone instruments and the problems they encountered in doing so. A large part of the heterogeneity of the use-experience in this period was due to the use of several different types of telephone instruments, and to the different characteristics of those instruments. It will be helpful to discuss these instruments together here in order to understand how Victorian contemporaries compared their strengths and weaknesses, and to note which were developed and employed in response to the need for clearer and better telephonic speaking. These problems applied both to systems of exchange telephony and private telephony.

### 2.1. Bell's electromagnetic telephone

Bell's instrument, which functioned as both transmitter and receiver, was first patented in the US in March 1876 and then again in the form in which it was to be sold commercially in January 1877 (Figs. 3.1. and 3.2.).<sup>12</sup> The 1877 version comprised a cylindrical permanent magnet with a coil of copper wire wrapped around one end. At that same end, next to but not touching the pole of the magnet, was a thin circular iron plate; speaking against this diaphragm caused it to vibrate, inducing a series of electrical currents in the coil of wire. At the receiving end the process occurred in reverse, and the receiving diaphragm vibrated according to the magnetic fluctuations caused by the electrical currents. The vibrations thus produced in the diaphragm reproduced the original speech (Fig. 3.3.).<sup>13</sup>

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11 BT Archives, TCB 304/2, unnumbered file in box 2, part 6, 'Report of Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885', pg. 6; 'The London Telephone Service', in the *Electrician*, vol. 28 (1892), pg. 436.

12 Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 45, 60.

13 Prescott, George Bartlett, *Bell's Electric Speaking Telephone: Its Invention, Construction, Application, Modification and History* (D. Appleton & Company, 1884 (reprinted Arno Press, 1972)), pg. 19-20.

However, William Preece noted after a visit to the US that the Bell telephone was “limited in its range”<sup>14</sup> by interference on the line when compared with Edison's instruments, discussed below.

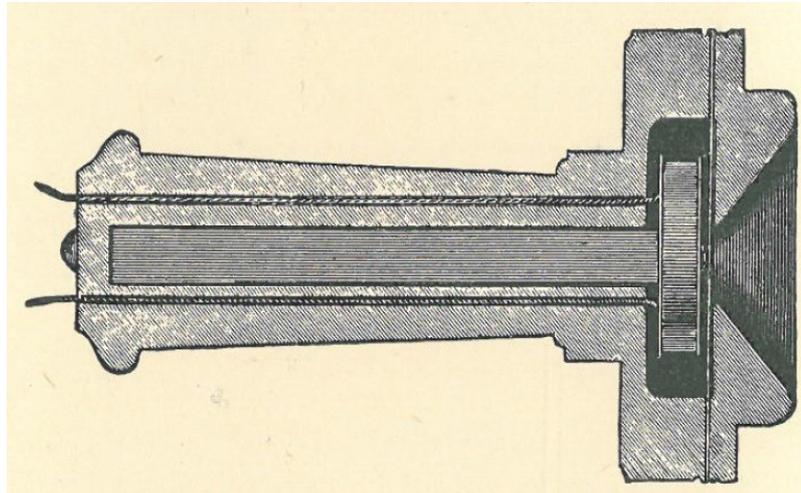


Figure 3.1. Bell's telephone, June 1877 model

Source: Kingsbury, 1915, pg. 64 (n.12)

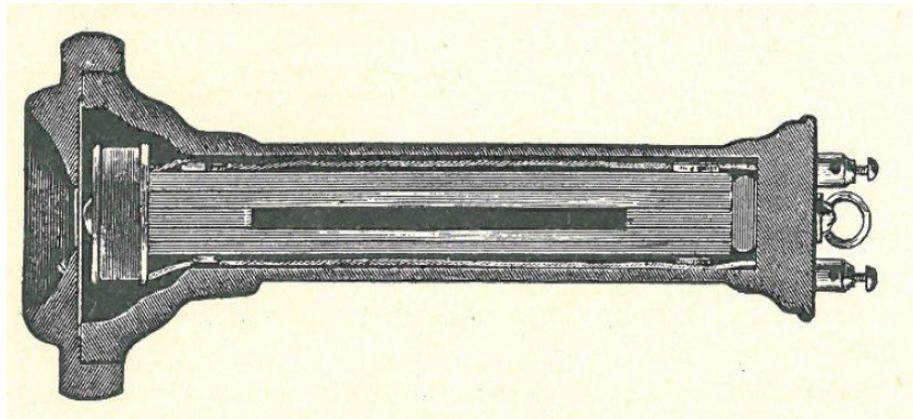


Figure 3.2. Bell's telephone, December 1877 model

Source: Kingsbury, 1915, pg. 65 (n.12)

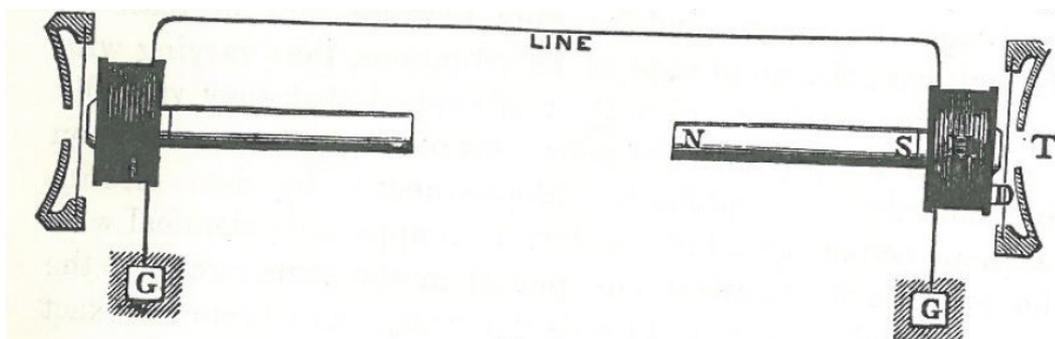


Figure 3.3. Principle of Bell's telephone

Source: Prescott, 1884, pg. 19 (n.13)

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14 Preece, W. H., 'The Telephone', in the *TJER*, vol. 5 (1877), pg. 200.

As a transmitter the electrical currents it produced were very small, generated only by the power of the human voice and not using a battery; however, as it was a very sensitive receiver, it also reproduced other currents on the line - for example, inductive interference from nearby telegraph wires. Thus the receiving instrument would produce interference noises which could drown out the faint sounds of the human voice from the transmitting instrument.<sup>15</sup> Even over shorter distances with less interference, the editor of the French electrical journal *La Lumière Électrique*, Theodore du Moncel,<sup>16</sup> commented in his influential 1879 book that, in order to use the Bell telephone, “[t]he ear requires practice”.<sup>17</sup> An editorial in the *Times* in May 1879 decried the “feebleness and uncertainty”<sup>18</sup> of the Bell telephone. Although speech was transmitted clearly and distinctly, the words were invariably quiet and tinny or metallic.<sup>19</sup> They were so faint that one Manchester doctor remarked in 1879 that: “[i]n its present form, the telephone is almost useless to those who have even a comparatively slight degree of deafness.”<sup>20</sup> From late 1879, however, when the Edison Company began to operate, the Telephone Company was forced to improve its apparatus, and began to supply the more powerful Blake transmitter, discussed below.<sup>21</sup>

One noted weakness of the instrument as a receiver was that some sounds were often lost. In October 1880 Preece noted “the difficulty in easily comprehending words containing sibilant sounds”.<sup>22</sup> Whenever proper names, numbers, or difficult words were spoken there was a great potential for error. However, there were also versions of the instrument which, for various reasons, fell outside of the main Bell patents.<sup>23</sup> The most

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15 'Telephonic Inventions of Gray, Bell, and Edison', in the *TJER*, vol. 5 (1877), pg.189-90.

16 Kingsbury, 1915, pg. 228 (n.12).

17 du Moncel, Theodore, *The Telephone, the Microphone and the Phonograph* (Harper & Brothers, 1879 [reprint, Kessinger Publishing edition]), pg. 67.

18 ['According to a Letter from Mr. White'], in the *Times*, 10 May 1879, pg. 11.

19 'The Telephone', in the *TJER*, vol. 5 (1877), pg. 233.

20 Pierce, F. M., 'The Telephone and Diseases of the Ear', in the *BMJ*, vol. 2 (1879), pg. 162.

21 'The Rise and Progress of Telephony in the United Kingdom', in the *Electrician*, vol. 19 (1887), pg. 289.

22 BT Archives, POST 30/1153B, Preece to Tilley, 18 October 1880.

23 For more regarding the specific patent litigation which ensued around these instruments, see Arapostathis, Stathis and Gooday, Graeme, *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain* (The MIT Press, 2013), pg. 90-1, 98-102.

commonly used of these instruments was known as the 'English Mechanic', so called because details of its construction had been published in Britain in the journal of that name in August 1876, before the British patent was filed that December. Instead of an iron plate, the diaphragm of this earlier instrument comprised a thin membrane of goldbeaters' skin.<sup>24</sup> Many other companies used these in their own telephone systems, for example the London and Globe Telephone and Maintenance Company and the New Telephone Company, discussed in more detail in chapter five.<sup>25</sup>

## 2.2. Edison's variable resistance transmitter and electro-motograph receiver

Edison's transmitter, unlike Bell's, employed the principle of variable resistance; a small button of carbon, the resistance of which changed with pressure, formed part of the circuit, and was attached to the diaphragm (Fig. 3.4.).<sup>26</sup> As the *TJER* pointed out, weak vibrations of the diaphragm at the transmitting end only reduced the resistance of the carbon a little bit, and so sent weak currents to the receiver, and strong vibrations reduced the resistance significantly, thus sending strong currents to the receiver.<sup>27</sup> This reproduced the nuances of speech more accurately than Bell's transmitter. In addition, the fact that the electrical current was being supplied by a battery, and not produced by the action of the voice itself, as in Bell's model, ensured that the resulting transmission was much more powerful, and able to transmit stronger signals over longer distances.<sup>28</sup> The sound of the voice was then louder than the interference from other electrical currents which were picked up by the sensitive Bell receiver. Kingsbury noted that although the little button of carbon on which the Edison transmitter relied was prone to be jarred out of place if not treated very carefully, it was agreed to be the better instrument.<sup>29</sup>

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24 S.R., 'The "Mechanic Receiver"', in the *TJER*, vol. 15 (1884), pg. 240; F.T.H., 'The "Bell" and "Edison" Telephone Patents', in the *TJER*, vol. 15 (1884), pg. 359.

25 'The London and Globe Telephone Company', in the *TJER*, vol. 13 (1883), pg. 36; 'More Litigation', in the *Electrician*, vol. 16 (1886), pg. 204; 'Telephonic Litigation', in the *Electrician*, vol. 16 (1886), pg. 303; 'The Equitable Telephone Company's Instruments', in the *Electrician*, vol. 19 (1887), pg. 107.

26 The *TJER*, vol. 5 (1877), pg.189-90 (n.15).

27 Ibid.

28 Preece, 1877, pg. 200 (n.14).

29 Kingsbury, 1915, pg. 124 (n.12).

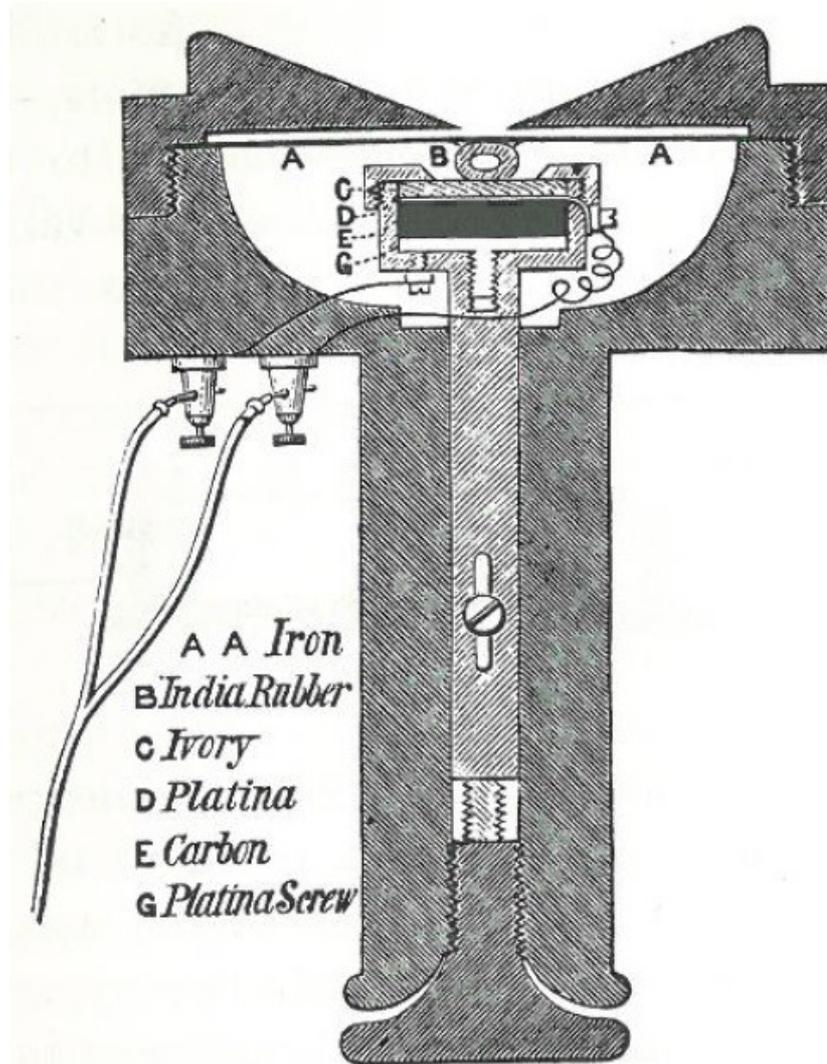


Figure 3.4. Edison's transmitter

Source: Prescott, 1884, pg. 36 (n.13)

Edison's receiving instrument however, again employing a very different principle to Bell's, was not so highly esteemed (Fig. 3.5.). Called the electro-motograph, it reproduced speech very well, as it was incredibly sensitive, picking up softer or quieter sounds which Bell's instrument was unable to reproduce, and it was loud enough to be heard throughout a large room.<sup>30</sup> However, requiring a handle at the side of the instrument to be constantly turned during conversation in order to work it (Fig. 3.6.), it was found to be too cumbersome, as John Tilley, the Secretary of the Post Office reported, stating also that: "I could not understand one single word. The noise, for I can only call it a noise, strikingly resembled an exceedingly bad street Punch".<sup>31</sup> Du Moncel asserted that the Edison system was not

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30 du Moncel, 1879, pg. 77 (n.17); Prescott, 1884, pg. 329 (n.13).

31 BT Archives, POST 30/398, file 6, Tilley to Manners, 13 January 1880.

affected as others were by inductive interference,<sup>32</sup> but the receiving instrument was not commercially successful.<sup>33</sup> George Bernard Shaw, who worked for a time for the Edison Telephone Company of London as a wayleave manager, noted that the problem with the Edison receiver was that it was too loud, bellowing secrets which ought more properly to have been discretely whispered; this was certainly not what British stockbrokers wanted.<sup>34</sup>

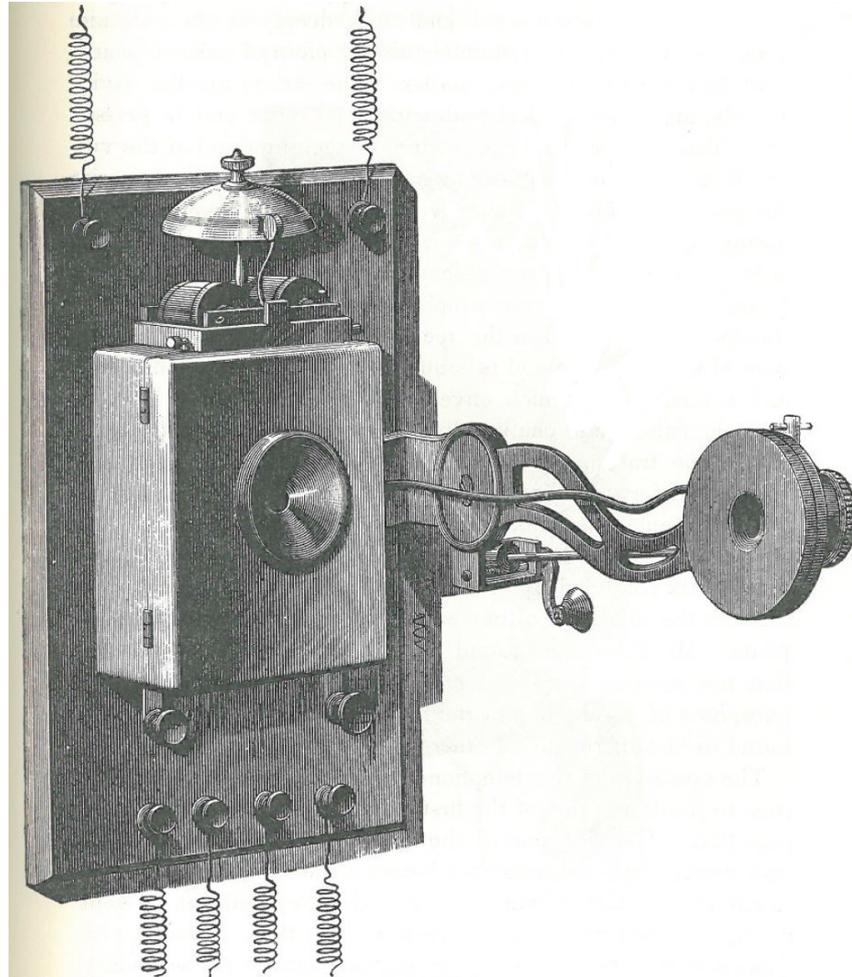


Figure 3.5. Edison's electro-motograph receiver

Source: Prescott, 1884, pg. 391 (n.13)

This receiver was never used commercially in the US.<sup>35</sup> In Britain, when the Bell and Edison companies merged in 1880, the engineer of the Edison Company, Edward Johnson, recommended the use of the Bell receiver in conjunction with the Edison transmitter

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<sup>32</sup> du Moncel, 1879, pg. 78 (n.17).

<sup>33</sup> The *Electrician*, vol. 19 (1887), pg. 289 (n.21).

<sup>34</sup> Kingsbury, 1915, pg. 202, n.1 (n.12).

<sup>35</sup> *Ibid.*, pg. 194-7.

because its greater simplicity made it more appropriate for commercial use. The general public, he claimed, “is notoriously incapable of grasping the simplest mechanical operations”,<sup>36</sup> continuing: “[a]ny added complications of mechanism limits disproportionately the number of people who are able to manipulate the apparatus. It is idle to seek to 'Educate the Public'”.<sup>37</sup> In so saying, Johnson dismissed the other potential solution to the problems users were having with these telephones: educating them to use and appreciate them better. Because telephony was being marketed as a technology which required no skill to use, unlike telegraphy, the ease of use of the Bell telephone was prioritised over the technical advantages of the Edison receiver. In this way the needs, and the complaints, of users influenced which telephone instruments were supplied to them.

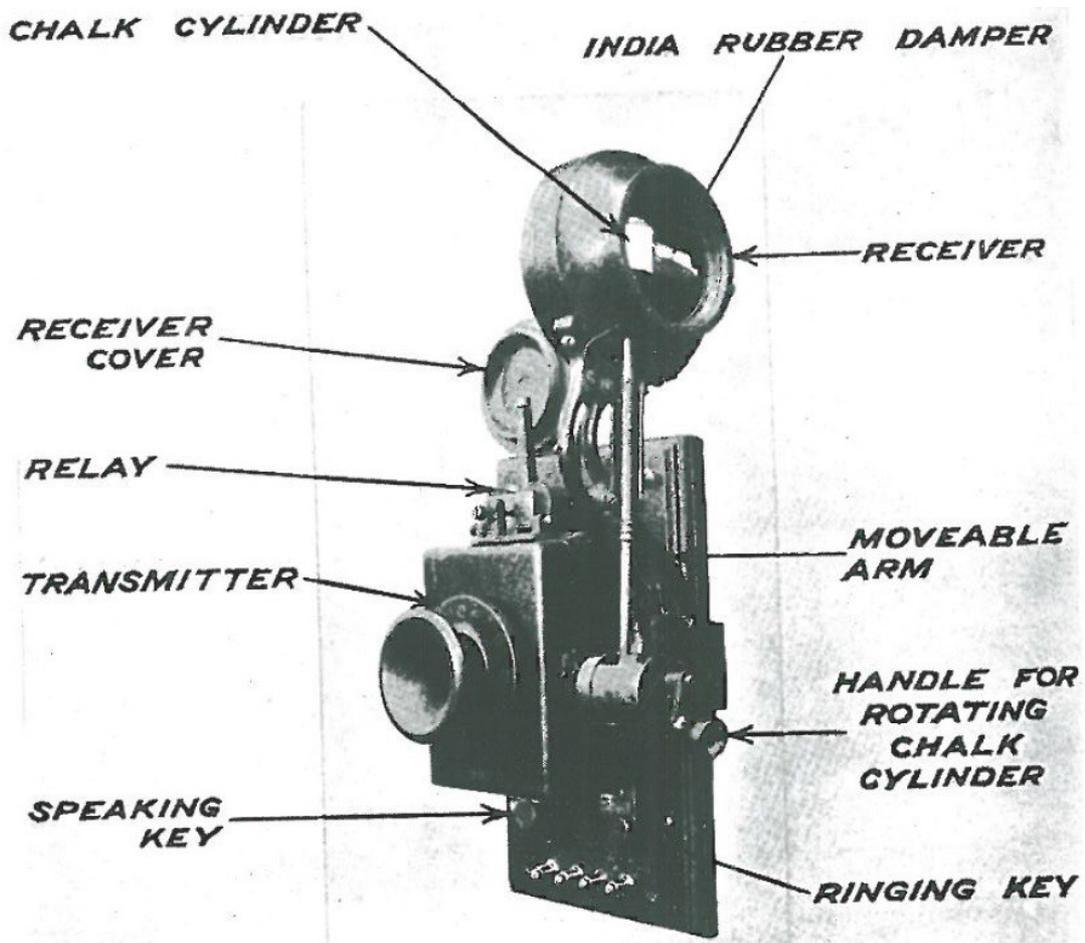


Figure 3.6. Annotated photograph of the Edison receiver

Source: Baldwin, 1925, pg. [32a] (n.6)

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36 Ibid., pg. 201.

37 Ibid.

### 2.3. The Blake transmitter

Inspired by Edison's transmitter, in May 1878 David Hughes invented the microphone, which was to be very influential in telephone transmitter technology.<sup>38</sup> Like Edison's transmitter, it worked on the principle of variable resistance. It comprised a vertical carbon pencil supported by a small block of carbon above and below it. The base on which this configuration of conductors was mounted, a thin board, vibrated sufficiently under the influence of sound waves that this mechanical motion was transferred to the carbon pencil configuration, and the current through the circuit varied as the degree of contact between the pencil and the other carbon supports varied with the slight changes in pressure (Fig. 3.7.).<sup>39</sup> The principle was that the transmission of speech depended on the contact between multiple conductors, in this case the carbon pencil and its two supports, and this enabled Hughes's instrument to amplify sounds beyond what Bell's or even Edison's instruments were capable of.<sup>40</sup> Notably, Hughes did not patent his discoveries or his invention, which enabled others freely to improve on his ideas.<sup>41</sup> Like the unpatented Bell instruments noted above, which could be used as receivers, variants of Hughes's microphone could also be employed to create a simple but patent-free telephone arrangement.

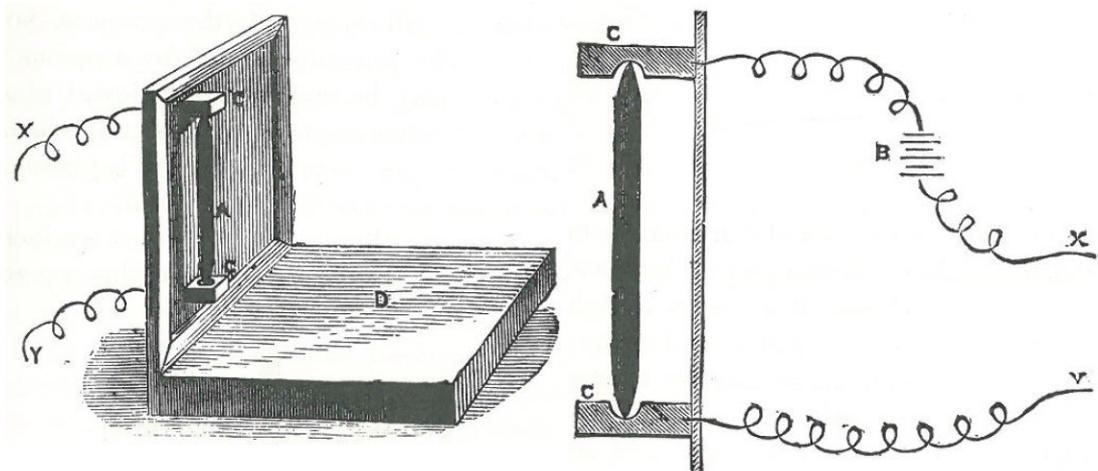


Figure 3.7. Hughes's microphone

Source: Prescott, 1884, pg. 141 (n.13)

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38 Ibid., pg. 113-4.

39 Prescott, 1884, pg. 141-2 (n.13).

40 Kingsbury, 1915, pg. 115-6 (n.12); du Moncel, 1879, pg. 145 (n.17).

41 Povey, P. J., and Earl, R. A. J., *Vintage Telephones of the World* (Peter Peregrinus Ltd., 1988), pg. 14-16; the *Electrician*, vol. 19 (1887), pg. 289 (n.21).

The first and subsequently the most widely used instrument to be based on Hughes's microphone was the Blake transmitter, invented in the summer of 1878 by Francis Blake, an employee of the Bell Company in the US.<sup>42</sup> Like the microphone, it used two pieces of carbon to provide the variable resistance element of the circuit, but in this instrument they were both attached to a spring, each of which then connected with the diaphragm; this way their contact with one another could be more easily regulated. A screw at the bottom of the instrument could be turned to adjust it (Fig. 3.8).<sup>43</sup> George Prescott noted in his 1884 book on telephony that the Blake transmitter had supplanted the Edison model in the US, and that, with this arrangement of carbons, “the disagreeable cracklings of the ordinary microphones are partially eliminated”.<sup>44</sup>

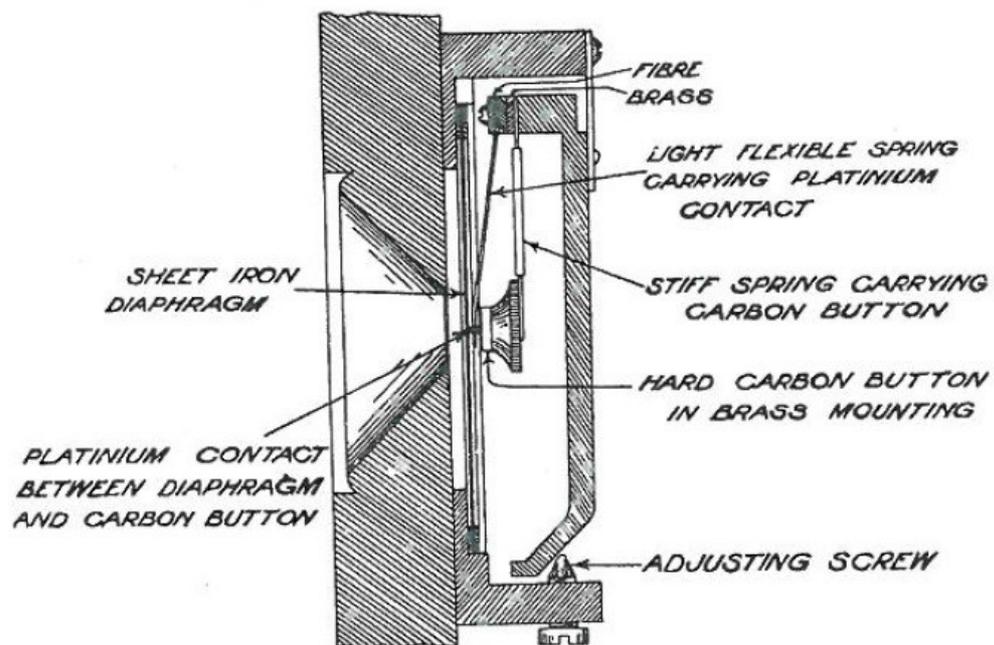


Figure 3.8. Blake transmitter

Source: Baldwin, 1925, pg. 39 (n.6)

As noted above, when the Edison Company began to operate in London in August 1879, the Telephone Company needed to improve its instruments to compete with the louder and clearer Edison transmitter, so they supplied Blake transmitters.<sup>45</sup> When the two companies merged in 1880 the Blake transmitter and Bell receiver combination became the

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<sup>42</sup> Kingsbury, 1915, pg. 120 (n.12).

<sup>43</sup> Prescott, 1884, pg. 368-70 (n.13).

<sup>44</sup> Ibid., pg. 370.

<sup>45</sup> Baldwin, 1925, pg. 33 (n.6).

standard configuration for telephone equipment supplied by the UTC and its subsidiary companies throughout this period.<sup>46</sup> Kingsbury noted that the Blake was clearer, more reliable, and less delicate than the Edison transmitter, if not as loud,<sup>47</sup> but nevertheless it needed a lot of attention. In particular it required frequent readjustment;<sup>48</sup> one former Telephone Company worker, who had installed many whilst working for the company, later noted that the springs were prone to rusting, “a most difficult fault which does and always will arise in the Blake transmitter.”<sup>49</sup> In addition, it was not very good for longer distance lines.<sup>50</sup>

#### 2.4. Other variable resistance transmitters: Hunnings, Crossley and Johnson

At about the same time as Blake was working on his transmitter in the US, a Yorkshire clergyman, Henry Hunnings, was working on an instrument which was similar to some of Hughes's experimental work, although he claimed he had been unaware of it. Patented in September 1878, the Hunnings transmitter essentially comprised two discs, one of them the vibrating diaphragm, the other fixed, and the space between them was filled with powdered carbon (Fig. 3.9.). The key to the function of this instrument was that the loose, finely powdered carbon was very sensitive to the vibrations of the diaphragm when spoken against.<sup>51</sup> Later versions of this kind of instrument used larger granules of carbons, but a common problem was that the powder or the granules could become packed together too solidly, and the diaphragm no longer exerted enough pressure on them, which meant that it would not work very well.<sup>52</sup> The solution to this problem was that, unlike most transmitters at the time, this one was used in a hand-held form, so that the movement of using it shook up the particles of carbon and ensured it continued to function.<sup>53</sup> It was

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46 The *Electrician*, vol. 19 (1887), pg. 289 (n.21).

47 Kingsbury, 1915, pg. 123-4 (n.12).

48 Dodd, Arthur, *History of the Telephone Service in Gloucester* (British Telecom, 1987), pg. 11; 'Notes', in the *Electrician*, vol. 29 (1892), pg. 82.

49 'New Telephone Company, Limited: Testimonials', in the *Times*, 8 March 1886, pg. 13.

50 Baldwin, 1925, pg. 39 (n.6).

51 Kingsbury, 1915, pg. 122-3 (n.12).

52 Povey and Earl, 1988, pg. 22-4 (n.41).

53 Kingsbury, 1915, pg. 361 (n.12).

supplied in this way by the London and Globe Telephone and Maintenance Company and was reviewed very positively in the technical press as being better than previous variable resistance transmitters.<sup>54</sup>

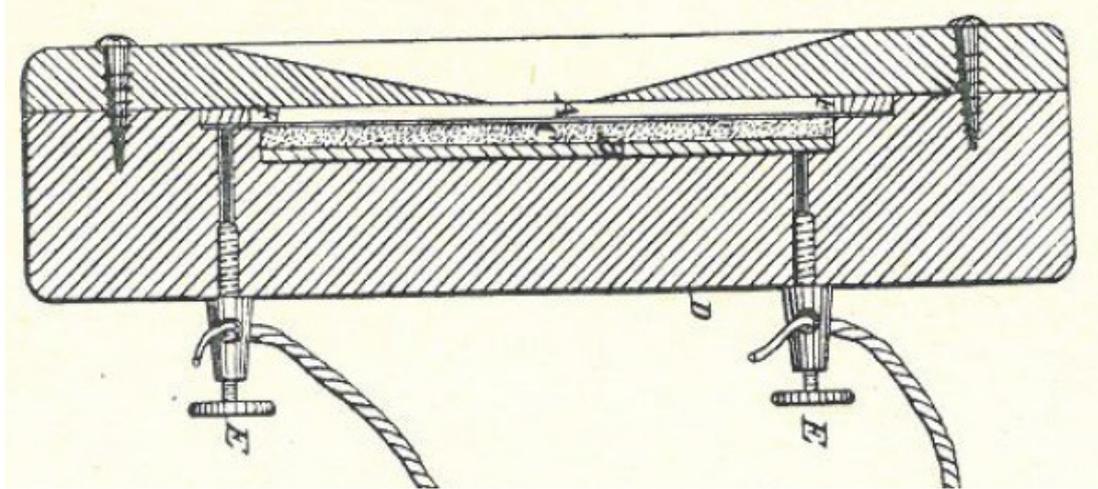


Figure 3.9. Hunnings transmitter

Source: Kingsbury, 1915, pg. 123 (n.12)

Two alternative transmitters which worked on a similar basis were the Crossley and the Johnson transmitters (Figs. 3.10. and 3.12.). Both employed carbon pencils, the resistance of which changed with pressure as the user spoke against a thin wooden diaphragm, to the underside of which one end of each of the pencils was attached (Fig. 3.11.).<sup>55</sup> The former, invented by Halifax carpet manufacturer John Louis Crossley, was patented in early 1879,<sup>56</sup> and was widely used. It was the first type of telephone instrument supplied by the Post Office from 1881.<sup>57</sup> After the patent was purchased from Crossley by the UTC for £200,000,<sup>58</sup> it was employed by the NTC to transmit sermons from churches to subscribers because it was capable of clearly picking up and transmitting speech even when the speaker was some distance from the instrument.<sup>59</sup> It was also used in combination with

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54 The *TJER*, vol. 13 (1883), pg. 36 (n.25); Baldwin, 1925, pg. 68 (n.6).

55 Povey and Earl, 1988, pg. 18-21 (n.41).

56 Baldwin, 1925, pg. 193 (n.6).

57 *Ibid.*, pg. 123; Povey and Earl, 1988, pg. 18 (n.41).

58 'Obituary. Louis John Crossley', in the *Electrician*, vol. 27 (1891), pg. 524.

59 'Telephonic Communication in Bradford', in the *TJER*, vol. 13 (1883), pg. 127.

Bell receivers by the independent companies in Preston and Sheffield, discussed in chapter four.<sup>60</sup>

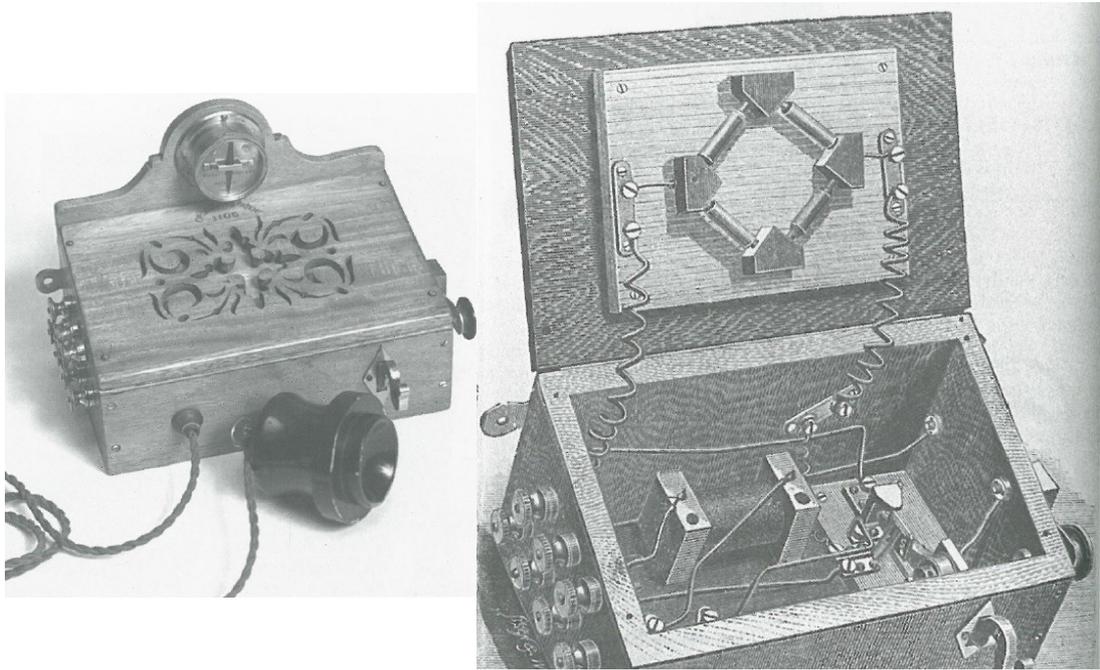


Figure 3.10. Crossley transmitter, exterior view

Source: Povey and Earl, 1988, pg. 19 (n.41)

Figure 3.11. Crossley transmitter, interior view

Source: *ibid.*, pg. 20

The Johnson transmitter was similar in that it also required no adjustments, giving it a practical edge over Blake instruments.<sup>61</sup> It used only two carbon pencils, whereas most transmitters based on the same principle as the Crossley used as many as they could fit in.<sup>62</sup> The advantage of this was that, although more pencils could produce a stronger sound, it only worked when the variations in the current produced by each of the pencils reinforced one another, and did not interfere. The simplicity of Johnson's two pencil design made it more robust and less likely to garble the speech it was transmitting.<sup>63</sup> The inventor, William Johnson, was the manager at John Tasker's Sheffield Telephone Exchange and Electric Light Company, and his transmitter was used extensively by the Sheffield company

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<sup>60</sup> 'Preston Telephonic Exchange', in the *TJER*, vol. 13 (1883), pg. 287; Baldwin, 1925, pg. 100.

<sup>61</sup> 'Notes', in the *Electrician*, vol. 29 (1892), pg. 82.

<sup>62</sup> Povey and Earl, 1988, pg. 22 (n.41).

<sup>63</sup> *Ibid.*, pg. 21.

on its exchange and on private lines erected around the country, replacing the Crossley instruments.<sup>64</sup>



Figure 3.12. Johnson transmitter

Source: Povey and Earl, 1988, pg. 23 (n.41)

### 2.5. The Gower-Bell telephone

The first telephone that the Post Office employed on a large scale, as it began to establish exchanges after the December 1880 court ruling, was the Gower-Bell telephone.<sup>65</sup> These telephones were developed from the original Bell model by the American Frederick Gower. Gower had acquired a licence issued by the Telephone Company in September 1879 to a company called Messrs. Scott & Wollaston for use of the Bell telephone for private line and domestic purposes. This gave him the right to manufacture his modified telephones, and he then entered into an agreement with the Postmaster General to sell the Post Office his Gower-Bell telephones.<sup>66</sup> Kingsbury described the unit as “a pencil microphone and a large Bell receiver fixed in the same case.”<sup>67</sup> The transmitter was based on the Hughes microphone, which was not patented,<sup>68</sup> and the receiver was made more powerful by the use of a large magnet; the resulting unit was thus too heavy to be

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64 Baldwin, 1925, pg. 100-1 (n.6); 'The Telephone at Balmoral', in the *TJER*, vol. 13 (1883), pg. 163.

65 Povey and Earl, 1988, pg. 21 (n.41); Kieve, Jeffrey L., *The Electric Telegraph: A Social and Economic History* (David and Charles Ltd., 1973), pg. 202-4.

66 Kingsbury, 1915, pg. 199 (n.12).

67 *Ibid.*, pg. 363.

68 Povey and Earl, 1988, pg. 14-16 (n.41).

comfortably held, so it was mounted in a box on the wall, and the user listened through two flexible tubes (Fig. 3.13.).<sup>69</sup>



Figure 3.13. Gower-Bell telephone

Source: Emmerson, Andrew, *Old Telephones* (Shire Publications Ltd., 1986), pg. 7

Kingsbury noted that this was a good telephone,<sup>70</sup> and du Moncel described the action of the modified Bell receiver unit as “extraordinary”.<sup>71</sup> These telephones were also used by George Sharples in Preston, after the UTC purchased the patent rights for the Crossley transmitters he had been supplying.<sup>72</sup> However, one key disadvantage of the Gower-Bell set was that it required both hands, whereas most other wall mounted units required only one hand for holding a receiver. When not in use, the listening tubes rested in automatic switches on either side of the case: “[b]y removing the tube on the user’s left hand a signal was operated at the central office. The speaking battery was brought into operation by removing the tube on the right. When the tubes were again placed upon their

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<sup>69</sup> Ibid., pg. 21.

<sup>70</sup> Kingsbury, 1915, pg. 199 (n.12).

<sup>71</sup> du Moncel, 1879, pg. 275 (n.17).

<sup>72</sup> BT Archives, POST 30/406a, file 1, leaflet, 'Firms, &c., in Lancashire and Cheshire Using Telephones Supplied by G. Sharples', [c.March 1881]; 'Telephonic', in the *TJER*, vol. 14 (1884), pg. 111.

respective switches the clearing signal was given automatically.”<sup>73</sup> Thus, using the instrument required the user to take both of the tubes while speaking. This was the root cause of the complaint that the use of the telephone did not enable one to take any notes or make a written record of a conversation as it was being held. As discussed in chapter two, this was a particularly pressing concern for the Army.

## 2.6. Circumventing patents: the valve telephone

In 1884, Silvanus Phillips Thompson, Professor of Physics at University College Bristol, and Philip Jolin, an electrical engineer in Bristol, attempted to get around the patent restrictions of the UTC by co-inventing a new telephone instrument.<sup>74</sup> In particular they attempted to avoid the use of a diaphragm to receive the voice of the speaker, which was protected under the Edison transmitter patent. Instead, Thompson and Jolin employed a small metal ball resting on three carbon pins at the top of a hollow, vertical tube. When the user spoke into a mouthpiece at the bottom of the tube, the voice was conveyed directly to the ball. The movements of the ball and its changing contact with the pins would then vary the resistance of the circuit and thus transmit the speech (Fig. 3.14.).<sup>75</sup> I discuss the company established to market this telephone, the New Telephone Company, in more detail in chapter five. Testimonials indicated that the instruments worked well on long private lines,<sup>76</sup> and the *Electrician* noted in 1887 that they were effective against inductive interference: when used on a wire which ran along an electric railway, the noises which had rendered the previously utilised Bell instruments inoperable were not a problem.<sup>77</sup>

Indeed, in producing the valve telephone Thompson was demonstrating his solution to the problems of unclear speaking. In this way the instrument provides an insight into the discussions among technical men at the time as they tried to improve telephony. In a paper read before the Society of Telegraph-Engineers and Electricians in January 1887 Thompson theorised that the solution to diminishing the background noises and inductive interference

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<sup>73</sup> Kingsbury, 1915, pg. 363 (n.12).

<sup>74</sup> Arapostathis and Gooday, 2013, pg. 104-6 (n.23); Thompson, Silvanus P., 'The Valve Telephone', in the *Electrician*, vol. 16 (1885), pg. 35.

<sup>75</sup> 'The Thompson Microphone', in the *Electrician*, vol. 16 (1885), pg. 9; Thompson, 1885, pg. 35 (n.74).

<sup>76</sup> *The Times*, 8 March 1886 (n.49); 'The New Telephone Company', in the *Electrician*, vol. 18 (1887), pg. 227.

<sup>77</sup> '1886', in the *Electrician*, vol. 18 (1887), pg. 194.

which so plagued speaking on most telephone instruments was to decrease the sensitivity of the receiver and increase the power of the transmitter, thus effectively overpowering and drowning out the inductive noises.<sup>78</sup> However, William Preece disagreed: he thought the solution to these problems lay in better wires, not better instruments. The implications of this approach will be discussed below. The valve telephone thus illustrates the practical manifestation not just of the attempts to circumvent the tightly regulated patent monopoly of the UTC, but also a technical debate fuelled by the need to improve the clarity of speech for telephone users. Use of the valve telephone was short-lived, however, as in 1889 the UTC successfully claimed it as an infringement of their patents and demanded that they all be returned by their owners.<sup>79</sup>

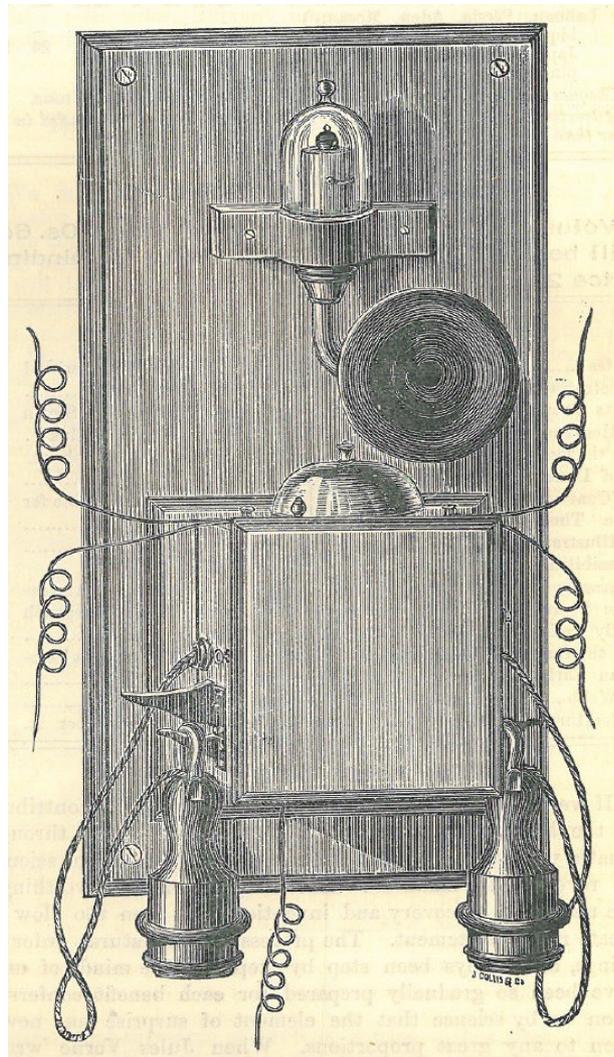


Figure 3.14. Valve telephone

Source: the *Electrician*, vol. 16 (1885), pg. 9 (n.75)

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<sup>78</sup> 'Telephonic Investigations', in the *Electrician*, vol. 18 (1887), pg. 287-91.

<sup>79</sup> Baldwin, 1925, pg. 86-7 (n.6).

### 2.7. Summary

The initial problems faced by a user picking up a telephone were dependent on what type of instrument they were using. This is important for understanding the responses of users and non-users to different types of telephone system around the country throughout the period covered by this thesis. Nevertheless, difficulties with understanding the other person were common to many different types of telephone instrument, and in many different places. I argue though that these problems were only really concerns when compared with other more reliable forms of communication; had a user no choice but to employ telephony, these difficulties would most likely have been eventually overcome, if only through a great deal of patience. However, the availability of messengers and the quality of the British postal and telegraph systems acted to raise the standard expected of British telephony, and it was a standard which, in its early years, it did not meet.<sup>80</sup>

## 3. Problems with connecting

In many towns and cities around the country users and non-users faced several problems which related specifically to the technologies and techniques involved in the provision of both private and exchange telephone connections. Thus, this category of problems includes those difficulties experienced when users and non-users encountered telephone infrastructure. Problems in this section fall under three subheadings: wires, exchanges, and cost of subscription, all of which provided cause for concern throughout the period for either users or non-users. The problems with wires applied to systems of both private and exchange telephony. However, the problems with the cost of subscription, as well as the problems with exchanges, of course, are discussed here only in relation to exchange telephony. The cost of private telephony was not such a concern because there were more providers, as discussed in chapter five.

### 3.1. Wires

Across Britain overhead telephone wires were erected in towns and cities which already had telegraph wires, and where electric power lines were also becoming increasingly common. Below I discuss two categories of complaints related to telephone wires: problems of interference and cross-talk, and concerns about the appearance of wires and about accidents. The first of these categories pertains to telephone users, and the second to non-users of the telephone who observed telephone wires in their local neighbourhoods or elsewhere.

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<sup>80</sup> Kingsbury, 1915, pg. 207-8 (n.12).

### 3.1.1. Interference and cross-talk

The wiring of a private line or exchange connection had a big impact on the quality of the calls that were possible when using it. From the beginnings of commercial telephony it was noted that electrical interference on an earth-return aerial wire, that is, a single wire suspended on poles with no return circuit, but using the earth itself instead, caused difficulties in hearing.<sup>81</sup> Thus a user picking up a telephone instrument would often hear a background noise which Preece likened to the sound of hail pattering against a window. Whilst he feared that inductive interference from telegraph wires which ran alongside the telephone wires would seriously impede telephone use, Preece hoped in September 1877 that scientific inquiry would soon solve these problems.<sup>82</sup> In April 1879, though, he pointed out this problem was even more serious in Britain than elsewhere because the Post Office employed Wheatstone high speed telegraphy, the “tremendous roar” from which would drown out the small telephone currents.<sup>83</sup> Thus the quality of telephonic communication was compromised because the quality of telegraphy was already so high; in some ways British telephony was a victim of the technical success of British telegraphy.

Users around the country often had problems understanding people through their telephones because of this background noise. One Birmingham user complained in April 1888 that: “[the telephone] perverts the clear, ringing, manly tones in which you ask if 'Mr. Jones is in his office' into an idiotic gurgle or a harsh guttural gasp which floats over the wire to a buzzing obbligato which gives a faint suggestion of bees”.<sup>84</sup> Several similar letters from dissatisfied subscribers to the NTC system in Leeds appeared in the *Yorkshire Post* in the same year.<sup>85</sup> In London the Duke of Marlborough, of whom more in chapter five, despaired of the system, writing to the Postmaster General in June 1890: “I find I have to

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81 'Society of Telegraph Engineers', in the *TJER*, vol. 5 (1877), pg. 276-7.

82 Preece, 1877, pg. 199 (n.14).

83 Kingsbury, 1915, pg. 208-9 (n.12); see also: Tucker, D. G., 'Beginnings of Long-Distance Telephony, 1882-87', in *Electronics and Power*, vol. 20, no. 18 (October 1974), pg. 826.

84 BT Archives, TPF/2/12/1, pg. 16, 'A New Rival to the Telephone', in the *Birmingham Daily Times*, 14 April 1888.

85 BT Archives, TPF/2/12/2, pg. 30, 'Leeds Telephones', in the *Yorkshire Post*, 22 December 1888; pg. 31, 'Leeds Telephones', in the *Yorkshire Post*, 24 December 1888; pg. 31, 'Leeds Telephones', in the *Yorkshire Post*, 26 December 1888; pg. 32, 'Leeds Telephones', in the *Yorkshire Post*, 26 December 1888.

write more letters of apology for conversations that fail to be heard than I ever can get convers[at]ions] with others.”<sup>86</sup>

This lack of clarity led some users and non-users to not trust telephony, even until the end of the period covered by this thesis. For example, from December 1880 the Post Office offered to replace with telephones the private telegraph instruments which some of their renters used on private telegraph lines and on telegraph exchanges. On these instruments, called ABCs, each letter of the alphabet was represented by a transmitting button. The instrument also comprised a receiving dial around which the letters of the alphabet were arranged. When pressed, the transmitting buttons caused the indicator on the receiving dial of a corresponding instrument at the other end of the line to point to the transmitted letters (Fig. 3.15.). Invented by Charles Wheatstone, ABC telegraph instruments enabled users to transmit words telegraphically without using a code.<sup>87</sup> The significance of private telegraphy to the growth of telephony is discussed further in chapters four and five.



Figure 3.15. Wheatstone ABC private telegraph instrument

Source: Kieve, 1973, pg. 198 (n.65)

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<sup>86</sup> BT Archives, TCB 304/2, file 67, Marlborough to Raikes, 24 June 1890.

<sup>87</sup> Kieve, 1973, pg. 69 (n.65); Baldwin, 1925, pg. 122-3 (n.6).

However, Post Office officials found that their renters often preferred to keep their ABC instruments as well as using telephones.<sup>88</sup> Baldwin noted that this indicated that telephony was not originally considered to be as reliable as ABC telegraphy.<sup>89</sup> Subscribers preferred to have available the tried and tested ABC instruments as well, for occasions when speaking was difficult. This lack of trust in the reliability of telephony was still evident many years later; when testing the new telephone line between London and Paris, which opened to the public in April 1891, the *Electrician* was impressed by how clear the conversation was: “[we] expected to hear... the usual buzzing and gurgling”.<sup>90</sup> Indeed, the journal was aware that, due to these problems: “many important houses of business [in London] decline to avail themselves of the present telephone service... and shrink from risk of verbal misunderstandings.”<sup>91</sup> Thus, towards the end of the period covered by this thesis companies were still wary of making agreements over the telephone when they could not be certain they would hear the details correctly.

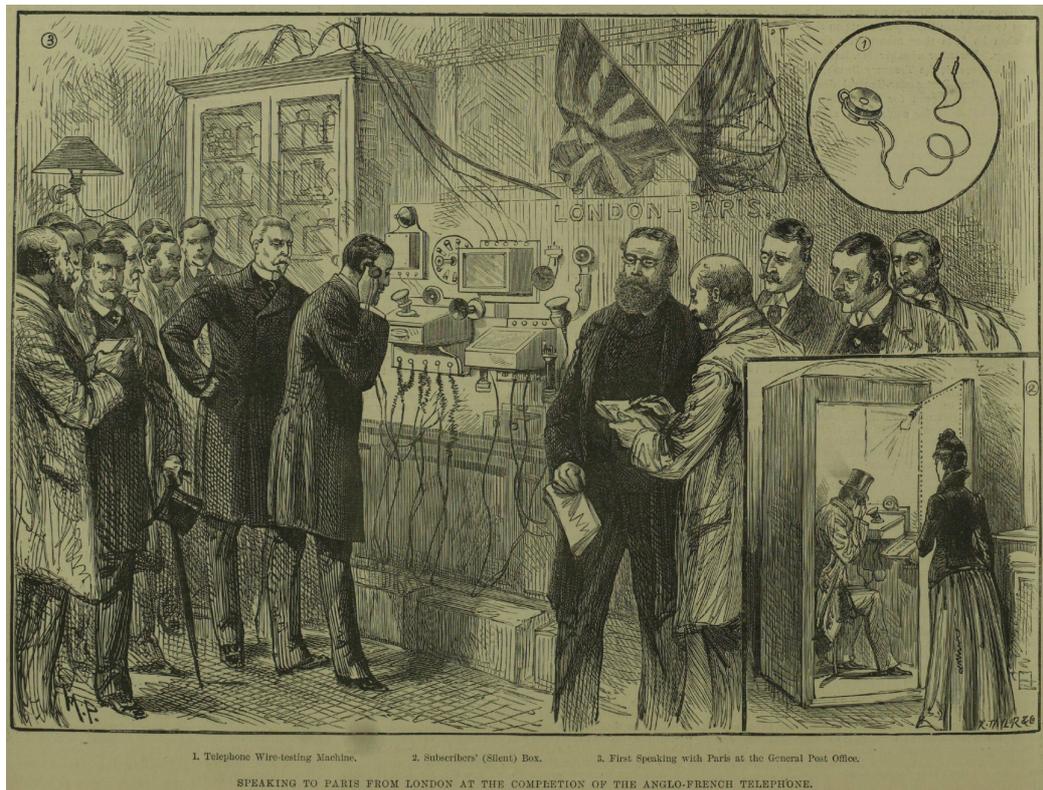


Figure 3.16. 'Speaking to Paris from London'

Source: the *Illustrated London News*, 28 March 1891, pg. 400

88 BT Archives, POST 30/392c, Gavey to Oakden, 19 February 1881.

89 Baldwin, 1925, pg. 124 (n.6).

90 'Notes', in the *Electrician*, vol. 26 (1891), pg. 593.

91 'Notes', in the *Electrician*, vol. 27 (1891), pg. 207.

As well as irritating background noises, there was for many businessmen a more serious concern; when single telephone wires ran parallel to one another for an appreciable distance, inductive interference also caused conversations held on one to be overheard on the others.<sup>92</sup> Known as cross-talk, this was an important reason why many businesses, for example in London, did not want to use telephones.<sup>93</sup> However, even without cross-talk or induction from other wires, Arthur Cotterell, Midland District Manager of the NTC, noted in 1889 that earth currents would sometimes be audible on the wires, and some disturbance was caused by leakage due to unsoldered or bad joints; dirty insulators, especially in heavily industrialised centres like London where the climate was moist and smoky were also a problem.<sup>94</sup> Where magneto-generators were used to call the exchange, as were employed in most of the larger systems around the country, subscribers would turn a handle to generate the current which would summon the exchange.<sup>95</sup> However, they became “decidedly objectionable when used as vigorously as they often are by impatient subscribers, owing to the large amount of noise which they produce by induction on the neighbouring lines.”<sup>96</sup> Thus, on single wire systems the background noise sometimes made conversation difficult, or even impossible.<sup>97</sup>

One solution to all of these problems was to use double wires, known as metallic circuits; this type of line employed a second wire to return the current, instead of using the earth, and inductive effects were all but eliminated. The Mutual Telephone Company in Manchester established its exchange in 1891 using metallic circuits, and users testified that they experienced clear speech, with no buzzing or annoying noises.<sup>98</sup> Likewise, the Post Office's exchanges around the country also used metallic circuits. However, this was more expensive than single wires, as it used twice as much wire, and subscription to Post Office

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92 'Disturbances on Telephone and Telegraph Lines', in the *Electrician*, vol. 25 (1890), pg. 613.

93 'Notes', in the *Electrician*, vol. 27 (1891), pg. 207.

94 'National Telephone Electrical Society', in the *Electrician*, vol. 24 (1889), pg. 83; 'Notes', in the *Electrician*, vol. 24 (1889), pg. 106.

95 Munro, J., 'Remarks on Some of our Telephonic Systems', in the *Electrician*, vol. 21 (1888), pg. 755-6.

96 'The Rise and Progress of Telephony in the United Kingdom', in the *Electrician*, vol. 21 (1888), pg. 41.

97 The *Electrician*, vol. 25 (1890), pg. 613 (n.92).

98 BT Archives, TCB 304/3, file 1, Testimonials of Subscribers to the Mutual Company, [April 1892].

exchanges was more expensive as a result.<sup>99</sup> Indeed, single wires were not always so problematic; some experienced telephone engineers pointed out that it was certainly possible to run single wires alongside one another for at least a mile without any problem of cross-talk.<sup>100</sup> Nevertheless, by February 1892 Colonel Jackson, chairman of the National Telephone Company, had to admit that in Newcastle, where there was a successful Post Office and a company exchange, subscribers often paid to use both: they used the company exchange because of its trunk line connections to other towns and cities, but they used the Post Office system because the lines were superior.<sup>101</sup>

### 3.1.2. Appearance and accidents

Whilst users' primary concerns were for the functionality of the system, a common complaint amongst non-users was that the overhead wires were ugly and dangerous.<sup>102</sup> In 1889, the Duke of Marlborough said in the House of Lords that he thought there was not a single town in Europe which had been “so disfigured, by wires running in all directions”<sup>103</sup> as London (Fig. 3.17.). Where the aesthetic qualities of a town were of particular note, overhead wires were opposed as being bad for tourism. In Bath, the South Western Counties and South Wales Telephone Company sought permission in November 1885 to establish an exchange, and fix overhead wires to connect Bath with Bristol. However, one local council Alderman likened networks of telephone wires, such as those seen in other towns, to “a mighty cobweb”.<sup>104</sup> One council member pointed out that Bath was not a commercial town but rather a resort for visitors, and so he was loath to see the city disfigured by overhead wires; another asked whether stringing wires over the streets was worth it for the benefit of only ten or twenty people.<sup>105</sup> In 1893, at the end of the period covered by this thesis, concern was still being expressed, for example in Manchester, that

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99 'Reduction of Telephone Charges', in the *Electrician*, vol. 26 (1891), pg. 658.

100 Sinclair, D., 'Improvements in the Telephone System of Glasgow and the West of Scotland', in the *Electrician*, vol. 21 (1888), pg. 635; Bennett, A. R., 'Twisted Telephone Lines', in the *Electrician*, vol. 26 (1891), pg. 799.

101 'Telephone Reform', in the *Electrician*, vol. 28 (1892), pg. 428-9.

102 Baldwin, 1925, pg. 76 (n.6).

103 Marlborough, *Hansard*, HL Deb, 4 July 1889, vol. 337, col. 1439.

104 Hall Ellis, M. J., *The Early History of the Telephone in Bath* (British Telecom, 1986), pg. 25.

105 'The Telephone and the Bath Corporation', in the *Electrician*, vol. 16 (1885), pg. 123.

the aerial wires were an “eyesore”.<sup>106</sup> Non-users, seeing no benefit from the telephone themselves, could thus oppose its introduction on these grounds.



Figure 3.17. UTC central office, Coleman Street, 1883

Source: detail from 'The Telephone Exchange in London', in the *Graphic*, 1 September 1883, pg. 232

Two types of safety-related problems concerning overhead wires also worried the general public: falling wires and electrical dangers. Some well publicised accidents served to reinforce this first worry: in 1883 an overhead wire fell in London, and, as it “twisted and turned in a serpent-like fashion in the air”,<sup>107</sup> cut an elderly lady across the face and head; in 1884 a five year old girl was severely injured by a falling wire in the West Midlands.<sup>108</sup> This first incident, caused by the carelessness of the London and Globe Company workmen who were moving the wire, was widely reported in newspapers around the country,<sup>109</sup> and caused the *Pall Mall Gazette* to remark that, although this incident had

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<sup>106</sup> 'Telephones', in the *Manchester Guardian*, 12 June 1893, pg. 8.

<sup>107</sup> 'London and the Provinces' in the *Standard*, 29 October 1883, pg. 2.

<sup>108</sup> 'Fall of a Telephone Wire', in the *TJER*, vol. 15 (1884), pg. 14.

<sup>109</sup> 'Singular Accident in the City', in *Reynolds' Newspaper*, 28 October 1883, pg. 1; 'The Danger of Overhead Wires', in the *Liverpool Mercury*, 29 October 1883, pg. 5; 'Politics and Society', in the *Leeds Mercury*, 29 October 1883, pg. 5; 'Gleanings', in the *Birmingham Daily Post*, 29 October

not been too serious, someday “a telephone wire will snap in a gale and decapitate some unlucky person underneath. It is to be hoped that the victim destined by the fates to such an end may be a telephone director.”<sup>110</sup> Less than a month later a man wrote to the *Times* describing how he had prevented the employee of an unnamed telephone company from erecting a wire over a communal garden which he shared, because of the potential danger to residents and their children.<sup>111</sup>

People were also worried about the danger of electrocution in their own homes. One widely held concern was that the wires passing over their houses would put them in danger by acting as lightning conductors. As a general concern about the mysterious and dangerous nature of electricity, this was similar to worries expressed regarding electric lighting in this same period, as highlighted by Graeme Gooday.<sup>112</sup> Another worry for users specifically was that telephone wires might come into contact with electric lighting wires. One suspected example of this was in 1888, when a firm of solicitors found that their telephone would not work; there was a smell of burning and part of it was singed. When a maintenance man came and attempted to disconnect the components he received a severe electric shock.<sup>113</sup> In 1891 John Lamb, Assistant Secretary to the Post Office and one of the department's foremost telephone experts,<sup>114</sup> noted that there was a risk of telephone wires “‘picking-up’ the strong currents of the Electric Light and setting fire to the Offices of the Telephone subscribers”.<sup>115</sup>

Several solutions were proposed for these aesthetic and safety-related problems. The concerns about wires endangering houses over which they passed by acting as lightning conductors were dismissed as a misapprehension by several newspapers, for example the *Gloucester Journal*; they cited William Preece as an authority who had asserted that

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1883, pg. 7; 'Latest London News', in the *Aberdeen Journal*, 2 November 1883, pg. 5.

110 'City Notes', in the *Pall Mall Gazette*, 29 October 1883, pg. 5.

111 Bonham-Carter, Alfred, 'Telephone Wires', in the *Times*, 29 November 1883, pg. 10.

112 Gooday, Graeme, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (Pickering and Chatto, 2008), chapter 3; see also: Gooday, Graeme, 'Electricity and the Sociable Circulation of Fear and Fearlessness', in Livingstone, David N. and Withers, Charles W. J. (eds.), *Geographies of Nineteenth-Century Science* (University of Chicago Press, 2011).

113 BT Archives, TPF/2/12/1, pg. 20, 'A New Danger', in the *Standard*, 18 December 1888.

114 BT Archives, TCB/167/11, Establishment Book, 1890, pg. 3; Perry, 1977, pg. 76 (n.8).

115 BT Archives, TCB 304/2, file 91, Lamb to Raikes, 12 February 1891.

overhead wires actually provided a way for electricity to escape to earth, thus making buildings safer.<sup>116</sup> In this case the solution resorted to by telephone providers was to educate the public, and not to make any practical changes to their telephone systems. Technical solutions were however implemented to alleviate users' fears of electrocution due to lightning strikes or contact between telephone and electric lighting wires. One solution was better insulation on the telephone wires to protect them from lighting wires,<sup>117</sup> and another was that the instruments themselves were built with lightning protectors to dissipate excessive electrical discharge on the line. These were often metal plates screwed to the woodwork of the telephone; such protectors were later placed where the lines entered the building instead in an attempt to make telephones safer.<sup>118</sup>

The most common solution suggested for all of these problems, including the appearance of the wires, the risk of breakages, and electrical dangers, was to place them underground.<sup>119</sup> The public commotion surrounding these issues led to the formation in 1885 of a government Select Committee to investigate the dangers posed by overhead wires, including telegraph and electric lighting wires. However, in May the committee concluded that the risk to the public was greatly exaggerated.<sup>120</sup> Thus, this problem was addressed by an official investigation, but was dismissed, and so no technical actions were taken to placate those complaining about this aspect of telephony, who were predominantly non-users. Additionally, placing wires underground also required granting the companies permission to break up the streets. The public, including local authorities, property owners, and amenities companies, were not willing to grant this permission because of the power it would give to the telephone companies and the disruption it would cause as the streets were dug up.<sup>121</sup> Thus, into the 1890s the only solution for those who objected to the appearance or dangers of the wires was even more disagreeable than the wires themselves.

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116 *Gloucester Journal* 16 April 1887, cited in Dodd, 1987, pg. 19 (n.48); the same fears were expressed elsewhere, for example: BT Archives, TPF/2/12/2, pg. 18, Jackson, H. F., 'The Telephone', in the *Grimsby News*, 26 July 1888.

117 Lamb to Raikes, 12 February 1891 (n.115).

118 Povey and Earl, 1988, pg 53, 56 (n.41).

119 For example: the *Standard*, 18 December 1888 (n.113).

120 UK Parliament, Report from the Select Committee on Telephone and Telegraph Wires, 1885 (188) XII.101, pg. iii.

121 Baldwin, 1925, pg. 575 (n.6).

### 3.2. Difficulties using exchange equipment and protocols

Having examined complaints regarding the overhead wires, I now turn to the exchanges themselves, and to the problems which subscribers encountered when they attempted to use them. During the period of this thesis, exchange equipment, including the apparatus used by subscribers, was not standardised around the country.<sup>122</sup> Subscribers in different towns thus encountered different exchange systems and different ways of using their telephones. Even towns under the auspices of the same company could have very different systems from both a technical and a use perspective. Exchanges did not start or subsequently grow in a systematic fashion;<sup>123</sup> in 1891 the *Electrician* called the London system built up by the former UTC “hand-to-mouth”.<sup>124</sup> These local differences need to be taken into consideration when assessing responses to different telephone systems.

#### 3.2.1. Subscribers' confusions about calling the exchange

The various lists of subscribers issued by the companies testify to these differences in exchange systems. Most included instructions for calling the exchange. In London the first list to also include instructions was issued in June 1881. Subscribers were informed that to attract the attention of the exchange they had first to press a button and wait for the operator to ring their bell. They then took the telephone off the hook and told the operator the number of the subscriber they wanted. Placing the telephone back on the hook, they waited for the bell to ring again to notify them that they had been connected and could talk.<sup>125</sup> However, by August 1882 these instructions had changed, and from then on subscribers were told to ring the exchange and keep the telephone to their ear until they were connected.<sup>126</sup> Seen in this context, subsequent complaints about delays in getting connected are understandable:<sup>127</sup> a caller might have been standing with the telephone receiver held to his ear waiting for the connection, instead of being able, as formerly, to do something else in the meantime. Subscribers in different provincial towns and cities had different ways to

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<sup>122</sup> Ibid., pg. 134.

<sup>123</sup> BT Archives, TCB304/2, file 68, Marlborough to Raikes, 12 July 1890; Bennett, A. R., 'On the Telephoning of Great Cities', in the *Electrician*, vol. 27 (1891), pg. 476.

<sup>124</sup> 'Competing Telephone Companies', in the *Electrician*, vol. 27 (1891), pg. 523.

<sup>125</sup> UTC, List of Subscribers, June 1881, pg. [iii].

<sup>126</sup> Ibid., August 1882, pg. [x]; *ibid.*, July 1886, pg. xvi.

<sup>127</sup> For example: Marlborough, 1891, pg. 7 (n.2).

ring their exchanges; in some places this was similar to the first method described above, in others it was more akin to the latter.<sup>128</sup> In order to understand subscribers' complaints regarding delays in getting connected it is important to appreciate these local differences.

However, advice included in lists for exchanges across the country indicates that there were certain problems which subscribers in different cities and towns all faced when using their exchange instruments. For example, subscribers were cautioned that they should not speak too loudly into the transmitter, and were asked not to speak to the operators about anything else, in order to ensure the smooth running of the exchange. Subscribers were also advised to answer calls as quickly as possible, and reminded that their bells would not ring to alert them of a call if the telephone was left off the hook.<sup>129</sup> These last two warnings indicate that calling up subscribers might not always have been easy, or even possible, due to their own actions. The inclusion of these points in telephone directories shows that telephone companies believed some of the delays which frustrated callers, such as those quoted in the epigraphs to this chapter, could be reduced by educating subscribers as to the correct telephone etiquette. All lists also emphasised the need for subscribers to remember to ring off to inform the operators when they had finished. Indeed, if operators could not be sure that people would remember, they needed to listen in on the lines occasionally to check whether or not they were free.<sup>130</sup> Regarding all these problems, companies generally sought to educate their users in order to improve telephone service.

In one or two cases, though, a different method of calling the exchange, the call-wire system, was implemented as an attempt to solve these problems.<sup>131</sup> In the exchanges mentioned above, subscribers had one wire to the exchange, with which they would summon the operator and ask to be put in contact with another subscriber. The operator would then make the connection and call the desired subscriber. Subscribers spoke to one another using the same wire with which they spoke to the operator. Under the call-wire system, however, subscribers had a second wire to the exchange, the call-wire, which they

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128 For example: NTC, List of Subscribers for Nottingham District, January 1885, pg. 8; NTC, List of Subscribers for Midland District, September 1886, pg. 8; L&C, List of Subscribers for Liverpool, January 1886, pg. [16]; L&C, List of Subscribers for Manchester and District, February 1885, pg. 27.

129 For example: NTC, List of Subscribers for Nottingham District, January 1885, pg. 8; NTC, List of Subscribers for Midland District, September 1886, pg. 8.

130 'Telephone Systems of London, Manchester and Glasgow', in the *Electrician*, vol. 21 (1888), pg. 526-7.

131 For example, by the NTC in Dundee, and the Mutual Telephone Company in Manchester (Baldwin, 1925, pg. 142, 234 (n.6)).

shared with other nearby users. This shared wire was used to summon the attention of the operator, who constantly listened in and made the requested connections.<sup>132</sup> However, the subscribers themselves were left to ring through to one another, which allegedly saved time in making connections and increased privacy by preventing the need for operators to listen in to subscribers' conversations.<sup>133</sup> This may have been true in some cases, but I argue that the employment of the call-wire system, although rare, was also a way for telephone providers to transfer responsibility for slow connection times from operators to subscribers. Operators would not be kept busy attempting to ring requested subscribers, but would be making the next connection, leaving subscribers themselves to carry out the potentially lengthy process of ringing up the person with whom they wished to speak. Nevertheless, the call-wire system could itself be extremely problematic.

The NTC introduced the call-wire system in Glasgow in the summer of 1893.<sup>134</sup> When subscribers picked up their telephones to talk to the exchange over the shared call-wires, what greeted them was, according to the numerous angry letters which appeared in the *Glasgow Herald* at this time, a chaotic babble of frustrated voices attempting to get connections. Many letters gave accounts of operators not responding to people's requests over the call-wire, and repeated mistakes and wrong connections were made due to the operator not hearing correctly the requested numbers.<sup>135</sup> A significant source of discontent was the overhearing of other people's conversations when subscribers were switched onto a number which was already connected to another subscriber.<sup>136</sup> This was very worrying to businessmen. A further complaint was that the frustration of waiting at the call-wire, with people seemingly whistling to keep themselves occupied, led to much swearing, to which office boys using the telephone should not have been exposed.<sup>137</sup> The call-wire system was

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132 Kingsbury, 1915, pg. 300-4 (n.12).

133 Baldwin, 1925, pg. 234-6 (n.6).

134 'The New Telephone Call System', in the *Glasgow Herald*, 12 August 1893, pg. 6.

135 Minerva, 'The Telephones', in the *Glasgow Herald*, 3 August 1893, pg. 3; "Hallo! who are you?", 'The Telephones', in the *Glasgow Herald*, 3 August 1893, pg. 3.

136 (From the *Glasgow Herald*:) Minerva, 'The Telephones', 3 August 1893, pg. 3; Merry, James Y., 'The Telephone', 30 August 1893, pg. 9; Bach, Albert, 'The Telephone', 19 September 1893, pg. 3; Sloggins, 'The Telephone', 21 September 1893, pg. 11; Dial Plate, 'The Telephone Service', 26 September 1893, pg. 3.

137 (From the *Glasgow Herald*:) Mashed on the Operator, 'The Telephone', 10 August 1893, pg. 3; Sloper, Ally, 'The Telephone', 21 September 1893, pg. 11; Iron Warrant, 'Telephone Service', 23 September 1893, pg. 9.

not, therefore, an unproblematic solution to the complaints discussed above. Indeed, I argue that its introduction in Glasgow led many exchange subscribers to support the establishment of a municipal exchange system run by the Corporation, a possibility made more plausible by the fact that the government had taken the decision to purchase the trunk lines in 1892. Thus, subscribers argued, it would be possible to establish a national network of interconnected municipal telephone systems.<sup>138</sup> I return to this theme of municipal telephony in my conclusion.

### 3.2.2. Problems with the switchboards: connection times and delays in getting through

Considering now the exchange equipment itself, different switchboard designs had a large impact on the use-experience of the subscriber, affecting how long it took for a call to be connected.<sup>139</sup> Complaints about delays in getting through were not uncommon.<sup>140</sup> The first switchboards used by the Bell and Edison companies before they amalgamated were known as either slipperjack boards or matrix boards respectively.<sup>141</sup> Later a model called the Williams switchboard was used by UTC companies for bigger exchanges of a hundred to two hundred subscribers.<sup>142</sup> All of these models required two operators to connect calls: when a subscriber summoned the exchange, an answering operator rang them back, ascertained to whom they wanted to speak, and informed the connecting operator, who made the connection (Fig. 3.18.). As this entailed a lot of talking between operators, especially on the larger exchanges, this resulted in a lot of background noise which one contemporary commentator noted “was by no means favourable to the rapid and accurate despatch of business.”<sup>143</sup> Operators had to shout across the room to be heard, and one later recalled that those with the strongest lungs made the fastest connections.<sup>144</sup> Additionally, the only way these operators knew if a conversation had finished was by listening in

138 (From the *Glasgow Herald*;) Wire, 'The Telephone', 8 August 1893, pg. 3; Bach, Albert, 'The Telephone', 19 September 1893, pg. 3; W. E., 'The Telephone', 21 September 1893, pg. 11; Iron Warrant, 'Telephone Service', 23 September 1893, pg. 9.

139 Munro, 1888, pg. 755-6 (n.95).

140 BT Archives, TCB 304/3, file 16, Marlborough to Lamb, 1 January 1892.

141 Occomore, David, “*Number, Please!*” *A History of the Early London Telephone Exchanges from 1880 to 1912* (Ian Henry Publications, 1995), pg. 20-21.

142 Sinclair, D., 'Improvements in the Telephone System of Glasgow and the West of Scotland', in the *Electrician*, vol. 21 (1888), pg. 562-4; Baldwin, 1925, pg. 100, 111, 114, 139-41 (n.6).

143 The *Electrician*, 18 May 1888, pg. 41 (n.96).

occasionally,<sup>145</sup> but many subscribers expressed resentment at this intrusion on their privacy.<sup>146</sup>

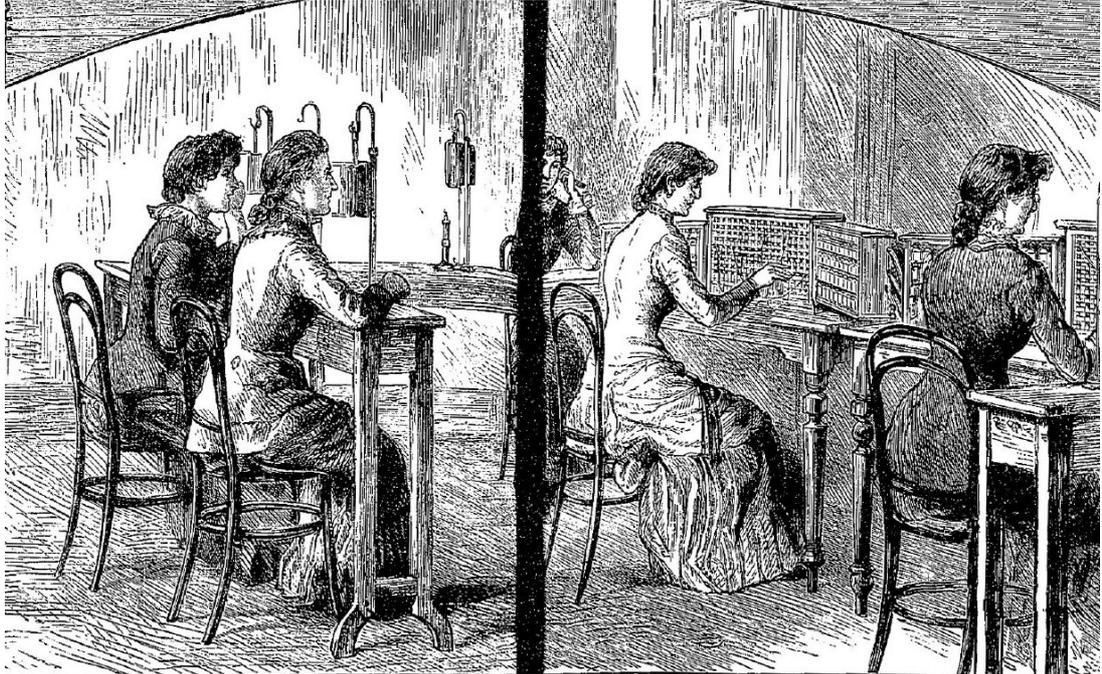


Figure 3.18. Slipperjack switchboard exchange, London, 1883

Source: detail from 'The Telephone Exchange in London', in the *Graphic*, 1 September 1883, pg. 232-3

At exchanges using these switchboards, subscribers' lines terminated at one point on one board, but exchanges often had a few switchboards; if two subscribers whose lines terminated on different boards required a connection this was done using a trunk line between the boards, which required more talking between the operators.<sup>147</sup> Thus, subscribers' experiences of this part of their telephone call would have varied depending on which exchange they were on, which exchange their desired correspondent was on, and even the relative positions of the two subscribers on switchboards of the same exchange. These switchboards were used in many towns throughout this period, for example in Edinburgh, which had about six hundred subscribers in 1888, served by five exchanges, the

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144 'Telephone Women I – Ellen Marian Ralph', in the *NTJ*, vol. 2 (July 1907), pg. 75.

145 Occomore, 1995, pg. 20 (n.141).

146 Hall Ellis, M. J., *The Early Years of the Telephone Service in Bristol, 1879-1931* (British Telecom, 1989), pg. 43; Milne, Graeme J., 'British Business and the Telephone, 1878-1911', in *Business History*, vol. 49, no. 2 (March 2007), pg. 174.

147 Kingsbury, 1915, pg. 213 (n.12).

largest having 150 subscribers.<sup>148</sup> London exchanges also used these types of switchboards until this time, and there were many complaints about delays in getting through.<sup>149</sup> In the Bristol exchange, established in December 1879, the original slipperjack switchboard remained in use until it was reaching capacity in 1893; subscribers needed to be very patient when waiting at their instruments to be put through.<sup>150</sup>

The alternative to these switchboards was the use of multiple switchboards. On multiple boards each subscriber's line was duplicated on every section of the switchboard, thus giving every operator access to every line coming in to the exchange. Each operator was responsible for a group of subscribers and was able to connect any of them to any other subscriber without needing to ask another operator for assistance. Thus connections could be made more quickly and efficiently.<sup>151</sup> Each section of the multiple switchboard accommodated two hundred subscribers, so they were good for larger exchanges such as Liverpool and Manchester where all the subscribers were concentrated into one exchange.<sup>152</sup> Glasgow's exchanges also made use of multiple switchboards by 1888.<sup>153</sup> However, the amount of wire required to duplicate every subscriber's wire across every operator's position on the exchange made multiple boards a very expensive investment.<sup>154</sup>

The London and Globe Telephone and Maintenance Company probably used the first multiple switchboard in London in early 1883.<sup>155</sup> In 1884, the first Western Electric multiple switchboard was installed in Liverpool (Fig. 3.19.), although the first of this design to come into use in London was not installed until 1888.<sup>156</sup> Use of multiple boards increased after 1888; that February, when one was installed in Bradford, the only other

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148 Munro, 1888, pg. 755 (n.95).

149 The *Electrician*, vol. 21 (1888), pg. 527 (n.130).

150 Hall Ellis, 1989, pg. 19, 23, 45 (n.146).

151 Kingsbury, 1915, pg. 213, 230 (n.12).

152 Ibid., pg. 230; Munro, 1888, pg. 755 (n.95).

153 The *Electrician*, vol. 21 (1888), pg. 526 (n.130).

154 Ibid., pg. 527.

155 Kingsbury, 1915, pg. 234, 361 (n.12).

156 Ibid., pg. 236; Occomore, 1995, pg. 24 (n.141).

places to be using them were London, Liverpool and Glasgow.<sup>157</sup> Subscribers to exchanges using multiple boards would have found their operators easier to talk to and their connection times quicker. In addition, multiple boards allowed more users to be grouped onto one exchange, which also increased the efficiency of connections. This local heterogeneity of use-experience indicates that when considering complaints about telephony from users or non-users, it is important to adopt a geographically sensitive approach and take into account not just when they were complaining, but also where.<sup>158</sup> Contrary to the assumptions of Perry and other historians, many provincial systems were considered to be better than London's, especially the Manchester system.<sup>159</sup>

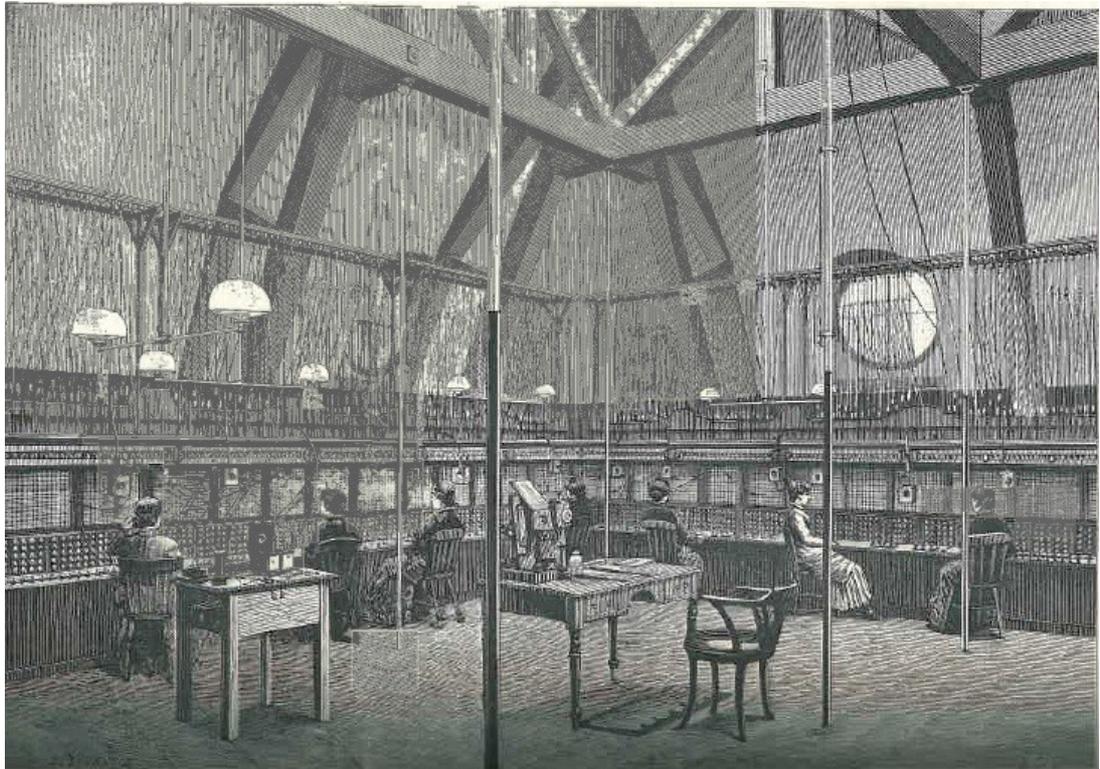


Figure 3.19. Multiple switchboard exchange, Liverpool, 1884

Source: 'The "Multiple" Switchboard', in the *TJER*, vol. 15 (1884), pg. 812

### 3.2.3. The incivility of operators

Telephone operators comprised an important part of the experience of using an exchange. Sometimes, however, subscribers' interactions with operators were not positive,

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157 BT Archives, TPF/2/12/2, pg. 9, 'Improvements at the Bradford Telephone Exchange', in the *Bradford Observer*, 14 February 1888.

158 For more on geographical approaches to the history of science, see: Livingstone and Withers, 2011 (n.112); and: Smith, Crosbie and Agar, Jon (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Macmillan Press Ltd., 1998).

159 Munro, 1888, pg. 755-6 (n.95); the *Electrician*, vol. 21 (1888), pg. 527 (n.130).

as the council of the Liverpool Chamber of Commerce complained to Charles Moseley, the chairman of the L&C, in late 1885.<sup>160</sup> Subscribers found that “they were often cut off in conversation, without due notice; that they were frequently connected with wrong numbers; that there was a want of attention in the switch room, and there was a want of civility”.<sup>161</sup> Moseley's response to these complaints was essentially a series of frank admissions that the telephone was not a particularly useful or reliable instrument for conducting business. He dismissed the complaints of subscribers being frequently cut off, and of distracting noises on the lines, as scientific issues beyond the company's control. With regard to being connected to the wrong numbers, he said that all the subscribers knew that “in listening through a telephone it was very difficult sometimes to distinguish numbers, and even words had often to be spelt [sic].”<sup>162</sup> However, this complaint was obviously noted, as the next list of Liverpool subscribers to be produced after these complaints explicitly reminded users to “be careful that the number you have given is repeated by the Operator, so as to prevent mistakes.”<sup>163</sup>

The company's response to these complaints was not to suggest any technical solutions such as metallic circuits, but rather to lower the expectations of the subscribers with regards to the capabilities of the technology itself, and to attempt to educate the users and modify their behaviour. Moseley did concede that the complaint of incivility was very serious, and encouraged subscribers to report specific instances as soon as possible. Indeed, lack of proper attention from operators was not just a problem in Liverpool. In early 1886 one London subscriber wrote to the *Electrician* to complain about the laxity and incompetence of the operators. Implying that this had been going on for some time, he explained that he and other subscribers were constantly told that the number they required was out of order.<sup>164</sup> However, when the subscribers sent a telegram or a messenger, they found that the person they wanted to speak to had called them, saying there was nothing wrong with their instrument. As a result of this, the anonymous subscriber complained, users spent more on telegrams without gaining the benefit from their expensive exchange connections. He claimed he had often asked firms with whom he did business to become

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160 'The Telephone Service in Liverpool and Manchester', in the *Electrician*, vol. 16 (1886), pg. 144.

161 Ibid.

162 Ibid.

163 L&C, List of Subscribers for Liverpool, January 1886, pg. [16].

164 Subscriber, 'The Telephone in London', in the *Electrician*, vol. 16 (1886), pg. 232.

subscribers, but “they almost invariably answer that it would only be adding £20 a year to their expenses without diminishing their cost for telegrams”.<sup>165</sup>

It is not clear what the response of the company was to this kind of complaint, but concerns regarding the conduct of the operators did not feature amongst the many worries expressed later by critics such as the Duke of Marlborough in the early 1890s. However, over the course of the 1880s the original male operators used on the exchanges, often boys who were found to be rude and rowdy, were replaced with women, whom managers thought to be more polite.<sup>166</sup> Although this happened at different rates around the country, and for example was still ongoing in London into the 1890s,<sup>167</sup> such complaints as those detailed above were probably a key factor in this change. If the Duke of Marlborough was served by a London exchange which had already switched over to female operators then this might not have been a major complaint. Thus, this could provide an important example in which complaints from users did effect real change in the system.

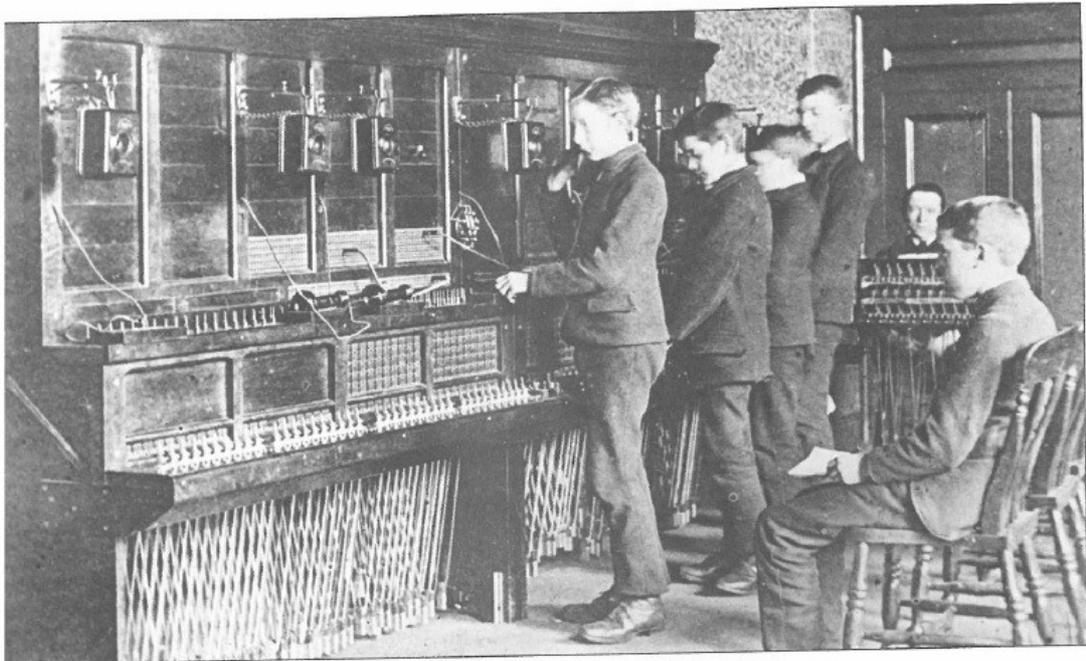


Figure 3.20. Boy operators at the Sunderland exchange, 1883

Source: Young, 1991, pg. 24 (n.7)

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<sup>165</sup> Ibid.

<sup>166</sup> Feuerstein, 1990, pg. 313-5 (n.6).

<sup>167</sup> 'Telephone Women LV – Fanny Louisa Holmes', in the *NTJ*, vol. 4 (January 1910), pg. 207; 'Telephone Women XCV – Minnie Frances Butler', in the *NTJ*, vol. 6 (July 1911), pg. 72.

### 3.3. Cost of subscription

When considering the complaints of users and non-users as they encountered telephone infrastructure, it is important to include complaints regarding the cost of the flat-rate subscriptions required to use exchange telephony.<sup>168</sup> Until the rates were reduced in 1891, the price of exchange subscription in most towns and cities with exchanges run by UTC group companies was between £15 and £20.<sup>169</sup> This expense made telephony a luxury for which only wealthy firms or members of the upper-middle class or aristocracy could afford to pay. By way of comparison, in London from 1877 the youngest Post Office telegraph boys, fourteen years old, were paid 7s. a week to deliver telegrams around the city.<sup>170</sup> Businesses could possibly have employed boys for less than this, especially in the provinces, or if the boys were younger. Thus, employing a boy who could deliver messages, and also carry packages, as well as performing other duties around the office, for a year would have been cheaper than getting an exchange telephone. Furthermore, the problems with the reliability of telephony as noted in this chapter, and the availability and affordability of the letter post and of telegraphy as noted in chapter one, made it less likely to be prioritised as an investment at this price.

This was a source of complaint throughout this period and across the country,<sup>171</sup> the ramifications of which led to numerous changes in existing systems, the establishing of new systems, and the alteration and often improvement of the use-experience in ways which will be discussed further in chapter five. In May 1879, before the first exchange was even established, an editorial in the *Times* cautioned that if a company had a monopoly they would always “do a comparatively small business at high rates, rather than... earn the same income by the increased trouble incidental to a larger business at lower rates.”<sup>172</sup> It was not long before this prediction was vindicated. In 1882 the publication of a circular by the

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168 Baldwin, 1925, pg. 193 (n.6).

169 In the 1880s, £20 was roughly equivalent to £1,000 in modern money (for conversions between historical and modern money, I have used the National Archives currency converter, available online: <http://www.nationalarchives.gov.uk/currency/default0.asp#mid>). Perry noted that in London in 1901 £20 would employ a maid for a year (Perry, 1977, pg. 78 (n.8)). Although this is outside my period, and London was not necessarily representative of the rest of the country, this is nevertheless a good indicator of the value and spending power of such a sum of money.

170 Hindmarch-Watson, Katie, 'Male prostitution and the London GPO: Telegraph Boys' "Immorality" from Nationalization to the Cleveland Street Scandal', in the *Journal of British Studies*, vol. 51, no. 3 (July 2012), pg. 603, 614.

171 The *Electrician*, vol. 16 (1886), pg. 144 (n.159); Subscriber, 1886, pg. 232 (n.164).

172 The *Times*, 10 May 1879, pg. 11 (n.18).

L&C advertising its trunk line charges allowed the *TJER* to calculate and reveal that the policy of the company was to cater to the few at higher rates, rather than to the many at lower rates.

The charges, wrote the author, were exceptionally high, as subscribers needed to pay for their exchange subscription – £20 a year in Liverpool and Manchester – separately to their trunk subscription. The latter could be as much as £60 per year for use of the trunk line between Manchester and Liverpool. Considering next the amounts which the company had to pay the Post Office to rent trunk lines – as they were required to do by Post Office policy at this time – the article explained that the company could have encouraged more subscribers to pay if the rate were lower, and would thereby still have been assured of covering its costs. The kind of approach adopted by the company, it was believed, had been greatly injurious to the progress of the telephone business in the country.<sup>173</sup> Indeed, this expense was discouraging many from using the telephone, and sometimes those who started to use it had to stop because the cost was prohibitive, as one Glasgow subscriber wrote in 1883.<sup>174</sup> His firm had given the telephone up two years ago, and many of his business friends had been doing the same.

Even the UTC acknowledged this, stating in its February 1884 list of subscribers that “[w]e have heard it said that our charge of £20 per annum for each Subscriber is too high”.<sup>175</sup> Nevertheless, they explained, it was still cheaper than other cities such as Paris and New York, and, when the price was broken down, the average cost for each communication was less than one penny. In addition they pointed to the Post Office royalty, which came to £2 per annum. The timing of this defensive addition to the information given in the company's list of subscribers is telling;<sup>176</sup> it was at this time that the London and Globe Telephone and Maintenance Company had begun competition in earnest with the UTC at a lower subscription rate.<sup>177</sup> The UTC, and then the NTC, continued to include this explanation in their lists until June 1890.<sup>178</sup> Its subsequent absence at this point

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173 'Lancashire and Cheshire Telephonic Exchange Company', in the *TJER*, vol. 11 (1882), pg. 318.

174 'Telephone Rates in Scotland', in the *TJER*, vol. 12 (1883), pg. 314.

175 UTC, List of Subscribers, February 1884, pg. [xi].

176 This was the first time this information was included; it did not appear in the previous list (UTC, List of Subscribers, October 1883, pg. [xi]).

177 Law, E. H., 'Telephonic Communication and the Government Monopoly', in the *Times*, 25 February 1884, pg. 10.

is also telling;<sup>179</sup> it was in that month that the Postmaster General, Henry Cecil Raikes, announced the intention of the government not to buy the telephone companies at the end of that year, as they could have decided to do under the terms of the companies' licences.<sup>180</sup> Thus I argue that, free from the threat of nationalisation, the NTC no longer felt the need to justify its charges in London.

Nevertheless, people in London were still complaining as bitterly as ever.<sup>181</sup> In the provinces the complaints were similar until the rates were eventually reduced to £10, in stages, between May 1890 and January 1891 in response to threats of competition once the time for the expiration of the main telephone patents approached.<sup>182</sup> Before this, vocal dissatisfaction was expressed widely: members of the Chamber of Commerce in Leeds saw that other towns had cheaper service, for example £10 per annum, and demanded to know why theirs was £15.<sup>183</sup> In Manchester, the *Manchester Guardian* called the £20 rate “absolutely prohibitive”<sup>184</sup> to most people who would want to use the telephone. Indeed, at the Leeds meeting the NTC chairman, Colonel Raynsford Jackson, confessed that complaints about the telephone cost were being expressed all over the country.<sup>185</sup> The fact that this problem continued for so long and was so universal is evidence that the suppliers of telephony, in particular the UTC group and the Post Office, did not work to expand access to their services unless pressured by competition. This indicates a narrow view of entitlement, whereby only wealthy businesses and individuals were expected to be able to use the telephone.

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178 UTC, List of Subscribers, October 1884, pg. xiii, September 1885, pg. xviii; NTC, List of Subscribers to the Metropolitan Exchange System, January 1890, pg. 13.

179 NTC, List of Subscribers to the Metropolitan Exchange System, June 1890, pg. 14.

180 BT Archives, TCB 304/2, file 66, Questions from Sir John Puleston and Mr. Labouchere in Parliament, 20 June 1890.

181 Marlborough, *Hansard*, HL Deb, 7 July 1890, vol. 346, col. 903-12; BT Archives, TCB 304/3, file 1, cutting from unknown newspaper, [c.23 February 1892], London Chamber of Commerce meeting on the telephone.

182 Baldwin 1925, pg. 194, 605 (n.6).

183 Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. [3], 5-6 (n.11).

184 BT Archives, TCB 304/2, file 40, editorial from *Manchester Guardian*, 6 December 1889.

185 Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. 4 (n.11).

### 3.4. Summary

These problems with connecting illustrate not only that using early telephones could be a very frustrating experience, but also that the problems of telephony were not felt, or expressed, solely by the users. Regarding the overhead wires, non-users such as property owners and local authorities had a strong influence over the expansion of the network; this theme will be explored in more detail below. However, concerns expressed by users, who were already paying for their service, were often not heeded by the company unless there was a threat of competition, and the preferred solution to such complaints was often to attempt to lower expectations of the technology itself and educate subscribers accordingly. This section also demonstrates how diverse telephone use-experience could be around the country. This highlights the importance of understanding the location and context of users and non-users when assessing their responses to telephony throughout this period, and in particular their subsequent attitudes towards telephone ownership.

## 4. Problems with communities

The third category of problems moves away from the direct provision of telephone service through equipment and apparatus and considers instead what needed to be in place before the telephone infrastructure was built, namely the communities willing to use the telephone, or to allow it to be used by others. There were two sets of problems in this category, the first applying only to exchange telephony, the other to both exchange and private telephony. Firstly an individual's use of telephone exchanges depended on the telephone exchange use of others, for example in terms of the number of other people to whom it was possible to speak, and also regarding the deciding of pricing models. The second set of problems concerned the influence non-users had on the availability and affordability of the telephone through decisions to grant or deny wayleaves. Wayleaves were the permissions given by those who owned land or property to allow a company to place poles or wires on their property.

### 4.1. Reliance on users

In order to provide one individual with exchange telephone use, there needed to be enough potential exchange users in the area willing to subscribe together and desiring intercommunication. For some users, an exchange with a small number of subscribers was of very little use; in July 1884 subscribers at the Post Office exchange in Plymouth were

threatening to leave because there were so few subscribers.<sup>186</sup> According to these subscribers, in 1881 there had been 150 residents connected to a company exchange, but the Post Office had closed that and opened its own; however, there were never more than 46 subscribers to that exchange, and at that point there were only 42 left. Many of these remaining subscribers saw little benefit in continuing to pay for a service which allowed them to speak to so few others. Thus these users, who desired to use the telephone, were on the verge of becoming non-users, not because of any problem with the technology itself, but because, in this configuration, as supplied by the Post Office, the community would not support it.

In some cases communities of exchange subscribers themselves acted to restrict the size and growth of exchange telephony because they preferred to limit the number of other users. One exchange user in Manchester, where subscription to the Mutual Telephone Company, discussed in chapter five, was only £6, argued against the busy lines being taken up by small householders in the suburbs ordering their groceries.<sup>187</sup> As the Mutual Company employed the call-wire system to enable users to contact the exchange, this subscriber may have believed that his call-wire was unnecessarily busy.<sup>188</sup> Another user expressed concern regarding public call offices, worrying that anyone would be able to pick up a telephone on the street and call a businessman in his office.<sup>189</sup> These potential privacy issues led some subscribers to oppose the introduction of public telephones because they preferred to know who had access to them. Thus, because of this reliance on a community of other subscribers who did not desire to have more users join the system, or to expand access beyond subscribers, exchange telephony in many places remained quite exclusive.

One way in which users could keep exchanges small was by ensuring that the subscription model remained flat-rate. Throughout this period subscribers were charged flat rates per annum for exchange use; as Baldwin noted, rates based on usage instead would have been good for smaller users, but larger users would have had to pay considerably more, and this did not appeal. The Chambers of Commerce for example persistently opposed adopting measured rates based on the numbers of calls made.<sup>190</sup> When

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186 'The Post Office and the Telephone', in the *TJER*, vol. 15 (1884), pg. 73.

187 Subscriber, 'Municipal Telephones', in the *Manchester Guardian*, 15 February 1896, pg. 5.

188 Baldwin, 1925, pg. 234 (n.6).

189 'Disadvantages of Telephone Call Offices', in the *TJER*, vol. 15 (1884), pg. 498.

190 Baldwin, 1925, pg. 607 (n.6).

the general manager of the NTC attempted to introduce measured rates in Sheffield in May 1892, the agitation from the users was such that the proposal was withdrawn. I discuss this case further in chapter four. Cheaper flat rates in places such as London, Manchester and Dundee encouraged more subscribers to join, as discussed in chapters four and five, but were sometimes opposed by users. One subscriber argued that what was wanted was greater efficiency, not lower cost. He would not mind paying for what he used if it worked reliably.<sup>191</sup>

The Scottish MP Andrew Dryburgh Provand, on whom more in chapter five, complained of these kinds of attitudes in 1889 when he was trying to gain support for a Glasgow-based co-operative telephone company which would charge lower rates. In a letter written to the *North British Daily Mail* in Glasgow he decried the apathy of the principal merchants of the city, to whom it was of little consequence whether they paid £5 or £20 a year for their exchange subscriptions. He implored them to “think of the 2000 or 3000 firms and persons in Glasgow to whom the difference between £5, £15, and £20 is a consideration, as by their inaction... they are debarring their fellow-citizens from obtaining the full and extended use of one of the greatest of modern conveniences to business men, lessening the value of the exchange to themselves by limiting the number of its members.”<sup>192</sup> This indicates that for bigger users, it was quite enough for them to be able to talk to other big users without the need for smaller businesses to be connected. I discuss this further in terms of the communications needs of different users in chapter four.

In this respect, communities of larger exchange users actively discouraged an expansion of the telephone system, and priced less wealthy businesses out of the network. Whilst those arguing for lower rates often had a broader conception of telephone entitlement, many influential existing users wanted a small, exclusive network. Indeed, for many merchants and traders the number of other subscribers with whom they wished to speak was small and consistent; it was no use to them to be able to speak to someone outside of their trade.<sup>193</sup> Thus it should not be surprising that some subscribers opposed plans for greater telephone accessibility. However, this posed a problem to those smaller businesses which wanted the opportunity to join a telephone exchange. The solutions to

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191 Subscriber, 1896, pg. 5 (n.187).

192 BT Archives TCB 304/2, file 39a, Transcript of Provand's Letter to the *North British Daily Mail*, 14 December 1889.

193 UK Parliament, Telephone Exchange Service in Glasgow, 1898 (C.8768-9) XLIX.1, evidence of Anton Kufeke, q.183-4.

this problem tended to involve the formation of new, cheaper companies, which will be studied in more detail in chapter five.

#### 4.2. Reliance on non-users

Having considered the impact which communities of exchange subscribers could have on the telephone use-experience of other exchange users or prospective users, I now consider the influence which non-users exerted over exchange or private telephone users by denying or withdrawing wayleaves. Securing wayleaves in order to run overhead wires was often very difficult, as landowners and local authorities, normally non-users, did not want to grant them, and the companies had no statutory rights to demand them. For example, in December 1882 the Northern District Telephone Company reported that they had experienced problems trying to convince members of the local council to allow them to use the roads for their wires.<sup>194</sup>

The concern was often the perceived danger from the wires, or their appearance, as noted above. There were even cases where exchange subscribers themselves would not allow other wires to even pass over their buildings, let alone be attached to them.<sup>195</sup> When Colonel Jackson spoke to the Leeds Chamber of Commerce in 1885 regarding their concerns about the price of telephone subscription, the main reason he cited for the high charges was the difficulty the company encountered in securing wayleaves.<sup>196</sup> Wayleaves were expensive, and often these permissions were subsequently withdrawn by those who had previously granted them, so the company found it needed to rearrange large portions of its system, entailing a great extra expense. This still posed a serious problem towards the end of the period covered by this thesis.<sup>197</sup>

The long anticipated trunk connection between London and the industrialised Midlands and North of the country via Birmingham, finally opened in 1890, was delayed because the Hendon Local Board refused to grant wayleaves; the veto was only removed when they were convinced of the utility of the line through extensive demonstrations.<sup>198</sup>

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<sup>194</sup> Kingsbury, 1915, pg. 277 (n.12).

<sup>195</sup> Telephone and Telegraph Wires, 1885, evidence of Joseph Bond Morgan, q.389-92, and James Staats Forbes, q.1288-91 (n.120).

<sup>196</sup> Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. 6, 13-14 (n.11).

<sup>197</sup> 'The National Telephone Company', in the *Electrician*, vol. 26 (1891), pg. 267.

<sup>198</sup> BT Archives, TCB 304/2, file 68a, Newspaper clipping, *Pall Mall Gazette*, 27 June 1890.

Thus, these non-users could prevent the companies from using the shortest, cheapest routes, and forced them instead to take circuitous, expensive routes, with repercussions for telephone subscribers.<sup>199</sup> Whilst debating the relative merits of two different methods of running telephone wires – the 'cross' system and the 'twist' system – in 1891, telephone engineer Alfred Rosling Bennett argued that the twist system resulted in a much uglier configuration of wires.<sup>200</sup> Bennett noted: “[t]elephone trunk lines have frequently to be carried past gentlemen's houses, and across estates. In such cases, as in dealing with road trustees and county councilmen, sightliness is of material moment, as any telephone manager who has to procure wayleaves knows.”<sup>201</sup> Thus, because the procurement of wayleaves required people's consent, Bennett recommended the cross system (Fig. 3.21.). In this way the opinions and complaints of these non-users influenced the technical decisions of the engineers in charge of the exchange systems.

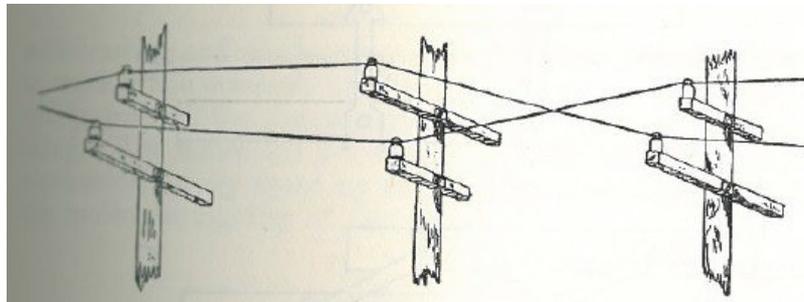


Figure 3.21. The cross system of running wires

Source: Sinclair, D., 'Improvements in the Telephone System of Glasgow and the West of Scotland', in the *Electrician*, vol. 21 (1888), pg. 531

One proposed solution to the wayleave problem was to petition the government to provide the companies with statutory powers to help them to secure wayleaves.<sup>202</sup> However, this did not happen throughout this period, partly because the public were unwilling to concede their rights over their property to a company providing an expensive service for the benefit of the few wealthy subscribers who could afford to pay for it. In one editorial piece in 1892, the *Electrician* commented that the compulsory powers to put up wires which the NTC wanted would be “neither granted nor tolerated in this country.”<sup>203</sup> It seems however that some companies suffered less; for example, when George Sharples

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199 BT Archives, TCB 304/3, file 26a, Newspaper clipping, *Financial Times*, 23 February 1892.

200 Bennett, 1891a, pg. 798-9 (n.100).

201 Bennett, 1891b, pg. 85 (n.10).

202 Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. 14 (n.11).

needed to run a wire through the estate of a wealthy local gentleman in 1884, it was not only permitted, despite the estate being apparently one of the most picturesque in the area, but the gentleman had his own residence connected with Sharples' exchange.<sup>204</sup> Also, Provand wrote in 1890 when trying to establish local telephone companies for Scotland and for Yorkshire that these companies would be more popular locally. They would thus find it easier to obtain local wayleaves than centralised companies based in London.<sup>205</sup> Thus I argue that many people in the provinces were more amenable to locally run businesses providing them with telephone service.

#### 4.3. Summary

These problems of interconnectedness and dependency resulted in a system tailored to the needs of those with the most power and influence. Amongst subscribers this meant the larger, wealthier users, who had the power to bar less affluent businesses and individuals from telephone subscription. Thus in some cases users with narrow views of telephone entitlement were themselves responsible for the lack of growth of exchange systems. Nevertheless, non-users with power in matters of wayleave rights held even more influence, driving up rental prices by demanding high wayleave payments or simply by making it difficult for companies to find routes for their wires. The result was that the companies had to find ways to appease this non-user public as well as their renters.

#### 5. Problems of culture

The final set of problems arose at a level beyond the instruments and equipment, and the people and communities who tried to use them, and occurred when the wider culture tried to make a new social space for the telephone. These problems with culture concerned both private and exchange telephony, and included all the ways in which telephone use came into conflict with existing cultural norms. A new culture was being formed, a telephone culture, which required the construction of new sets of rules to deal with the novel social situations which began to arise when people started using telephones. Most of these problems would not have technical solutions, but social ones, and would only be

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203 'Telephone Reform', in the *Electrician*, vol. 28 (1892), pg. 429.

204 'Telephonic', in the *TJER*, vol. 14 (1884), pg. 111.

205 BT Archives, TCB 304/2, file 78, Blackwood to Raikes, 15 October 1890, Provand to Raikes, 31 October 1890.

resolved when people changed their attitudes or behaviour towards telephony or towards one another.

### 5.1. Coping with stress and unwanted callers

The concern that the telephone would make life more stressful for its users by its intrusive nature was expressed before the first exchange was established in Britain. Although Carolyn Marvin has discussed similar concerns, her sources were drawn mainly from the US case.<sup>206</sup> An editorial in the *Times* in May 1879, already given as the second epigraph of chapter one, noted that modern life had already been made too fast and complicated by the invention of the telegraph. Prior to the employment of telegraphy in commerce, a businessman could plan his day after receiving the morning post. However, now telegrams, brought by messengers, could arrive at any time, answering questions, bringing new requests, or delivering information which had to be acted on urgently.<sup>207</sup> This, the *Times* lamented, would be worse with the telephone, as making telephone calls was easier than sending telegrams, and so people would have fewer reservations about calling regarding smaller, more trivial matters. As the *Times* was read by a large proportion of wealthy commercial, industrial and professional men, this concern for the increasing pace of life was probably representative.

Phebe Lankester, whose reservations regarding the future of domestic exchange telephony comprised the first epigraph of my introductory chapter, concurred with this assessment of the telephone as a technology which would interrupt the course of daily life.<sup>208</sup> Lankester disliked the prospect of being summoned to the telephone by a bell, which I argue might have been too similar to the manner in which servants were summoned. However, I do not believe that the readership of Lankester's syndicated women's column for provincial newspapers would have included many people who could have afforded a telephone in this period.<sup>209</sup> Therefore the fears she expressed were unlikely to have been relevant to them. Nevertheless, both the editorial in the *Times* and Lankester's speculations imply a concern that in the indefinite future people would feel impelled to have a telephone in order to continue to be financially successful, or to keep up with friends. This kind of

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<sup>206</sup> Marvin, Carolyn, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford University Press, 1988), see in particular chapter 2.

<sup>207</sup> The *Times*, 10 May 1879, pg. 11 (n.18).

<sup>208</sup> Lankester, Phebe, 'Our Ladies' Column', in the *Preston Chronicle*, 21 October 1882, pg. 2.

<sup>209</sup> For more details about the newspapers in which Lankester's column was published, see chapter one, n.3.

unwilling use of telephones, especially exchange telephones, is evidence of the inertia of exchange growth, a phenomenon which I discuss in more detail in chapter four.

However, the *Times* noted that as there were limits to human tolerance there would surely be a way of keeping this new evil of constant telephonic interruptions within reasonable bounds. The telephone companies themselves, possibly in response to such sentiment, suggested just such a solution. In their February 1882 list of subscribers the UTC noted that “[s]ubscribers occasionally complain that they object to being rung up and asked questions to which their Clerks can attend, and at the same time many do not like to talk in the hearing of their Clerks or others.”<sup>210</sup> The proposed answer was that subscribers in this position should have an instrument in their office and another, equipped with switching apparatus, outside, under the care of a clerk (Fig. 3.22.). When the telephone rang, the clerk would answer, ascertain whether the person really needed to speak with the subscriber or whether it was a matter he could deal with himself, and only then, if necessary, would he switch the caller through to the office. Likewise the busy subscriber could ask his clerk to ring up a desired number and only switch the call through to the office telephone when the connection had been made, thus saving valuable time waiting at the instrument.



Figure 3.22. 'Table instruments for private rooms'

Source: NTC, English Districts Telephone Directory, April 1891, pg. [2a]

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210 UTC, List of Subscribers, February 1882, pg. 9.

In addition to people calling at the wrong time, exchange subscribers worried that the wrong types of people might also call, and therefore gain access to subscribers. One Edinburgh subscriber raised just such a complaint in 1884 when the first public call boxes were being installed: “[t]he telephone companies appear to propose opening places of call where any person off the street may for a trifling payment – a penny is suggested in some cases – ring up any subscriber, and insist on holding a conversation with him.”<sup>211</sup> This plan he considered most objectionable, and sufficient reason if it went ahead for him to give up his telephone; the telephone was intrusive, and forced subscribers to give up whatever they were doing when it rang to speak to the person at the other end, even if the caller, appearing in person, would have “no claim to such prompt or exclusive attention.”<sup>212</sup> Nevertheless, as long as all subscribers were in the same position, this was tolerable, as they would not desire to waste one another's time. However, he argued that if anyone could insist on being listened to by the leading businessmen of the city they would be forced to protect themselves by paying less attention to telephone calls in general. This user was effectively in favour of limiting the number of people who could use the telephone rather than putting in place mechanisms to screen his calls. He was made uncomfortable by the thought of being accessible to people with whom he would not normally desire to interact, and would consider giving up the conveniences of the telephone himself if this danger became real.

A similar worry was expressed in the *Lancet*, which noted in 1883 that, when medical men were subscribers to the telephone companies, people might abuse the privilege of being able to have a conversation with them for a penny. This would lay such medical men open to communications “from all quarters and at all times”, condemning them maybe to having “a dozen telephonic consultations in one day”.<sup>213</sup> This, the periodical noted, would make life very stressful. These problems of being too accessible through the telephone were not insurmountable; however I argue they did require a change in attitude on the part of the subscriber if he were to keep his telephone. This was because the only technical solution offered by the companies was that of installing an extra instrument so that a subscriber's clerk could screen his calls, noted above. None of the UTC group companies' directories in this period offered subscribers the option to have their numbers left out of the published lists of subscribers in order to increase their privacy. Because the lists of subscribers acted as advertisements for the companies' services as much as

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211 The *TJER*, vol. 15 (1884), pg. 498 (n.189).

212 Ibid.

213 'The Use of the Telephone from a Medical Point of View', in the *Lancet*, vol. 122 (1883), pg. 966.

directories for their subscribers, I argue that it was not in the companies' interest to allow subscribers to opt out of inclusion in their directories.

## 5.2. Negotiating conceptions of telephony

Above I have discussed the concerns about how telephone calls might affect people's daily lives. However, it is also important to appreciate that there was at this time no consensus regarding what a telephone call actually was. There were two different ways to understand a telephone call. It could either be seen as a development of a normal conversation, held remotely, or it could be seen as the equivalent of a telegram, sent along a private wire and to which one received an immediate response. Which model was adopted affected the question of telephone purpose, and made a difference to the uses to which exchange telephony could be put. The kinds of telephone communications which were permissible were determined by the Post Office and the telephone companies, but not always adhered to or understood by users. This was because, whilst many of the users employed the analogy of a normal conversation, the providers of telephone service, the Post Office and the companies, employed the analogy of a telegram.

For the Post Office, the court ruling of December 1880 confirmed that a telephone was legally equivalent to a telegraph, as both transmitted messages via the medium of electricity along a wire; therefore, by extension, a telephone message was a telegram.<sup>214</sup> The companies, despite their complaints regarding this ruling, also benefited from such a conception: when marketing the telephone and stressing its utility, they emphasised the number of messages which had been transmitted using their system. A message, however, was not one telephone conversation between two subscribers, but one side of the telephone conversation. Both subscribers in the conversation were counted as having sent a message.<sup>215</sup> Thus, each telephone conversation comprised two messages, and the company's statistics looked better.

This distinction, between a remote conversation and a pair of telegrams, had implications beyond marketing. It determined, legally, what a subscriber could use a telephone for. For example, a situation arose in Manchester in 1884 whereby certain clubs had to be reprimanded by the Postmaster General for illegal transmission of news.<sup>216</sup> These clubs had arrangements with the Post Office that they would receive racing news

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<sup>214</sup> Baldwin, 1925, pg. 43-45 (n.6).

<sup>215</sup> UTC, List of Subscribers, February 1882, pg. 8.

<sup>216</sup> 'The Post Office and the Telephone', in the *TJER*, vol. 14 (1884), pg. 526-7.

telegraphed to them at special press rates, on the condition that this news was only for display in the club rooms; any further transmission of this news, especially systematic transmission, was an abuse of privilege, and against the terms of the agreement. However, when these clubs acquired exchange connections, people called to ask for this news to be told to them over the telephone. Whereas they may have believed that the simple act of having a conversation in which they were told news which was freely available in the club rooms was not problematic, in the terms used to understand telephony by the Post Office and the companies this comprised a retransmission of the information.

Likewise in Liverpool, similar concerns arose during elections and, more commonly, during cricket matches.<sup>217</sup> Operators were not allowed to tell subscribers any news, as these telephonic conversations counted as telegraphic communications. The L&C claimed that this led to a ridiculous situation whereby the Post Office could transmit election news, and put it on posters in the street, but telephone companies could not send messengers to look at the posters, tell the operators, and then allow the operators to tell subscribers the news. The same applied to sending a messenger to get cricket news and then allowing operators to relay that to interested subscribers. Thus, although the *Manchester Courier* complained bitterly about the penalties exacted on the clubs in question by the Postmaster General, and the L&C complained that the Post Office was restricting their business, Fawcett was merely enforcing a rule intended to regulate the dissemination of a commodity, namely, telegraphic news.<sup>218</sup>

More evidence of the different ways in which telephony was conceived by the public and by the providers was the fact that these groups used different terms to describe telephone instruments. Educated laymen, who were not acquainted with telephone matters, reversed the terms transmitter and receiver, and were furthermore able to defend their choice of names. Although the accepted name among electricians for the instrument into which one spoke was the transmitter, because it transmitted an electrical impulse along the line, such people called it the receiver, because it received the voice. Likewise the instrument to which one listened, called by electricians the receiver because it received the electrical currents from the other instrument, was being called a transmitter, because it transmitted the sound of the speaker's voice to the listener's ear.<sup>219</sup> The key to understanding this confusion is the same as that required to understand the previous

217 Roberts, Stan, *The First Hundred Years of the Telephone Service in the Liverpool Telephone Area* (n.d.), pg. 7.

218 Ibid.; the *TJER*, vol. 14 (1884), pg. 527 (n.216).

219 Kingsbury, 1915, pg. 454 (n.12).

distinction: the layman saw these instruments, and indeed telephony in general, as extensions of the everyday world of the senses and of normative human interaction. Hence the emphasis placed on the action produced by each instrument with regard to the sounds of the voice. However, the electrician saw these instruments in terms of their electrical actions.

Examples of this occur throughout this period in the popular press, for example when newspapers or journals described arrangements of telephone instruments or wrote of receivers being placed on a stage to pick up the voices of singers or actors.<sup>220</sup> One account noted how a gentleman frustrated with his telephone was “bawl[ing] into a receiver”<sup>221</sup> to try to make himself heard. In this case, as in others, a telephone user referred to the part of the instrument into which one spoke as a receiver, instead of a transmitter. This confusion appeared even in the pages of specialist electrical journals.<sup>222</sup> Indeed, although it may have appeared obvious to technical men that their definitions were correct and the best descriptions of the instruments, it did not necessarily have to be this way. There is no inherent reason why the version of the names which was based upon intuitive, human experience should not have taken precedence over names derived from the telegraphic working of the instruments. However, I argue that the technical men, as the promoters of the technology and those responsible for explaining it through lectures and publications, possessed the authority to convince the public to adopt their chosen labels.

### 5.3. Summary

The solutions to these problems of culture were not technical, but social. The concerns of users regarding the telephone as a disruptive technology in the business or domestic sphere could be addressed by their maintaining an elitist attitude towards telephone entitlement which restricted exchange growth. Additionally, concerns about stress and about being too accessible to the wrong people at the wrong time could discourage telephone use during the period in which people were becoming accustomed to the potential advantages and disadvantages of exchange telephony. These problems reveal also the different conceptions of telephony held by the public and by the providers: whereas the layman often saw telephony as an extension of normative human interaction, the telephone providers viewed it in telegraphic terms. These different conceptions led to

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220 'The Telephone', in the *Manchester Guardian*, 5 December 1877, pg. 6; “Bohemian Girl” - Opera by Telephone', in the *Manchester Guardian*, 24 September 1883, pg. 5.

221 The *Birmingham Daily Times*, 14 April 1888 (n.84).

222 'The Telephone in Sweden', in the *Electrician*, vol. 16 (1885), pg. 102.

different ideas and expectations regarding the purpose of telephony which, as noted above, could lead to conflict and tensions between telephone users and suppliers. Ultimately these problems were resolved with legal solutions which formalised the views of the Post Office, as a body representative of the general public, over those of the telephone users.

## 6. Conclusions: the heterogeneity of telephone instruments and systems

By the end of the period covered by this thesis, the complaints of users and non-users led to certain important changes in telephony. For example, the Edison receiver was abandoned in favour of the Bell instrument because of user preferences. Likewise, there were fewer complaints about operators by the 1890s. This decrease coincided with the replacement of boy operators with women, and I argue that here as well the telephone companies took the views of users into consideration. Neither the Edison receivers nor the boy operators, both components of telephone systems, were considered by users to be fit for the purpose for which they required exchange telephony. Thus users' notions of telephone purpose – what they believed telephones ought to be used for – directly or indirectly determined the components and the design of telephone systems. Furthermore, when users decided that exchange telephony in general was not suitable for the purposes for which they wanted to employ it, they sometimes gave it up, which impacted negatively on the growth of the exchange system. However, in both of the above cases the complaints of the users only acted as a catalyst for change, and were not the sole reason; for example, the Edison receiver was never used commercially in the US, and the trend towards employing women as operators was universal in every country with exchange telephony over the course of the mid-1880s.<sup>223</sup>

In contrast, the complaints of users regarding the cost of subscription were only effective when sufficient numbers of subscribers joined together, and in particular when the existing UTC company was threatened with competition. I will examine cases of this further in chapters four and five with regard to Aberdeen, Dundee, Manchester and Sheffield. Other than this I argue that the companies preferred to attempt to adjust the expectations of users and non-users by justifying their prices with references to higher exchange prices elsewhere, and by blaming the Post Office royalty. Indeed, because of their elite view of telephone entitlement, I have argued that many larger subscribers were also responsible for keeping prices high by opposing lower rates. Such subscribers preferred that exchanges remained exclusive in order to limit the number of people who

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223 Kingsbury, 1915, pg. 194-7 (n.12); Feuerstein, 1990, pg. 315-6 (n.6).

could call them. Although by the end of this period the price of subscription had been reduced in the provinces, this was largely because of the increased threat of competition after the patents expired. Nevertheless, in London the situation was still very frustrating for many users. The founding of the Association for the Protection of Telephone Subscribers in London in 1892, discussed in chapter five, illustrates further how dissatisfied London users still were.

The problems with interference, cross-talk and general noise on telephone lines went largely unresolved during this period, although users of Post Office exchanges and one or two other smaller systems were unaffected by this, as noted in chapters four and five. The complaints of non-users regarding overhead wires, on the other hand, did impact on telephony. The formation of the Select Committee on Telephone and Telegraph Wires was in itself an indication of the strength of feeling on this point. However, even after the Select Committee reported that the wires were safe, many non-users still thought they were ugly, if not dangerous, and continued to deny wayleaves to the companies. The effect of this is hard to quantify. Nevertheless, the fact that Alfred Bennett, in 1891, recommended configuring overhead wires in a way which would be least unsightly for landowners indicates that this was certainly a concern for telephone suppliers towards the end of the period covered by this thesis.<sup>224</sup> Thus I conclude that those with the most power to exert their influence over the telephone suppliers through their complaints were large groups of users acting together, and non-users on whom the companies depended for wayleaves.

As a result of exploring these problems and complaints, non-use of the telephone in this period is not difficult to understand. Telephone systems were very varied, not always intuitive, and often difficult to use for conversation. The establishment of rival, local companies in various towns and cities around the country, discussed in chapters four and five, varied further the different use-experiences around the country. This heterogeneity of systems and instruments resulted in a corresponding heterogeneity of use-experiences which enables us to understand why some users maintained their telephone subscriptions whilst others, like Clifford Dunn of Leeds, decided to give theirs up. Even a subscriber's position on a switchboard might make a difference, as well as the type of exchange he was connected to, the distance he was from the exchange, and the same details again as applied to the subscriber with whom he desired communication. In the next chapter I continue to pursue this theme of heterogeneity by examining the establishment and growth of exchanges, and reveal how the different uses to which subscribers put their exchange

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<sup>224</sup> Bennett, 1891b, pg. 85-6 (n.10).

connections shaped the variety of different exchange systems which developed around the country.

Considering how difficult telephone use could be, it is pertinent to question not why people did not use the telephone, as Perry asked,<sup>225</sup> but why people invested their time and money in the system in the first place. It appears there were very few groups of users who had no complaints at all; even the relatively well-served Manchester and Liverpool communities, with big, wealthy commercial users and arguably some of the best equipment in the country, were not happy with their service. I argue that the answer lay in their expectation of the potential of the system from hearing reports of the situation in the US. As Perry has pointed out, comparisons were often made and the numbers of telephone users active in the US was pointed out in the press.<sup>226</sup> Although I have argued in chapter one that specific international comparisons in this period were problematic, nevertheless the expectation that telephony could be better somewhere else was important. Jon Agar has provided another example of this phenomenon in the case of mobile telephony a century later. Subscribers to Paris's new mobile cellular telephone network were complaining about the service they were receiving, and Agar noted "the telling observation of France Telecom's Philippe Dupuis in 1988: 'If it had not been demonstrated in other countries that mobile communications can become more abundant and cheaper, everyone would be happy.'"<sup>227</sup> Thus, it may have been this expectation which drove people to subscribe and to remain subscribed to early British telephone systems.

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225 For example: Perry, 1977, pg. 74 (n.8).

226 'The Development of the Telephone System', in the *Times*, 7 December 1882, pg. 3; 'The Telephone', in the *TJER*, vol. 12 (1883), pg. 387; 'A New Telephone Exchange', in the *Electrician*, vol. 16 (1885), pg. 5.

227 Agar, Jon, *Constant Touch: A Global History of the Mobile Phone* (second edition, Icon Books, 2013), pg. 55.

## **Chapter Four: Diverse experiences of exchange telephony: the Post Office, the UTC group and the 'Independents'**

### 1. Introducing exchanges

“My experience in Dundee is that half of the value of the telephone system is lost by their [sic] being two companies... I venture to think that the saving of a small sum per annum would ill repay the annoyance and interruption to business.”

John White, Aberdeen telephone exchange subscriber, February 1883<sup>1</sup>

“Thanks to local enterprise, we have enjoyed for a long time reasonable rates, and shall strongly resent any imposition [from the National Telephone Company].”

'Bellum', Sheffield telephone exchange subscriber, May 1892<sup>2</sup>

Having demonstrated the heterogeneity of telephone systems around the country in the previous chapter, here I expand on this theme to show how exchanges developed differently depending on the purposes to which they were put. Whereas most histories of telephony simply assume that exchanges were an inevitable step in telephone development, in this chapter I demonstrate the specific contingencies by which exchanges developed in Britain by analysing the reasons for their establishment and growth. I firstly give some historical background regarding exchange telephony in Britain, focusing on the legal context of the Post Office licences. Next, I explore why exchange telephony, on a local, regional and national level, came about; considering who wanted exchanges and why I explain the ways in which exchange systems developed in different towns and cities. In particular I examine how trunk lines were an incentive to potential users, and also the different uses to which exchange telephony was put. I then analyse how different patterns of exchange use affected the growth of exchanges around the country by considering the three different providers of exchange telephony – the UTC group, the Post Office and the 'independent' companies – in terms of their users. Finally I evaluate how the different purposes for which exchange telephony was used contributed to debates about exchange telephone ownership. Given the geographical spread of the cases discussed in this chapter, the conclusion draws out the significance of provincial regions for understanding the development of British exchange telephony.

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1 'Telephonic Communication in Aberdeen', in the *Aberdeen Journal*, 9 February 1883, pg. 6.

2 Bellum, 'Telephone Rates', in the *Sheffield and Rotherham Independent*, 9 May 1892, pg. 8.

Discussions about how best to run exchange systems were common in the period covered by this thesis. For example, in February 1883, a meeting of Aberdeen businessmen was convened to discuss the desirability of establishing a local telephone exchange to compete with the existing NTC system.<sup>3</sup> However, from his experience of the two competing exchange systems then operating in Dundee, John White, an Aberdeen corn merchant and miller, wrote in absentia to advocate reaching an agreement with the existing company instead. Although the proposed new company would have been cheaper than its rival, White noted that having two companies without intercommunication was very inconvenient if the person you wanted to speak with was on the other system; thus the financial saving would have been negated. Such discussions reveal how different experiences of exchange telephony were around the country. Through examining different exchange systems, this chapter addresses how exchange users and non-users – in this case those who wanted to become users – contributed to discussions regarding telephone ownership and purpose. I argue that subscribers' views on who should supply exchange telephony were strongly influenced by the way in which they wanted to use exchange systems. Thus different notions of purpose resulted in different models of ownership.

In this way my use-focused approach enables me to draw out factors which are not evident in existing, supply-focused accounts of the history of exchange telephony, such as the different uses to which exchange telephony could be put within 'open' or 'closed' networks, as defined below. The influential accounts of Kingsbury, Baldwin and Perry, as well as Feuerstein's thesis, all focused on the provision of telephony, whether from an engineering, an administrative, or a political perspective, and did not show how users influenced exchange development. In addition, I examine various provincial towns and cities as explained in chapter one; this national focus gives me a broader view of developments which occurred around the country instead of focusing specifically on one town or area, and allows me to compare and contrast different cases. Although some local histories have been written for specific areas, often to mark local telephone centenaries, these do not provide a national perspective on telephone development as a whole, or reveal how different areas and regions influenced one another.<sup>4</sup> I examine the ways in which local

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3 The *Aberdeen Journal*, 9 February 1883, pg. 6 (see n.1).

4 For example: London: Occomore, David, *"Number, Please!" A History of the Early London Telephone Exchanges from 1880 to 1912* (Ian Henry Publications, 1995); Liverpool: Roberts, Stan, *The First Hundred Years of the Telephone Service in the Liverpool Telephone Area* – there are two editions of this source in the BT Archives, neither of which have a date; Birmingham: Tupling, R. E., *A History of the Birmingham Telephone Area* (Post Office, 1978); Bristol: Hall Ellis, M. J., *The Early Years of the Telephone Service in Bristol, 1879-1931* (British Telecom, 1989); Oxford: Earl, R. A. J., *The Development of the Telephone in Oxford, 1877-1977* (Post Office, 1978); Bath: Hall Ellis, M. J., *The Early History of the Telephone in*

events had national effects and thus demonstrate in the concluding section of this chapter the importance of investigating developments in provincial, regional telephony.

This chapter focuses on exchange telephony in smaller provincial towns, as well as on Post Office exchanges and local 'independent' companies, in order to address these gaps in the historiography. In the first two years of exchange telephony many small companies began to provide local exchange service around the country. At this stage, I argue that it was not clear how exchange telephony was going to progress, and that it was not inevitable that the system which eventually emerged should have done so. Indeed, Stein noted that the telephone system could have developed differently. His example of this was the Mutual Telephone Company in Manchester, which I discuss in chapter five.<sup>5</sup> Stein noted that in the US, once the telephone patents expired, thousands of mutual or independent telephone companies were established, mostly in rural areas; he wondered why the situation had not been similar in Britain.<sup>6</sup> In this chapter I demonstrate that independent, local telephone companies were indeed established in Britain. However, this happened at the beginning of exchange telephony, before the American companies started appearing, and they had all gone by the end of the period covered by this thesis. In this respect, Britain was ahead of the US.

## 2. A brief overview of British exchange telephony

Before examining the processes by which exchanges were established and subsequently grew, I first give some historical background about exchange telephony in Britain during the period covered by this thesis, focusing on the particulars of the Post Office licences. The first British telephone company, the Telephone Company, was established in June 1878 with control of Bell's patent.<sup>7</sup> A year later, in August 1879, another company, the Edison Telephone Company of London, was founded to work the

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*Bath* (British Telecom, 1986); Gloucester: Dodd, Arthur, *History of the Telephone Service in Gloucester* (British Telecom, 1987).

- 5 Stein, Jeremy, 'Ideology and the Telephone: The Social Reception of a Technology, London 1876-1920' (Ph.D. thesis, University College London, 1996), pg. 124.
- 6 *Ibid.*, pg. 245. For more on independent telephony in the US, see MacDougall, Robert, *The People's Network: The Political Economy of the Telephone in the Gilded Age* (University of Pennsylvania Press, 2014).
- 7 Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925), pg. 20. For details about how the company was formed, see Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990), pg. 36-57.

competing patents of Thomas Edison.<sup>8</sup> These companies both began to provide exchange service in London in August and September of 1879,<sup>9</sup> and by the end of the year had also opened affiliated exchanges in Manchester, Liverpool, Glasgow, Edinburgh, Birmingham and Bristol. Others quickly followed around the country, although Baldwin noted that it is not always possible to determine exactly when particular exchanges commenced operation because it was not well documented and they often did not open with any ceremony or advertisement.<sup>10</sup>

As noted in chapter one, in December 1880 telephony was declared to be legally a form of telegraphy, and thus public exchange telephony came within the Postmaster General's public telegraph monopoly. The Post Office then offered to issue licences to any companies which desired to establish exchanges. The licences were local, with telephone service limited to a radius of a few miles from the centre of the town. The Post Office would construct and maintain trunk lines between towns, and rent these to the companies. In addition, companies would pay a 10% royalty on their gross receipts to the Post Office, and could not open call offices for non-subscribers to use exchange telephones.<sup>11</sup> The Post Office also reserved the right to establish its own exchanges, which it did in towns such as Newcastle, Leicester, Hull and Plymouth.<sup>12</sup> As the Post Office already supplied systems of ABC telegraphy in many towns, and some telegraph exchanges, discussed in more detail below, these were often simply replaced with telephones.<sup>13</sup> Meanwhile, the two telephone companies had amalgamated to form the UTC in May 1880, and, possessing a master patent over British telephony, began to establish associated telephone companies to provide

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8 Baldwin, 1925, pg. 33 (n.7).

9 Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 193. Subscriptions were for the year and were flat-rate, with the Telephone Company charging £20 per annum and the Edison Company £12 (Baldwin, 1925, pg. 33 (n.7)).

10 Baldwin, 1925, pg. 116-9 (n.7).

11 Ibid., pg. 45, 51.

12 Although the Treasury only allowed this as a tool to improve the telephonic position of the Department and thus aid in negotiations with the private companies: Robertson, J. H., *The Story of the Telephone: A History of the Telecommunications Industry of Britain* (Sir Isaac Pitman and Sons, Ltd., 1947), pg. 34; regarding Newcastle: Baldwin, 1925, pg. 147 (n.7); Plymouth, Baldwin, 1925, pg. 467; Leicester and Hull: 'The London Telephone Service', in the *Electrician*, vol. 28 (1892), pg. 436.

13 Baldwin, 1925, pg. 122-3 (n.7). I have described ABC telegraph instruments in chapter three, section 3.1.1.

telephony in the provinces, as noted in chapter one.<sup>14</sup> There were also some local independent companies established and maintained around the country, which were gradually bought out by the larger companies over the course of the 1880s and early 1890s.<sup>15</sup> These local companies have not been extensively researched, and will be discussed in detail below.

However, by 1884 pressure from Parliament, the press and the companies began to mount on the Postmaster General Henry Fawcett to alter the conditions of the Post Office licences.<sup>16</sup> To this end he held a consultation with all the exchange telephone companies in July. Taking their recommendations into account, Fawcett announced new licensing terms, making two major changes which came into force that November. The first of these changes enabled the companies to open public call offices. The second change abolished the local restrictions on the companies and allowed trunk line expansion. Subsequently the trunk line network grew rapidly.<sup>17</sup> As I demonstrate below, these trunk lines provided important incentives for new subscribers to join local exchanges by increasing the purposes for which exchange connections could be used. Liverpool and Manchester were connected to each other, and also to the Yorkshire district of the NTC and to the NDTC. This resulted in a relatively dense network. London, however, remained telephonically isolated from the provinces until July 1890, when it was connected to Birmingham, and thus to the rest of the north of England.<sup>18</sup> I argue that this indicates that during this period London was neither the most advanced nor the most important telephone centre in the country.

Under the terms of the telephone licences, the government could purchase the telephone companies at certain intervals, the first being at the end of 1890.<sup>19</sup> With this approaching, in May 1889 the NTC bought up the UTC and the L&C. The process of

14 Ibid., pg. 40, 135.

15 For example, in Dundee, Sheffield, Swansea and Preston: Baldwin, 1925, pg. 142-6 (n.7); BT Archives, TCB 304/1, file 5 and 6, correspondence between the independent companies and the Post Office regarding a consultation to reform the existing licence conditions, and a report of a meeting on this topic.

16 Baldwin, 1925, pg. 566-9 (n.7).

17 Ibid., pg. 570-1; Kingsbury, 1915, pg. 429 (n.9).

18 '1885', in the *Electrician*, vol. 16 (1886), pg. 152; Baldwin, 1925, pg. 477-81 (n.7). Although London had been connected to Brighton in 1884, this trunk line was not very efficient: Baldwin, 1925, pg. 474; 'Telephone Systems of London, Manchester and Glasgow', in the *Electrician*, vol. 21 (1888), pg. 527.

19 BT Archives, TCB 304/2, file 66, Questions from Sir John Puleston and Mr. Labouchere in Parliament, 20 June 1890.

amalgamation then continued until, by 1894, the NTC was the only telephone company in the UK.<sup>20</sup> Another reason behind the amalgamation was the imminent expiry of the key telephone patents – Bell's in December 1890 and Edison's in July 1891.<sup>21</sup> This prompted threats of competition, such as from a new co-operative company called the Mutual Telephone Company in Manchester, and the Duke of Marlborough's New Telephone Company, which he claimed would provide cheaper, more efficient telephony in London and eventually across the country.<sup>22</sup> These companies will be examined in chapter five. In response to this competition, as noted in chapter three, the NTC reduced its prices in the provinces twice between May 1890 and January 1891 to £10, but maintained the same £20 charge in London.<sup>23</sup>

Meanwhile the Post Office had continued to run 35 of its own exchanges in certain towns, but most of them, with the exception of Newcastle, remained small.<sup>24</sup> As demonstrated in the table below, the UTC group companies had considerably more subscribers' lines than the Post Office. Because it was a smaller provider, the Post Office's telephone exchange systems were not considered very important by commentators at the time or subsequently by historians.<sup>25</sup> Nevertheless, I argue that the Post Office telephone systems were very important for their users, and below I examine them in more detail alongside the exchange systems of the UTC group companies and independent local companies.

Table 4.1. Numbers of subscribers' lines<sup>26</sup>

<i>Telephone service provider</i>	<i>Date</i>	<i>Number of lines</i>
Post Office	31 March 1892	4,691
Amalgamated NTC	1 May 1889	23,585

20 Baldwin, 1925, pg. 191-7 (n.7); 'Telephone Amalgamation and the Post Office', in the *Economist*, 8 June 1889, pg. 731-2.

21 Baldwin, 1925, pg. 193 (n.7).

22 Mutual Telephone Company: *ibid.*, pg. 194-7 (n.7); New Telephone Company: *ibid.*, pg. 232-6.

23 *Ibid.*, pg. 605.

24 *Ibid.*, pg. 133; the *Electrician*, vol. 28 (1892), pg. 435 (n.12).

25 For example: the *Electrician*, vol. 28, (1892), pg. 435 (n.12); Feuerstein, 1990, pg. 272 (n.7).

26 Baldwin, 1925, pg. 133, 191-2, 197 (n.7).

NDTC	30 April 1890	1,551
SETC	31 October 1890	3,235
WC&SW	1 January 1892	4,027

### 3. Problematising public exchange telephony

Having considered this historical context, I now consider how and why public exchanges, meaning those for which subscribers were actively solicited, were opened and why they grew. I explore who benefited from exchange systems, and the purposes to which they were put by users. I demonstrate that public exchange telephony was not a homogeneous phenomenon; different types of exchanges offered different types of connections, from local to national, through their trunk lines, and were thus useful to different groups of subscribers. In order to examine the heterogeneity of exchange telephony around the country, I first examine how exchanges were established and networks developed. I then assess the roles which different types of trunk lines played as incentives to different groups of users. Finally I consider the different purposes for which public exchange telephony was used by different subscribers as either an 'open' or a 'closed' network.

#### 3.1. Establishing and growing exchanges

Telephone historians have not tended to question the establishing of public exchanges as a step in the development of telephony, but rather have assumed that the establishment of exchanges naturally followed a certain critical mass of private lines as part of the logical progression of the system. I believe that this was because the earliest histories were written either by journalists for a broad public, such as Casson and Robertson, or by telephone engineers who worked in exchange telephony, such as Baldwin and Kingsbury. Subsequent historians have followed this lead, often taking public exchanges as a starting point, or at least as an inevitable end point. However, not all users of private telephony wanted a public exchange connection. As will be discussed below, in some towns the majority of businessmen did not initially want an exchange. In this section I examine the difficulties of building and using public exchanges, then compare this with the benefits of using private exchanges, and finally consider how exchange telephony was sold to potential users.

### 3.1.1. Public exchange infrastructure

Building public exchanges was more expensive for telephone companies than erecting private wire systems. The business historian Graeme Milne has noted that when building a public exchange from scratch a “locational critical mass”<sup>27</sup> of subscribers was required to justify the investment in wires, poles and exchange buildings. Poles needed initially to be erected and wires strung to individual subscribers in the hope that more potential subscribers in the vicinity would also join the exchange, making use of some of the same plant and thus justifying the expenditure. Milton Mueller has pointed out that an exchange became more expensive to run the bigger it grew. This was mainly because multiple switchboards, described in chapter three as a more time-efficient means of connecting subscribers, cost more to produce and fit when every subscriber needed the potential to be connected to every other subscriber. Thus as the number of subscribers increased, the amount of wire required to connect them all increased at a faster rate, roughly as the square of the number of subscribers.<sup>28</sup> I argue that this was one of the reasons why exchange subscription in London continued to be so much higher than the rest of the country, £20, when rates elsewhere were reduced.<sup>29</sup>

For subscribers, a public exchange connection cost more than a private line, and would at first offer only limited benefits, especially for those subscribers who wanted to communicate primarily with their other, distant business premises, perhaps in another part of the city or in an outlying town. Indeed, Milne, in the context of business use, noted that it was sometimes better for these users to revert to private lines, even after having used an exchange connection.<sup>30</sup> This way they were guaranteed a more reliable connection, with no delays. An example of this can be found in the case of George Sharples' independent exchange in Preston. Many firms for whom Sharples erected private wires received an exchange connection on trial, but not all of them found the exchange wire more useful than the private line. In a letter to the Post Office in May 1882 Sharples wrote of Paul Butler and Sons, corn merchants, that their exchange connection was “of very little use to them”, and that they did not want to become full subscribers to the exchange after the expiration of

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27 Milne, Graeme J., 'British Business and the Telephone, 1878-1911', in *Business History*, vol. 49, no. 2 (March 2007) pg. 165.

28 Mueller, Milton, 'The Switchboard Problem: Scale, Signaling and Organization in Manual Telephone Switching, 1877-1897', in *Technology and Culture*, vol. 30, no. 3 (July 1989), pg. 534-5.

29 Baldwin, 1925, pg. 605 (n.7).

30 Milne, 2007, pg. 171 (n.27).

their free trial period.<sup>31</sup> Although no further reason was provided, this indicates that public exchanges were not always beneficial for businesses.

### 3.1.2. The benefits of private exchanges

Some large firms had their own private exchanges installed to facilitate their internal business communications. For example, in late 1879 the large brewing firm of Messrs. Bass and Co., of Burton-on-Trent, had the whole of their works placed in telephonic communication by John Tasker's local Sheffield telephone company.<sup>32</sup> A similar system was installed in 1881 by a Cardiff moving company, which connected premises including its general office, cab office, bus office and a local coffee tavern, so that customers could go to any one of those addresses and their order would be telephoned to the relevant place.<sup>33</sup> By December 1883 the proprietors of the *Bolton Evening News* were also using a private telephone exchange to communicate between the offices of the various local Lancashire newspapers they ran, and the NTC had completed an extensive system for Messrs. William Denny and Bros., Dumbarton, one of the largest ship-building firms on the Clyde.<sup>34</sup> This latter comprised 22 wires connecting yards, engine works, forges, foundries and private houses, and the *TJER* noted that it was “perhaps the largest and most complete private telephone system existing.”<sup>35</sup> Thus, telephony was useful to firms without their needing to subscribe to public exchanges.

Indeed, considering the complaints discussed in chapter three, sometimes a private system was a better option, as it was under the firm's direct control. Official bodies also used private exchanges; for example Liverpool's City Engineer had a small exchange in

31 BT Archives, POST 30/406a, file 4, C. H. Sharples to Chetwynd, 18 May 1882; Butler and Sons as corn merchants: Slater's Lancashire Directory, 1895, pg. 606 (viewed on Ancestry.co.uk – nb: this source is listed on the website as “1895 Kelly's Directory”).

32 'The Telephone in Burton', in the *Sheffield and Rotherham Independent*, 9 September 1879, pg. 6; 'The Telephone', in the *Sheffield and Rotherham Independent*, 24 December 1879, pg. 3. In January 1880 the company testified that this system was “simply invaluable” for enabling its distant offices to speak to one another clearly and naturally without delay, and that it worked “exceedingly well.” (As quoted in The Telephone Company, List of Subscribers, February 1880, pg. 26.)

33 'Keep Moving, Employ S. Andrews's Star Furniture Vans', in the *Western Mail*, 12 August 1881, pg. 1. This firm built buses, trams and furniture vans ('Andrews' Coach Factory at Cardiff', in the *Western Mail*, 31 August 1882, pg. 3).

34 'Telephonic', in the *TJER*, vol. 13 (1883), pg. 426; UK Parliament, Report from the Select Committee on Telephone and Telegraph Wires, 1885 (188) XII.101, evidence of Robert Raynsford Jackson, q.1121.

35 'Telephonic', in the *TJER*, vol. 13 (1883), pg. 426.

communication with all the depots connected with his department.<sup>36</sup> From late 1881 the Treasury had a switchboard connecting all the major government departments in London.<sup>37</sup> The government and some municipal authorities thus benefited from having a telephone system which was independent of the public system. Several members of the aristocracy also installed such systems, including Queen Victoria, the Prince of Wales, and the Dukes of Norfolk, Devonshire, Newcastle and Marlborough.<sup>38</sup> This indicates a willingness among the upper classes to engage with new technology. As noted in chapter one, this has been overlooked in previous histories of technology, but has been brought back into focus by Gooday's emphasis on the "technophile aristocracy".<sup>39</sup> Although private telephone exchanges have not been considered in existing histories, I argue that by 1883 they comprised a common use for which telephones were employed alongside public exchanges. They also gave businessmen more reason to consider adopting telephony, and employees more exposure to it.

### 3.1.3. Selling the vision of public exchange systems

Once public exchange infrastructure was in place, people needed to be convinced to join the system. In June 1889, in a Post Office memorandum on telephone policy, the authors stated that the UTC and its subsidiary companies had long been in the habit of distributing for free some of their shares amongst the principal business people in the towns where they established exchanges. They then recruited as their local directors influential local businessmen, mayors, and members of Chambers of Commerce, and these men, who were effectively the first shareholders and subscribers to the company in the area, then acted as agents of the company. If someone hesitated to join the exchange they persuaded him, and then the company's engineer went to his office and offered to put the telephone in for free for three months. This offer was seldom refused, as the men who were pressing him were also those with whom his business required that he frequently communicate.<sup>40</sup> Indeed, at a meeting of telephone subscribers called to condemn the conduct of the NTC in

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36 Telephone and Telegraph Wires, 1885, evidence of Clement Dunscombe, q.22273 (n.34).

37 BT Archives, POST 30/1153B, Eaton to Graves, 4 August 1881.

38 'The Telephone in Sheffield', in the *Sheffield and Rotherham Independent*, 17 January 1888, pg. 2; Marlborough, 'The London Telephone Service', in the *Electrician*, vol. 27 (1891), pg. 538.

39 Gooday, Graeme, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (Pickering and Chatto, 2008), pg. 2, and see also pg. 116-7.

40 BT Archives, TCB 304/2, file 22, Memorandum Prepared for Information of Lord Salisbury with Reference to Notice of Motion Given by Duke of Marlborough, 28 June 1889.

Sheffield in May 1892, the mayor did not want to join a committee to negotiate with the NTC on behalf of the subscribers because he was connected with the company.<sup>41</sup> This demonstrates that in instances of discontent, the companies' methods could act against the wishes of subscribers.

One common tactic, the promise of free service on a trial basis, usually three to six months, was a big incentive for early users.<sup>42</sup> In December 1880, when telephone exchanges had been operational in Britain for just over a year, the Secretary of the Post Office, Stephenson Arthur Blackwood, noted that the telephone companies took their wires to the premises of firms who had not asked for them, and offered them a year's free service.<sup>43</sup> Where there was competition between telephone companies, these free trial periods were sometimes extended almost indefinitely by the UTC group companies, which could afford it. Although the Postmaster General agreed with the smaller local companies when they protested, he was powerless to stop the practice.<sup>44</sup> In this way the telephone companies began to get many subscribers interested in their exchanges. Nevertheless, not all large commercial towns wanted telephone exchanges immediately. Gloucester was one example: despite meetings and marketing attempts in 1880, 1883, 1885 and 1886, sufficient interest for an exchange was only obtained in 1887.<sup>45</sup> However, given the efficiency of postal and telegraphic communications around the country in this period, as well as the availability of messengers, it is understandable that the introduction of exchange telephony

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41 'National Telephone Co. and its Charges', in the *Sheffield and Rotherham Independent*, 10 May 1892, pg. 7.

42 For example, in Bath: Hall Ellis, 1986, pg. 87 (n.4); in Birmingham: Baldwin, 1925, pg. 109 (n.7); and in Aberdeen: 'Telephonic Communication in Aberdeen', in the *Aberdeen Journal*, 2 February 1883, pg. 6.

43 BT Archives, POST 30/542, file 1, Blackwood to Fawcett, 10 December 1880.

44 For the way in which this tactic was used against local opposition companies in Preston and Dundee, see: BT Archives, POST 30/406a, file 7, document giving legal discussion asking for Law Officers' opinion on Preston and Dundee, 13 May 1882, and then the subsequent ruling, 7 June 1882.

45 Dodd, 1987, pg. 10-12, 14-16 (n.4). Two other examples were Coventry and Reading, both bigger than Gloucester (BT Archives, TCB 304/1, file 2, Towns whose Population Exceeds 20,000 that are Without a Telephone Exchange [May 1884]). In June 1889, the *Coventry Mercury* noted that although an exchange had just opened there, the NTC had approached the town to open one in 1886, but had received little support (BT Archives, TPF/2/12/2, pg. 48, 'The Telephone in Coventry', in the *Coventry Mercury*, 26 June 1889). An exchange was opened in Reading in October 1886 (BT Archives, TPF/2/13/2/1, file 53, Agreement between the South of England Telephone Company Limited and the Mayor, Aldermen and Burgesses of the Borough of Reading (22 October 1886)).

was not always a priority.<sup>46</sup> Some local communities simply did not want exchange telephony for many years.

The advent of telecommunications exchanges and their associated networks of users comprised the first time that the availability and efficacy of a technology to an individual depended on who else was also using it.<sup>47</sup> Telephone companies constantly emphasised in their promotional materials how many subscribers were using their systems,<sup>48</sup> because it was effectively this access to other people that they were selling. For the first time, I argue, the users of a technology became themselves a product to be marketed by the companies to potential subscribers. As a result of this, an exchange system, once started, possessed a certain degree of inertia. For example, business subscribers in Aberdeen, when attempting to secure lower subscription rates, were concerned that even if the price was lowered in the short term, it might be raised again later, and those who had joined would have to pay the extra or risk losing business if they gave up their telephone.<sup>49</sup> Similar complaints were raised many years later by subscribers to the Glasgow exchange system, who were not satisfied but felt compelled to continue using it because their customers were also subscribers.<sup>50</sup> In this way, telephone users helped telephone companies to sell their exchange services. Thus, the establishing and growth of exchanges depended on telephone companies securing as subscribers important firms in any given town or city in order that others would feel compelled to join as well.

### 3.2. Trunk lines

An important incentive for potential users to become subscribers to newly established telephone exchanges was provided by trunk lines. The term 'trunk line' was used in different ways during the 1880s and 1890s. Three types of trunks need to be considered as appealing to different types of users: local, regional and national trunks.<sup>51</sup> Firstly, in cities with multiple exchanges, the local lines which connected these branch exchanges to one

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46 For example: Dodd, 1987, pg. 16 (n.4).

47 Although some private telegraph exchanges using ABC instruments had existed earlier, from the 1860s, these were very small and specialised, and were not marketed on a large scale (Kingsbury, 1915, pg. 82).

48 UTC, List of Subscribers, August 1882, pg. [xi]; 'Mutual Telephone Company, Limited', in the *Manchester Guardian*, 14 July 1891, pg. 1.

49 The *Aberdeen Journal*, 2 February 1883, pg. 6 (n.42).

50 For example: UK Parliament, Telephone Exchange Service in Glasgow, 1898 (C.8768-9) XLIX.1, evidence of Anton Kufeke, q.158; evidence of David Clarkson, q.802; evidence of Andrew Sinclair, q.1608.

another were known as trunk lines.<sup>52</sup> Next, when larger towns and cities were being connected with outlying towns and villages, these were also known as trunk lines, and were often a big incentive for firms with offices in larger centres but manufacturing or warehouse facilities in outlying towns.<sup>53</sup> I call these regional trunks. Finally, the longest lines, national trunks, connected these large centres, such as happened across the north between Liverpool, Manchester and Leeds, or any of these to Birmingham, or Birmingham to Bristol, and finally to London.<sup>54</sup> I now examine each of these in turn.

### 3.2.1. Local trunk lines

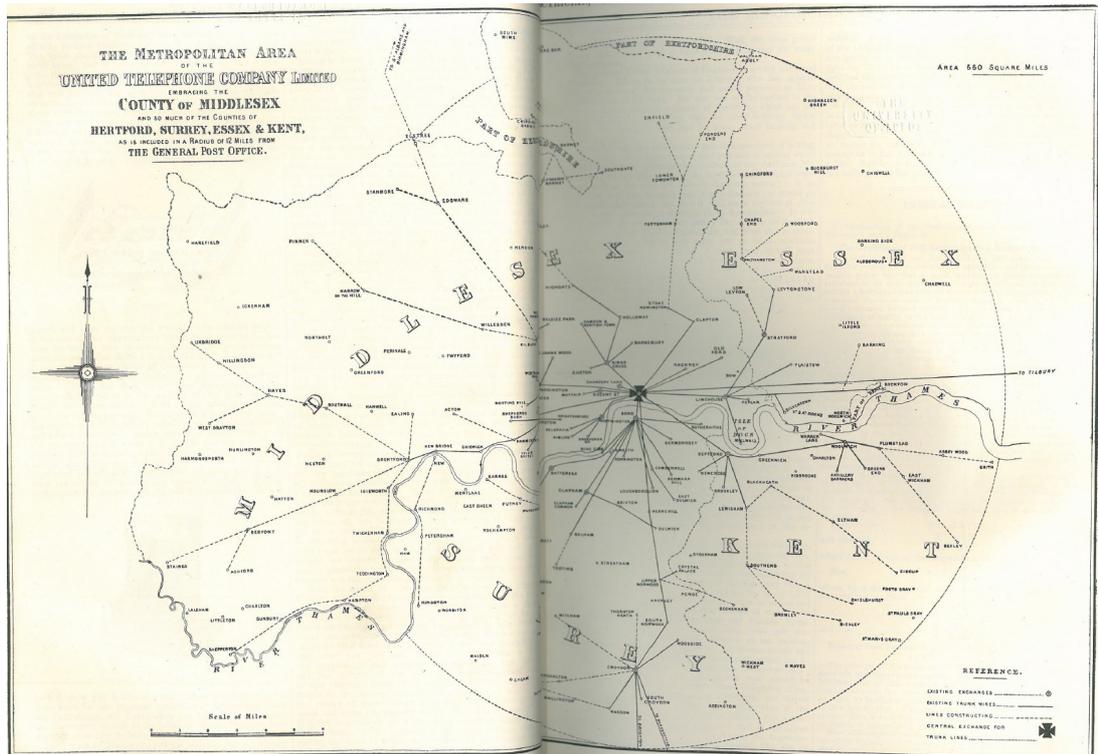


Figure 4.1. The UTC's local trunk line system, London, 1888

Source: 'The Metropolitan Area of the United Telephone Company', in the *Electrician*, vol. 21 (1888), pg. [42a-b]

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- 51 Indeed, a 'trunk' could even be a wire used within an exchange to connect two switchboards together in order to complete a call (Kingsbury, 1915, pg. 177-8 (n.9)).
- 52 Munro, J., 'Remarks on Some of our Telephonic Systems', in the *Electrician*, vol. 21 (1888), pg. 756.
- 53 For example, Birmingham developed a large regional network by 1886: Tupling, 1978, pg. 17 (n.4).
- 54 Baldwin, 1925, pg. 477-81 (n.7).

Local trunk lines enabled communication within cities with multiple interconnected exchanges, namely London, Glasgow and Edinburgh (Fig. 4.1.).<sup>55</sup> Both telephone users and providers referred to these wires as trunks.<sup>56</sup> By the late 1880s most other larger telephonic centres such as Manchester, Liverpool and Dundee had all their subscribers grouped on one exchange, which, as noted in chapter three, was more efficient for making connections, and smaller towns only needed one exchange anyway.<sup>57</sup> Nevertheless, although few cities used local trunks, London and Glasgow were two of the first places to have exchange communications, and in thus pioneering the system were prominent and influential telephone centres to which others looked when planning their own systems. Local trunks were important when those connected to local exchanges desired communication with subscribers on other exchanges elsewhere in the city. However, they provided less of an incentive to subscribers when those with whom they wished to converse were already on the same exchange. This indicates a difference, examined in more detail in section 2.3., between, on the one hand, those subscribers who only wanted to talk with other users within their trade or occupation, and on the other, those subscribers who desired to communicate more widely.

The types of users who benefited most from local exchange connections were those whose business came from local sources. These included cab firms and omnibus companies,<sup>58</sup> doctors, hotels, and legal practitioners, all of which were among some of the first subscribers to telephone exchanges. In addition, it was common for printers and also painters and decorators to be early exchange subscribers.<sup>59</sup> However, as exchange systems around the country grew, users and engineers noticed that having fewer exchanges was more efficient, and the UTC in particular was criticised in the press for having so many

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55 Ibid., pg. 84, 138; 'The National Telephone Company', in the *Electrician*, vol. 16 (1886), pg. 142.

56 UTC, List of Subscribers, August 1881, pg. ii; and: Marlborough, 'The Telephone', in the *Times*, 5 September 1891, pg. 7 (although the Duke of Marlborough would later be involved with telephone supply, he was primarily a user).

57 Munro, 1888, pg. 755-6 (n.52).

58 For example in Preston: 'Preston Local Telephonic Exchange', in the *Preston Chronicle*, 16 April 1881, pg. 4; in Sheffield: 'The Sheffield Telephone Exchange Company', in the *Sheffield and Rotherham Independent*, 25 March 1880, pg. 8.

59 'Preston Telephonic Exchange', in the *Preston Chronicle*, 15 October 1881, pg. 1; Le Flaneur, 'On Men and Things', in the *Sheffield and Rotherham Independent*, 23 September 1880, pg. 5; 'Swansea Telephone Exchange', in the *Cambrian*, 22 July 1881, pg. 4; Dodd, 1987, pg. 20 (n.4).

exchanges in London, for example in the *Financial Times* and the *Electrician*.<sup>60</sup> The use of branch exchanges connected by local trunks generated negative feelings towards the exchange system from the subscribers, because being connected to a subscriber on another exchange was a lengthy process.<sup>61</sup> This is supported by complaints discussed in chapter three, in particular the complaints about delays in being connected. By the 1890s the most vociferous complaints were about the London and Glasgow exchange systems, which also had the largest numbers of local trunk lines, and I argue that a larger number of local trunk lines in this period correlated with a less satisfactory system.<sup>62</sup>

### 3.2.2. Regional trunk lines

Regional trunk lines reached outside town and city limits to connect them with outlying towns and villages (Fig. 4.2.). Often these were either manufacturing or warehouse districts, or small villages with a wealthy demographic. For example, the Mutual Telephone Company in Manchester had in 1891 a trunk line between Manchester and Bolton, where many subscribers had business premises such as offices or mills.<sup>63</sup> An example of the latter was Beckenham, a small village outside London inhabited by the Archbishop of Canterbury and the deputy chairman of the UTC, James Staats Forbes.<sup>64</sup> Forbes noted in 1885 that, in both types of area, people would sometimes only connect to a local telephone exchange if they could use it to communicate with a large regional hub; this occurred, for example, in the area around Birmingham.<sup>65</sup> However, until 1884 telephone companies were restricted to a radius of no more than five miles from the centre of the town or city for which they held a licence, and could not build regional trunks. Thus, companies could not connect up groups of neighbouring towns which had close business relations,

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60 The *Electrician*, vol. 21 (1888), pg. 526-7 (n.18).

61 Stanton, John E., 'Switchboards – Past and Present', in the *NTJ*, vol. 4 (June 1909), pg. 60.

62 For example, regarding London: 'Notes', in the *Electrician*, vol. 27 (1891), pg. 207; and in Glasgow: UK Parliament, Report from the Select Committee on the Telephone Service, 1895 (350) XIII.21, evidence of Councillor James Colquhoun, q.686-9. There was so much discontent among users of the Glasgow system that ultimately an official inquiry was held regarding the quality of the exchange system: Telephone Exchange Service in Glasgow, 1898 (n.50).

63 Baldwin, 1925, pg. 195 (n.7); BT Archives, TCB 304/3, file 1, Testimonials of Subscribers to the Mutual Company [April 1892].

64 Telephone and Telegraph Wires, 1885, evidence of James Staats Forbes, q.1169 (n.34).

65 UK Parliament, Report from the Select Committee on the Telegraphs Bill, 1892 (278) XVII.729, evidence of James Staats Forbes, q.367.

despite some firms having branches or works in two or more towns, and daily customers in each one.<sup>66</sup> In 1884 the Post Office abolished these local limitations, as noted above, and subsequently regional trunk connections grew rapidly.<sup>67</sup>

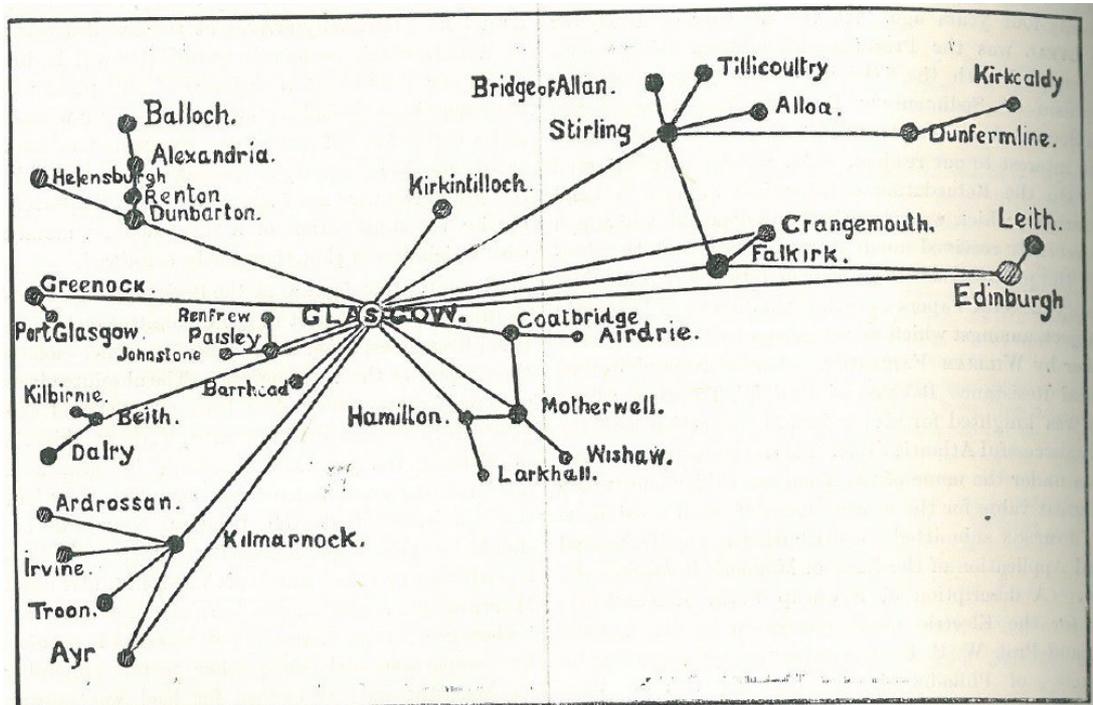


Figure 4.2. Regional trunk lines around Glasgow, 1888

Source: Sinclair, D., 'Improvements in the Telephone System of Glasgow and the West of Scotland', in the *Electrician*, vol. 21 (1888), pg. 530

These trunks often provided a kind of direct, closed communication between companies' premises in different towns. Subscribers making use of these lines for this purpose would not have benefited from having more people connected to the local exchanges in the outlying towns. These trunks acted to some extent like private lines, in that, if a firm could afford it, they could have had such a connection built between separate premises just for themselves, independently of exchanges. However, going through an exchange allowed multiple firms to share the cost of erecting the line, and thus made the connection cheaper. Connecting two premises in different towns to their respective exchanges was cheaper than building an entire dedicated line between them. I argue that regional trunk lines would thus have made such communication more affordable to smaller firms, and encouraged them to join exchanges. For example, Milne pointed out that Newcastle and Sunderland were administrative centres for shipbuilding and coal mining in

66 For example, in Glasgow: 'Bennett's Telephonic Translators', in the *TJER*, vol. 12 (1883), pg. 21.

67 Holcombe, A. N., 'The Telephone in Great Britain', in the *Quarterly Journal of Economics*, vol. 21, no. 1 (November 1906), pg. 104-6.

the 1890s, and thus firms involved in these industries made a lot of use of regional trunk lines to co-ordinate their business.<sup>68</sup> However, regional trunk lines were not as clear as local exchange lines; by 1891, the NTC's directory for its English districts reminded subscribers that they needed to speak more loudly when using trunk lines than when making a local call.<sup>69</sup>

Regional trunks provided an important incentive for businesses to adopt exchange telephony, as supported by the cases of Manchester and Birmingham, noted above.<sup>70</sup> The importance to businesses of regional trunk lines between Liverpool and Manchester was illustrated by an instance in 1887 when communication was disrupted over a weekend by a tree falling on the lines; the *Electrician* noted that the number of enquiries resulting from the accident indicated how much a part of commercial life the telephone was there.<sup>71</sup> In 1884, merchants in Plymouth complained to the Postmaster General that their Post Office exchange did not count the nearby towns of Devonport and Stonehouse, with which they did much business, along with Plymouth as being one exchange area.<sup>72</sup> Birkenhead's small exchange, opened in 1882, was not remunerative until it was connected with nearby Liverpool in 1885.<sup>73</sup> In some towns, there was little interest in establishing an exchange unless regional trunk lines from neighbouring towns or cities could be brought in and made available when the exchange opened, for example in Bath and Gloucester, which were both connected with Bristol from the beginning.<sup>74</sup> This indicates that the main priority of many firms which desired exchange telephony in this period was to communicate not locally, but on a regional level.

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68 Milne, 2007, pg. 173 (n.27).

69 NTC, English Districts Telephone Directory, April 1891, pg. 13.

70 Testimonials of Subscribers to the Mutual Company, [April 1892] (n.63); Telegraphs Bill, 1892, evidence of James Staats Forbes, q.367 (n.65).

71 'Liverpool and Manchester Telephonic Communication', in the *Electrician*, vol. 19 (1887), pg. 46.

72 'The Postal Telephonic Exchange at Plymouth', in the *TJER*, vol. 15 (1884), pg. 354.

73 Roberts, n.d., pg. 8 (n.4).

74 Bath: Hall Ellis, 1986, pg. 25 (n.4); Gloucester: Hall Ellis, 1989, pg. 52 (n.4).

### 3.2.3. National trunk lines

National trunk lines enabled communication between large hubs of telephonic development, and were useful for the co-ordination of business on a national scale, which was probably only attractive to very large firms. However in an area like the north of England, with Manchester, Liverpool, Leeds and Bradford in relatively close proximity to one another, more firms may have appreciated the ability to communicate by telephone, hence the density of the network in this region (Fig. 4.3.).<sup>75</sup> I argue that this type of trunk line provided the smallest incentive for subscribers to join an exchange during the period covered by this thesis. Indeed, London had no significant national trunk lines until July 1890, when it was connected to Birmingham.<sup>76</sup> Baldwin also noted that long distance telegraphy was considered by most to be quite adequate for national communication between towns and cities, so there was less of an incentive to establish national telephone trunks.<sup>77</sup>

The problems encountered by companies when attempting to obtain wayleaves have been discussed in chapter three, and over such long distances these difficulties would have been increased. When building lines across the country, companies had to secure the permission of the local authorities whose roads they wanted to use, and it was here that non-users exercised a lot of power over the development of the national network. For example, when trying to connect Nottingham and Sheffield in 1888, the NTC had to negotiate with the local boards of Heanor and Alfreton, some of the members of which saw an opportunity to make money from the company, whilst others did not want to give permission at all because the lines would simply block the streets and cause a nuisance.<sup>78</sup> London's first national trunk line was stopped on the outskirts of the city for a time, at Edgware, because the local authority did not want to grant wayleaves.<sup>79</sup>

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<sup>75</sup> Milne, 2007, pg. 166 (n.27).

<sup>76</sup> Baldwin, 1925, pg. 479-81 (n.7).

<sup>77</sup> Ibid., pg. 474.

<sup>78</sup> BT Archives, TPF/2/12/2, pg. 15, untitled clipping from the *Nottingham Daily Guardian*, 6 June 1888.

<sup>79</sup> Tupling, 1978, pg. 24 (n.4).

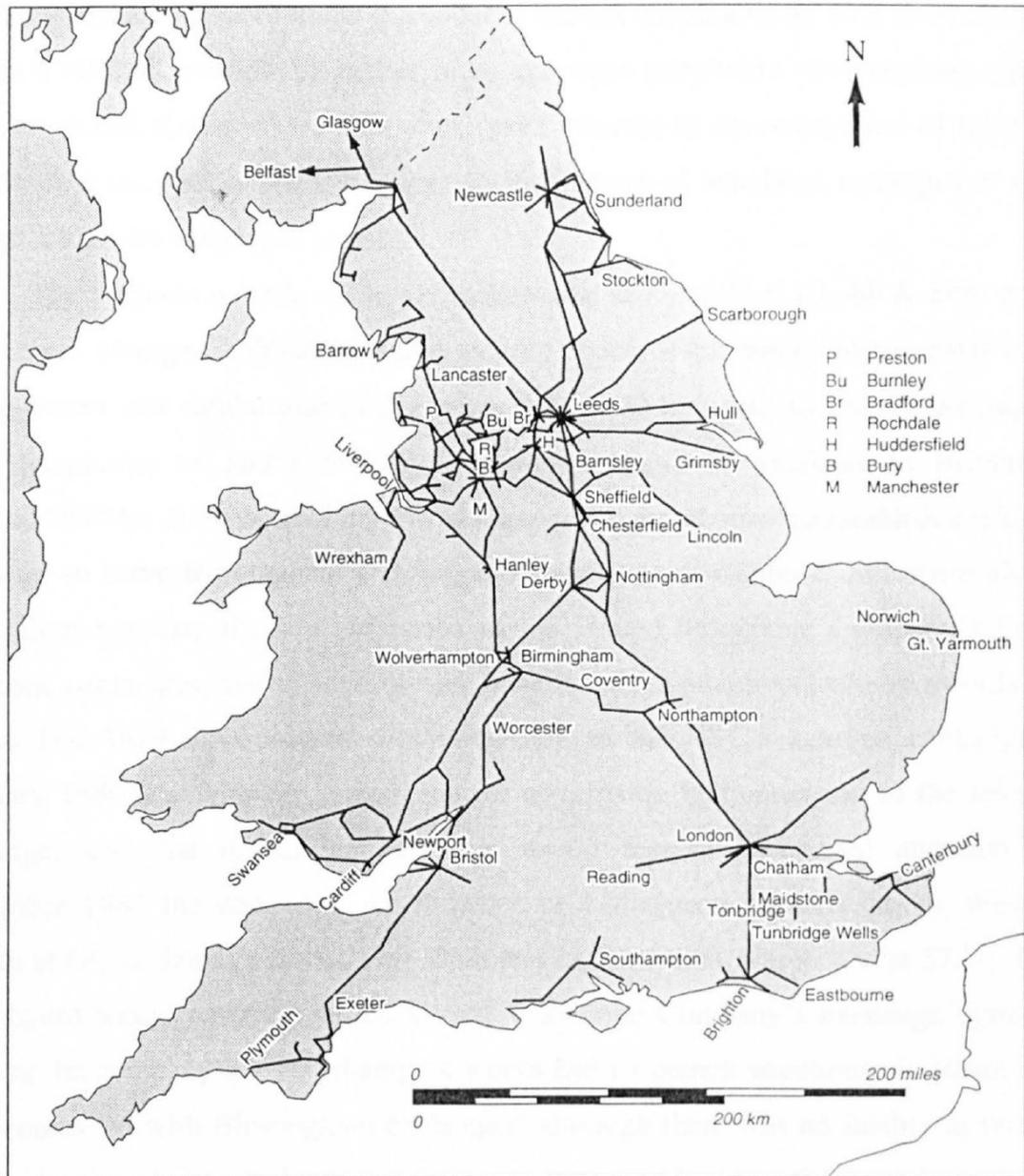


Figure 4.3. NTC trunk line network, England and Wales, 1892

Source: Stein, 1996, pg. 75 (n.5)

The types of users who wanted national trunk service during the 1880s and 1890s included large merchants in the provinces who might have had business with London. For example, in 1885 at a meeting of the Leeds Chamber of Commerce, Francis Lupton asked the chairman of the NTC, Robert Raynsford Jackson, when Leeds would be connected with London.<sup>80</sup> Lupton was a woollen cloth merchant and manufacturer, and may have had

<sup>80</sup> BT Archives, TCB 304/2, unnumbered file in box 2, part 6, Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, and Address by Colonel Jackson with Relation to Telephonic Charges, pg. 12.

business in London.<sup>81</sup> Firms involved in transportation, for example Earle and Haller, carriers on the Sheffield and Hull canal, had an interest in longer distance telephony,<sup>82</sup> and in addition, Milne noted that newspapers and stockbrokers desired national communication.<sup>83</sup> By 1889 there was a demand amongst this latter community across the country to connect the London and provincial stock exchanges, and preferably to do this directly in order to avoid delays at the local exchanges.<sup>84</sup> Certainly by the 1890s newspapers, as well as stockbrokers, were heavy users of national trunks, although, as Milne stated, it is doubtful there were many others.<sup>85</sup> I therefore argue that national trunks, whilst enabling telephone companies to demonstrate the technical capabilities of telephony, were not as important a feature of exchange telephony as regional trunks in this period.

### 3.3. Diverse purposes of exchange networks

I now address the two different purposes for which exchange telephony was used during the period covered by this thesis, which I call open network telephony and closed network telephony. In September 1883, Sir Frederick Bramwell, an eminent consulting engineer not affiliated to the telephone companies, gave an evening lecture to the working classes at the Southport meeting of the BAAS.<sup>86</sup> Regarding telephone exchanges, he noted that “the temptation to subscribe must increase with the increase of your speaking power to a large number of persons. No one would care to join if there were only a dozen to speak to... Therefore, as the numbers increase, this very increase will tempt others to join.”<sup>87</sup> In

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81 Occupation derived from 1881 English census details.

82 'Sheffield Town Hall', in the *Sheffield and Rotherham Independent*, 19 April 1871, pg. 4; 'Change of Sailing Day', in the *Sheffield and Rotherham Independent*, 17 December 1881, pg. 1; 'The Use of the Telephone in Sheffield', in the *Sheffield and Rotherham Independent*, 27 November 1879, pg. 5.

83 Milne, 2007, pg. 176 (n.27).

84 Michie, R. C., 'The London Stock Exchange and the British Securities Market, 1850-1914', in *The Economic History Review*, new series vol. 38, no. 1 (February 1985), pg. 70.

85 Telephone Service, 1895, evidence of Harcourt Everard Clare, q.1224 (n.62); Telephone Exchange Service in Glasgow, 1898, evidence of John Yuille, q.8860-3 (n.50).

86 Cronin, B. P., 'Bramwell, Sir Frederick Joseph, Baronet (1818–1903)', *Oxford Dictionary of National Biography* (Oxford University Press, 2004) [<http://www.oxforddnb.com/view/article/32040>, accessed 23 Dec 2013].

87 'Sir F. Bramwell on Telephones', in the *Times*, 24 September 1883, pg. 5.

1891 the Duke of Marlborough expressed a similar sentiment in the *Times*,<sup>88</sup> and some telephone companies also used this approach in their advertising, for example when the L&C reminded potential subscribers in Preston that the usefulness of an exchange increased with its members.<sup>89</sup> However, whilst the general expectation at the time might have been that bigger exchanges were better for all subscribers, this was not always the case.

Not all subscribers wanted the same thing from their exchange connections. The specific uses to which exchange telephony was put in this period have not been explored in existing literature; most earlier works focus on producers and suppliers of exchange telephony, and not on the users. However, even scholars who have looked at use specifically, such as Stein and Milne, have not considered such distinctions between different types of users. This is partly because the scope of these studies has been so broad in terms of time-scale, covering the period from the late 1870s until the early twentieth-century, and relatively narrow in geographical terms, focusing predominantly on London, with some attention paid also to Manchester and Liverpool. By studying specific groups of users in towns and regions across the country over a shorter time period, I now draw out patterns which have not otherwise been evident. I demonstrate below that exchanges did not always become more useful as the number of subscribers increased.

Milne noted that for some firms the number of other subscribers with whom they wished to talk was small: those firms which supplied them, and those which they themselves then supplied.<sup>90</sup> Indeed, by 1882 the UTC were claiming that: “[t]he value of an Exchange connection does not consist simply in being able to converse readily with two thousand or even twenty thousand other Subscribers, but in being able to talk to the twenty or hundred with whom the Subscriber has daily business transactions.”<sup>91</sup> Nevertheless, the implications of this for exchange development have not been explored. Rather than wanting the biggest exchange possible, many users and potential users were more concerned to see that those with whom they wanted to converse were also using the exchange. I argue that different types of user required different types of network, either 'closed', whereby only communication with certain specific other firms was required, or

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88 Marlborough, 'The Telephone', in the *Times*, 5 September 1891, pg. 7.

89 'Preston Telephonic Exchange', in the *Preston Chronicle*, 3 September 1881, pg. 1. Modern commentators have similarly assumed that early telecommunications users benefited from the growth of the network; see, for example: Lipartito, Kenneth, 'Regulation Reconsidered: The Telephone Industry Since 1975', in *La Modernisation des Télécommunications*, special issue of *Entreprises et Histoire*, no. 61 (December 2010), pg. 169.

90 Milne, 2007, pg. 170 (n.27).

91 UTC, List of Subscribers, February 1882, pg. 9.

'open', whereby communication with as many other subscribers as possible was desirable. As I will demonstrate below, the ratio of these two categories of users shaped the development of telephone systems in different areas.

Some subscribers, such as those in specific industries or trades, gained little or nothing from the ability to communicate outside of a small, 'closed', group of other users. In 1898, as part of an inquiry into the telephone service in Glasgow, one grain merchant, who said he had been a subscriber since the telephone first came to the city, commented that he and others in specific trades such as iron, coal, or grain only wanted to speak with those in their own trade, and not the general public.<sup>92</sup> When the Swansea postmaster was attempting to secure renters for a Post Office telephone exchange in 1881, the Swansea Zinc Ore Company only wanted a Post Office telephone if two other firms with which it did business were also connected.<sup>93</sup> Sometimes such subscribers joined an exchange en masse for business purposes, so they could talk to one another, such as a large group of solicitors and architects in Dundee in 1885.<sup>94</sup> Such subscribers used their connections to talk to a limited number of other telephone users, and were not enticed by larger numbers of other firms being connected to the exchange.

Subscribers who wanted 'open' networks wanted to be contactable by as many potential customers or users of their services as possible. Examples included cab hire firms, hotels, solicitors, estate agents, shopkeepers such as grocers, bakers, butchers, or clothing stores, printers and doctors or dentists.<sup>95</sup> As well as using their telephones for administrative or logistic purposes, as closed network users did, those prioritising open networks sometimes also used their telephones as a marketing tool to increase their business by including their telephone number in advertisements. This was done in Dundee by, amongst others, a merchant selling beer, a baker selling pies, bread, and biscuits, and a theatre.<sup>96</sup> Similar advertisements were placed around this period in other towns by cab and

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92 Telephone Exchange Service in Glasgow, 1898, evidence of Anton Kufeke, q.183-4 (n.50).

93 BT Archives, POST 30/392c, Snell to Brodie, 10 February 1881.

94 'Local Intelligence', in the *Dundee Courier*, 31 March 1885, pg. 2.

95 Telephone Service, 1895, evidence of Robert Kay, q.2200 (n.62); two examples of printers wanting open networks can be found here: Telephone Exchange Service in Glasgow, 1898, evidence of William Mollison, q.1089 and Alexander Sinclair, q.1595-6 (n.50). Examples of others in this list are given through the citations of advertisements, below.

96 'Guinness' XXX Stout', 24 February 1883, pg. 1; 'Couper's Celebrated Pies', 9 February 1884, pg. 1; 'Theatre Royal, Dundee', 9 February 1884, pg. 1. All of these advertisements were in the *Dundee Courier*; other small firms using the telephone for advertising in this newspaper included a shop which sold needlework materials and leather goods, a chemist, a school

carriage hire firms, hotels, theatres, and various small stores, all of which would have benefited from being accessible to a wide audience.<sup>97</sup> Such users expected to receive more business as the system expanded, so an exchange subscription was a worthwhile investment. For example, in April 1880 Charles Nodder, a Sheffield estate agent, noted that he did not use his telephone as much as some businessmen, but believed it would be indispensable in future.<sup>98</sup>

Another common use of exchanges which required open networks was by local fire brigades, as noted in chapter two. Although a connection with a fire brigade station may have been desired also by those firms which only desired closed networks, the fire brigades as users benefited from the network being as open as possible in order to maximise the possibility of emergencies being rapidly reported. In Sheffield, John Tasker connected the main Fire Brigade Office up to his local exchange in 1880, and in 1885 he gained permission from and gave permission to every subscriber to his exchange to allow anyone to use their telephone for free in the case of fires or accidents.<sup>99</sup> In May that year, when call offices were opened around Sheffield, these could also be used to report fires for free.<sup>100</sup> In this case, the fire brigade gained considerable benefit from its use of exchange telephony. In other towns, however, it is doubtful that telephone access was quite so open.

Closed network users made more intensive use of their exchange connections than open network users. For example, even by 1898, when telephone use was more common,

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stationery shop, a seed and vegetable merchant, a boys' clothing shop, and a dentist ('Stationery and Berlin Repository', 14 October 1884, pg. 1; "Pick-Me-Up", or "Tonic Bitters", 15 October 1884, pg. 1; 'School Books and School Stationery', 23 August 1884, pg. 1; 'Choice Vegetables and Flower Seeds, Seed Potatoes, &c.', 16 June 1885, pg. 1; 'J. P. Smith & Sons, Clothiers', 7 April 1885, pg. 1; 'Dr Stewart, Dental Practitioner', 23 August 1884, pg. 1).

97 For example, in Preston, a theatre, a photographer, a wine and spirit merchant, and a coal merchant ('Theatre Royal, Preston', 12 July 1884, pg. 1; 'Royal Show', 18 July 1885, pg. 4; 'Richard Robinson and Sons', 14 November 1885, pg. 1; 'The Coal Trade', 22 January 1887, pg. 1 – all from the *Preston Chronicle*); in Sheffield, a carriage hire firm, two house furnishing firms, a tailor and a fish and game shop ('Weddings, Excursions, Funerals', 16 July 1885, pg. 1; 'Norfolk Furnishing Warehouse', 7 October 1885, pg. 1; 'Woof and Whitaker', 17 October 1885, pg. 1; 'Jubilee Clothing', 13 June 1887, pg. 1; 'Local Intelligence', 18 December 1888, pg. 3 – all from the *Sheffield and Rotherham Independent*); and in Swansea, a hotel and a local chain of general stores ('Royal Commercial and Family Hotel', in the *Western Mail*, 17 June 1885, pg. 1; 'Taylor & Company', in the *Cambrian*, 9 June 1882, pg. 1).

98 Nodder, Chas., 'Telephones', in the *Sheffield and Rotherham Independent*, 22 April 1880, pg. 2; occupation derived from 1881 English census details.

99 The *Sheffield and Rotherham Independent*, 25 March 1880, pg. 8 (n.58); 'Telephones and Fires', in the *Sheffield and Rotherham Independent*, 3 February 1886, pg. 3.

100 'The Sheffield Telephone Exchange Co.', in the *Sheffield and Rotherham Independent*, 2 May 1885, pg. 8.

the telephone use of a printer could be quite low and inconsistent, making from six calls over the course of a week to twenty in a day,<sup>101</sup> and a large newspaper such as the Glasgow daily the *Evening Citizen* could only claim to make between thirty and forty calls a day.<sup>102</sup> Both printers and newspapers were open network users,<sup>103</sup> and both ideally wanted as many other telephone users as possible to be able to contact them. However, it is possible that they received more telephone calls than they made.<sup>104</sup> Nevertheless, Milne indicated that subscribers who desired closed networks, and only spoke to a limited number of other subscribers, were the heaviest users of the telephone. He noted that subscribers with two lines were most likely to be heavy users, and listed from an 1899 Liverpool telephone directory the types of subscribers who had a second exchange line. Those most prominent were agents and brokers, and also merchants and wholesalers. These are good examples of closed network users. Open network users, such as hotels, printers, and carting companies, were only represented by one or two subscribers with an extra line.<sup>105</sup>

Users who wanted open networks benefited from possessing the potential to communicate with every other subscriber on the exchange. They gained increasing benefit from their connection as more people joined the exchange, as an open network increased in usefulness for its members the more people had access to it. A closed network on the other hand was effectively a group of subscribers who specifically wanted to speak with one another, and did not require communications outside of the group. Even a very large exchange would have offered little incentive to a company or individual considering a subscription had it comprised only people and firms with whom the potential new subscriber had no desire to communicate. The significance of the balance between open and closed network users for questions of telephone ownership, such as competition versus monopoly, will be discussed further below.

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101 Telephone Exchange Service in Glasgow, 1898, evidence of William Mollison, q.1092-96 (n.50).

102 Ibid., evidence of John Yuille, q.8879.

103 Ibid., evidence of John Yuille, q.8855.

104 Ibid., evidence of Alexander Sinclair, q.1595-6.

105 Milne, 2007, pg. 176-7 (n.27).

#### 4. The three providers of exchange telephony

Having addressed the ways in which exchanges were founded and used, I now examine the significance of open and closed networks for the development of different exchange systems around the country. I argue that these different purposes for exchange telephony resulted in different patterns of exchange growth, use-frequency and ownership models. Below I consider the exchange systems of the three providers of exchange telephony in this period – the Post Office, the independent companies and the UTC group companies – in terms of open and closed networks. Whilst it is not possible to split these two different types of exchange use clearly between the users of these three exchange providers, some patterns emerge. I argue that the Post Office exchanges tended to comprise more closed networks, whereas those of the local companies were more open. Whilst it is difficult to generalise regarding the many exchanges of the UTC group around the country, I believe that they fell between these two extremes. Nevertheless, as the price of subscription was a good indicator of how open an exchange might have been, it is possible to see which UTC group towns were likely to have had more open network subscribers.

##### 4.1. The Post Office

From 1870 the Post Office had run ABC private telegraph exchanges in many towns around the country. Initially started by the Universal Private Telegraph Company in the 1860s, the Post Office acquired these upon the nationalisation of the telegraph network in 1870.<sup>106</sup> The provision of this service was subsequently expanded around the country during the 1870s and into the 1880s. When the telephone came under the Post Office monopoly in December 1880, the Postmaster General offered to replace these subscribers' ABC instruments with telephones.<sup>107</sup> Telephone exchanges were thus started in a few towns around the country, most notably in Newcastle, Leicester, Hull and Plymouth. With the exception of Newcastle, none of these exchanges grew very large compared with the companies' exchanges.<sup>108</sup> Although most existing telephone histories mention briefly the ABC exchanges as the basis of Post Office telephony, none consider what this means in terms of the subscribers who would have been using these systems.<sup>109</sup> These subscribers had originally joined together specifically because they wanted to talk to one another by

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106 Kieve, Jeffrey L., *The Electric Telegraph: A Social and Economic History* (David and Charles Ltd., 1973), pg. 69-70; Baldwin, 1925, pg. 121-3 (n.7).

107 Kingsbury, 1915, pg. 77-88 (n.9).

108 BT Archives, TPF/2/13/7/1, file 68, Return Giving the Names of All Telephone Exchanges which the Post Office has at Any Time Opened in the United Kingdom, 16 May 1899, pg. 2.

virtue of a shared trade or industry, such as mining. The resulting exchanges, which frequently formed the core of Post Office telephone endeavours, for example in Swansea in 1881, were thus inherently closed networks.<sup>110</sup>

The Post Office was criticised by many during the 1880s and 1890s because its exchanges were seen as being unsuccessful. Some complainants, such as telephone users in Plymouth, Hull and Leicester, were Post Office subscribers.<sup>111</sup> Others, such as a deputation from Portsmouth sent to speak with the Postmaster General, Henry Fawcett, in 1884 about establishing an exchange there, were considering becoming Post Office subscribers.<sup>112</sup> The Portsmouth deputation claimed that except for Newcastle, the Post Office had not established any successful exchanges anywhere in the country. Some Post Office subscribers noted that their exchanges were too small to be of much use, and those in Hull and Leicester in particular looked to the NTC in 1889 to provide them with the trunk connections which they lacked.<sup>113</sup> By 1892, one member of the London Chamber of Commerce could say that the Post Office had been beaten out of every town, except Newcastle, in which it had attempted to run an exchange, and the chairman of the NTC, Robert Raynsford Jackson, could boast more subscribers on the company's new exchanges in both Hull and Leicester than the Post Office had managed to gain over a much longer period of time.<sup>114</sup>

By March 1884 the Post Office had nineteen exchanges across Britain, the majority of which had between ten and fifty subscribers; Newcastle was the exception with 345 subscribers.<sup>115</sup> The strong Post Office presence in Newcastle was partly because the Northern District Telephone Company opened an exchange in 1882 without the Postmaster

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109 For example: Baldwin, 1925, chapter 5 (n.7); Feuerstein, 1990, chapter 4.1-2 (n.7); Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977), pg. 83-5.

110 BT Archives, POST 30/392c. The Post Office's Swansea renters were primarily involved in metal mining.

111 Plymouth: 'The Post Office and the Telephone', in the *TJER*, vol. 15 (1884), pg. 73; Hull: BT Archives, TPF/2/12/2, pg. 61, untitled clipping from the *Eastern Morning News*, 19 August 1889; Leicester: 'Leicester', in the *Electrician*, vol. 26 (1891), pg. 563.

112 'The Proposed Telephone Exchange for Portsmouth', in the *TJER*, vol. 14 (1884), pg. 269.

113 BT Archives, TPF/2/12/2, pg. 50, untitled clipping from the *Hull Daily News*, 16 August 1889; and pg. 66, 'Leicester Town Council: The Postal Authorities and the Telephone', in the *Leicester Daily Post*, 27 November 1889.

114 The *Electrician*, vol. 28 (1892), pg. 435-6 (n.12).

General's permission, and were forced to close it shortly afterwards. Although it opened again in 1883, in the meantime the Post Office had greatly expanded its own exchange service in the town.<sup>116</sup> The Post Office total of 783 subscribers, using in all 982 instruments, did not compare well against the companies' total of approximately 12,500 instruments.<sup>117</sup> However, Post Office exchanges were, for local service, technically better than those of the companies. They used metallic circuits throughout their system instead of single wires, which were prone to induction, thus providing users with much clearer lines.<sup>118</sup> Even Jackson admitted, in 1892, that where the NTC still competed with the Post Office in Newcastle, subscribers might choose the latter because of the quality of the system.<sup>119</sup> However, the Post Office faced a few unique difficulties in attempting to provide exchange service. For example, the Treasury withheld funding for Post Office telephony, and refused to allow government officials to canvass for subscribers, thinking it below their dignity.<sup>120</sup>

In addition, Post Office exchanges were more expensive than those run by the companies. Although Baldwin implied that Post Office rates were lower than those of most companies, at £8,<sup>121</sup> when the Post Office, like the NTC, reduced its rates in 1891, the new tariff was £8 within a quarter of a mile, £10 for half a mile, and £14 for a full mile.<sup>122</sup> The fact that the Post Office exchanges used metallic circuits increased the price of subscription. Additionally, when establishing exchanges, the Post Office had to use its existing local branches, whereas the companies could find an area where there were a large number of subscribers and set up their exchange there. The companies could therefore keep their wiring and wayleave costs lower than the Post Office.<sup>123</sup> Baldwin did note that rates charged by different suppliers were not always comparable because of the different ways in

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115 BT Archives, TCB 304/1, file 2, Number of Subscribers to the Department's Telephone Exchanges (31 March 1884).

116 Baldwin, 1925, pg. 146-7 (n.7).

117 BT Archives, TCB 304/1, file 2, extract from the *Postal Telegraphic and Telephonic Gazette*, 30 May 1884.

118 'Newport Post-office Telephone Exchange', in the *Weekly Mail*, 25 December 1886, pg. 3.

119 The *Electrician*, vol. 28 (1892), pg. 436 (n.12).

120 Perry, 1977, pg. 85 (n.109); Feuerstein, 1990, pg. 112-123 (n.7).

121 Baldwin, 1925, pg. 604 (n.7).

122 'Reduction of Telephone Charges', in the *Electrician*, vol. 26 (1891), pg. 658. At this time the NTC had universally reduced its rates, except in London, to £10 per mile (Baldwin, 1925, pg. 605 (n.7)).

which they were applied, and my research shows that lower prices were offered in many cases when subscribers took contracts for 3, 5 or 7 years.<sup>124</sup> Nevertheless, Baldwin himself gave evidence that the Post Office was charging more than the companies,<sup>125</sup> and I have found several other examples.<sup>126</sup> I conclude that Post Office exchanges were definitely universally more expensive than company exchanges in this period, and this restricted the types of firms which could afford to subscribe to the Post Office's exchanges.

Nevertheless, the Post Office exchanges in South Wales, and in particular Cardiff and Newport, were quite successful, with most maintaining their numbers until the late 1890s; some exchanges, such as Manchester and Liverpool, were also still growing, albeit slowly.<sup>127</sup> The Newport exchange was a good example of a typically sized Post Office exchange.<sup>128</sup> Opened in August 1881, by December 1886 it had 35 subscribers making an average number of calls per day which was very high for the period, as will be seen below, and indicates a small community of subscribers who used the telephone very intensively in their daily business in comparison to other telephone centres.<sup>129</sup> I believe it helped that the Post Office provided a good system of regional trunk wires in South Wales from an early stage, connecting Newport, Cardiff, Swansea, and other smaller towns, and these were heavily used.<sup>130</sup> Indeed, the Newport exchange did not begin to decline in numbers until 1897, and the Cardiff exchange remained the second largest Post Office exchange after

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123 Baldwin, 1925, pg. 564-5 (n.7); BT Archives, TCB 304/2, file 3, Graves Memorandum, 12 June 1888.

124 'A New Telephone Exchange', in the *Electrician*, vol. 16 (1885), pg. 5; 'Progress of the Telephone in Swansea', in the *Western Mail*, 11 June 1887, pg. 3.

125 In Portsmouth: Baldwin, 1925, pg. 564-5 (n.7).

126 For example in Windsor: 'The Telephone at Windsor', in the *Electrician*, vol. 16 (1885), pg. 124; and Liverpool: 'The Telephone Service in Liverpool and Manchester', in the *Electrician*, vol. 16 (1886), pg. 144; and in Hull: the *Hull Daily News*, 16 August 1889 (n.113).

127 Names of All Telephone Exchanges which the Post Office has at Any Time Opened, 16 May 1899, pg. 2 (n.108).

128 BT Archives, TCB 304/1, file 2, Number of Subscribers to the Department's Telephone Exchanges (31 March 1884).

129 Names of All Telephone Exchanges which the Post Office has at Any Time Opened, 16 May 1899, pg. 2 (n.108); the *Weekly Mail*, 25 December 1886, pg. 3 (n.118).

130 'Telephonic Progress in South Wales', in the *Cardiff Times*, 3 November 1883, pg. 3; the *Weekly Mail*, 25 December 1886, pg. 3 (n.118).

Newcastle until 1898.<sup>131</sup> Thus, many Post Office exchanges which had small numbers of subscribers but which nevertheless continued for many years were, often until the end of the century, not failures but successful closed network exchanges.

#### 4.2. The independent companies

Several small local companies, active mainly during the 1880s, served certain towns around the country, and are worthy of study because collectively they provided a different vision for the future of British exchange telephony. The most important local companies were in Sheffield, Dundee, Swansea and Preston. Although all but one of these, Swansea, received a mention in Baldwin,<sup>132</sup> their full significance in the period has not been addressed. For example, the local Dundee company, the Dundee and District Telephone Company, was a big influence on Andrew Provand who started the Mutual Telephone Company in Manchester. Together these four companies identified themselves as the 'independents',<sup>133</sup> not allied with the UTC group. In 1884, when the Postmaster General consulted with the telephone companies regarding the licences, these companies suggested that the Post Office ought to purchase the trunk lines in order to connect up exchanges run by different local companies.<sup>134</sup> This alternative model of exchange telephone ownership appeared to those involved to be a valid and technically viable proposition; John Lamb, then one of the Post Office Secretary's Principal Clerks, speculated that when the telephone patents ran out more local companies like that in Dundee might be started to provide competing telephone exchanges.<sup>135</sup> Although this proposal was not adopted at the time, it was carried out in 1892, after it had been suggested by the Duke of Marlborough, as I discuss in chapter five.

However, these four towns were not the only places where local exchange provision was attempted. Many telegraph engineers, contractors and electricians tried to establish local telephone exchanges, and brief successes were enjoyed in Glasgow, Leeds, Bradford and Plymouth. In Manchester, David Moseley and Sons, who had begun by providing

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131 Names of All Telephone Exchanges which the Post Office has at Any Time Opened, 16 May 1899, pg. 2 (n.108).

132 Baldwin, 1925, pg. 99-101, 143-4, 197 (Sheffield); 109, 146 (Preston); 142-3 (Dundee) (n.7).

133 BT Archives, TCB 304/1, file 6, Report of a Meeting of the Independent Telephone Companies, 26 July 1884.

134 Ibid.

135 BT Archives, TCB 304/1, unnumbered file in part 3, Lamb's Memorandum on the Companies, 28 July 1884; TCB/167/7, Establishment Book, 1885, pg. 4.

private telephone lines, sought a Post Office licence to establish an exchange, but was denied.<sup>136</sup> The dates and exchange charges of all of these local companies are given in the tables below. All of these examples started up between 1879 and 1881, at the same time as the larger companies were opening their first exchanges around the country. Because it was not possible at this stage to predict how exchange telephony would eventually develop, these companies are worthy of study alongside the UTC group companies and the Post Office. In addition, these independent exchanges, when they lasted, tended to comprise the most open networks of any exchange systems during this period, in part due to their lower charges for exchange subscription.

Table 4.2. Independent telephone companies, 1879-1892

<i>Name/location of company</i>	<i>Start date</i>	<i>Date of closure or purchase</i>
D. and G. Graham – Glasgow	1879 <sup>137</sup>	February 1881 <sup>138</sup> (Sold to NTC)
Sheffield Telephone Company (John Tasker)	December 1879 <sup>139</sup>	March 1892 <sup>140</sup> (Sold to NTC)
West Riding Telephone Exchange Company – Leeds and Bradford (Blakey and Emmott)	July 1880 <sup>141</sup>	August 1880 (Sold to UTC) <sup>142</sup>
Dundee & District Telephonic Company	July 1880 <sup>143</sup>	June 1885 <sup>144</sup> (Sold to NTC)

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136 Baldwin, 1925, pg. 92-3 (n.7).

137 Ibid., pg. 96. But, see chapter 2, n.60.

138 Ibid., pg. 97.

139 *The Sheffield and Rotherham Independent*, 27 November 1879, pg. 5 (n.82).

140 'Amalgamation of the National and the Sheffield Telephone Companies', in the *Sheffield and Rotherham Independent*, 12 March 1892, pg. 7.

141 Baldwin, 1925, pg. 106 (n.7).

142 Ibid.

143 'The Telephone in Dundee', in the *TJER*, vol. 15 (1884), pg. 234.

144 Baldwin, 1925, pg. 143 (n.7).

Swansea Telephonic Exchange Company	October 1880 <sup>145</sup>	April 1887 <sup>146</sup> (Sold to WC&SW)
Plymouth Telephone Company (Cox and Williamson)	July 1881 <sup>147</sup>	October 1881 <sup>148</sup> (Closed by Post Office)
Preston Telephonic Exchange Company (George Sharples)	September 1881 <sup>149</sup>	December 1886 <sup>150</sup> (Sold to L&C)

Table 4.3. Independent telephone company subscription prices, 1879-1892

<i>Company</i>	<i>Initial charge</i>	<i>Later charge and date of change</i>
Glasgow	£12 <sup>151</sup>	£15 (December 1880) <sup>152</sup>
Sheffield	Unknown	£10 for half a mile, £12 for a mile, £16 for two miles and £20 for three miles (January 1885) <sup>153</sup>
Leeds and Bradford	£12 <sup>154</sup>	N/A
Dundee	£10 <sup>155</sup>	£5 10s. <sup>156</sup>

145 'The Swansea Telephone Exchange', in the *Cambrian*, 19 November 1880, pg. 8.

146 'Transfer of the Swansea Telephone Company', in the *Western Mail*, 5 April 1887, pg. 2.

147 Baldwin, 1925, pg. 110 (n.7).

148 Ibid.

149 'Opening of Mr. G. Sharples's Preston Local Telephonic Exchange', in the *Preston Chronicle*, 3 September 1881, pg. 5.

150 Green, M. J., *A Century of Telephone Service: Preston Telephone Centenary 1880-1980* (Unpublished, February 1980), pg. 7.

151 Baldwin, 1925, pg. 97 (n.7).

152 Ibid.

153 'The Sheffield Telephone Exchange Co.', in the *Sheffield and Rotherham Independent*, 29 November 1884, pg. 8. Baldwin noted that the rate for subscription to the Sheffield exchange was £7. I have found no evidence that the price was this low at the beginning, although it may have been by the time the local company were purchased by the NTC (Baldwin, 1925, pg. 100 (n.7)).

154 Baldwin, 1925, pg. 106 (n.7).

Swansea	£15 for a mile <sup>157</sup>	£10 for half a mile (July 1881) <sup>158</sup>
Plymouth	Free on a trial basis <sup>159</sup>	N/A
Preston	£6 <sup>160</sup>	£8 (date unknown) <sup>161</sup>

The independent companies all provided cheaper exchange service than the other two groups of providers.<sup>162</sup> This was partly because the independent companies used cheaper instruments, such as Gower Bell telephones acquired from the company granted the licence by the UTC to manufacture them,<sup>163</sup> or, in Sheffield, the Johnson transmitter, for which Tasker's local company owned the patent.<sup>164</sup> Using such instruments meant that these companies did not need to pay a royalty to the UTC for using their instruments, as the other companies of the UTC group did, and could thus supply telephony more cheaply.<sup>165</sup> In

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155 Ibid., pg. 142.

156 Ibid.

157 'Telephone Intercommunication', in the *Western Mail*, 23 December 1880, pg. 1.

158 The *Cambrian*, 22 July 1881, pg. 4 (n.59).

159 Baldwin, 1925, pg. 110 (n.7).

160 Ibid., pg. 109.

161 Ibid.

162 Most UTC exchanges charged £20 per annum (Baldwin, 1925, pg. 604 (n.7)).

163 Swansea: 'The Swansea Telephonic Exchange', in the *Cambrian*, 8 October 1880, pg. 8; Dundee: 'Dundee Naturalists' Society Exhibition and Conversazione', in the *Dundee Courier*, 9 February 1881, pg. 3; Preston: the *Preston Chronicle*, 3 September 1881, pg. 5 (n.149). In Glasgow, David Graham's short-lived local exchange also employed Gower Bell instruments, and in Manchester, David Moseley and Sons intended to use these instruments if they had received a Post Office licence ('Telephonic Exchanges', in the *Glasgow Herald*, 17 January 1881, pg. 1; Baldwin, 1925, pg. 93 (n.7)).

164 'The Sheffield Telephone Exchange Company', in the *Sheffield and Rotherham Independent*, 29 May 1888, pg. 3.

165 The *TJER*, vol. 15 (1884), pg. 234 (n.143). The UTC charged £1 per year per instrument, but because they charged separately for the transmitter and the receiver the royalty for a full telephone set was £2 ('The Proposed Aberdeen Telephone Company', in the *TJER*, vol. 12 (1883), pg. 138-9). This royalty was the source of some dissatisfaction amongst subscribers to the UTC affiliated companies (For example: 'Telephone Charges', in the *Electrician*, vol. 16

addition, as explained in chapter three, they may also have experienced greater ease in obtaining wayleaves from local people.<sup>166</sup> As these companies were normally facing competition from the larger companies, this may have been another factor in keeping their prices down. Lastly, it is possible that these companies underestimated how much money they might have had to put aside to cover maintenance and specifically the depreciation of their plant over time. This was certainly later conceded to have been the case in Dundee, where the chairman later admitted that the low rate of £5 10s. per annum had been unsustainable.<sup>167</sup>

As a result of these low rates, subscribers joined these exchanges who did not become telephone users elsewhere, for example in Dundee, where nearly all of the small shopkeepers, such as grocers, butchers and other retailers joined the exchange.<sup>168</sup> This resulted in a more open network than elsewhere, as these users benefited more from their telephone subscriptions the more other subscribers there were to contact or be contacted by. In Sheffield, Swansea and Preston there were hotels and cab hire firms on the exchange, but it was the smaller retailers who joined that indicate the openness of the exchange, because they were the users who would benefit most as the exchange grew and more and more potential customers were able to contact them. For example in Sheffield by May 1885 there were call offices for public use at such convenient locations as a tobacconist's shop, an excursion agents' premises, and a cab and omnibus firm, all subscribers who benefited from open exchanges.<sup>169</sup> In Swansea, within nine months of the exchange opening, a local chain of cash co-operative stores were all connected up to the exchange.<sup>170</sup> There were also many solicitors.

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(1886), pg. 445). It was not only the users who were frustrated by this royalty payment: the chairman of the South of England Telephone Company, itself a UTC subsidiary company, also called in 1889 for these royalties to be abolished, in a thinly veiled accusation of hypocrisy aimed at the parent company, which had been complaining about the Post Office royalty ('South of England Telephone Company (Limited)', in the *Electrician*, vol. 23 (1889), pg. 208).

166 'Telephonic', in the *TJER*, vol. 14 (1884), pg. 111. See also the discussion in chapter three, section 4.2.

167 Telephone Service, 1895, evidence of Alexander Moncur, q.2365 (n.62).

168 Ibid., evidence of Sir John Leng, q.1114.

169 'The Sheffield Telephone Exchange Co.', in the *Sheffield and Rotherham Independent*, 2 May 1885, pg. 8.

170 The *Cambrian*, 22 July 1881, pg. 4 (n.59); the *Cambrian*, 9 June 1882, pg. 1 (n.97).

The newspaper advertisements cited above in section 2.3 as including telephone numbers reveal that the towns with the cheapest independent telephone companies had the most advertisements which included telephone numbers. Dundee, the cheapest service in the country, had the most, followed by Preston, Sheffield and Swansea. Thus I argue that in towns with cheaper exchange subscriptions, in this case those which had an independent company exchange, a larger number of exchange users wanted an open network. Where prices were lower, the resulting networks were more open; for small retailers who wanted to be contactable by as many people as possible, it was then more practical to expect that there would be enough other subscribers to do business with over the telephone. Thus the exchange connection was a worthwhile investment. After the independent companies were all absorbed into the various UTC group companies, local subscription rates, although raised, remained lower than in most other places around the country through negotiations with the purchasing companies. In Dundee and Preston the prices were raised to £10 per annum, and in Swansea to £12, but this was still lower than most UTC group exchanges.<sup>171</sup> In Sheffield the subscribers negotiated a subscription charge better than anywhere else in the country, which I discuss in more detail in section five, below.<sup>172</sup>

#### 4.3. The UTC group

Whilst the Post Office exchanges were on the whole the most closed networks, and the independent companies' exchanges were more open, the exchanges of the UTC group were too numerous to easily generalise about. However, from the examples of the Post Office and independent exchanges I argue that the subscription price provides a good indicator of how open the exchange was. Until 1890, when the rates were reduced due to competition,<sup>173</sup> the charge for most UTC group-supplied towns around the country was between £15, for example in Leeds and Birmingham, and £20, for example in London, Manchester, Liverpool and Glasgow.<sup>174</sup> Thus I infer that most of these exchanges comprised a high proportion of closed network users. The examples of two different UTC

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171 Telephone and Telegraph Wires, 1885, evidence of Robert Raynsford Jackson, q.1137-8 (n.34); Telephone Service, 1895, evidence of Alexander H. Moncur, q.2363-5 (n.62); 'The Telephone at Preston', in the *Electrician*, vol. 18 (1886), pg. 73; the *Western Mail*, 11 June 1887, pg. 3 (n.124).

172 'Telephone Charges in Sheffield', in the *Sheffield and Rotherham Independent*, 31 May 1892, pg. 7.

173 Baldwin, 1925, pg. 605 (n.7).

174 Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. 5 (n.80).

group exchanges, Bradford and Aberdeen, both run by the NTC, demonstrate how different exchange experiences could be, even within the same company. These two exchanges became very busy telephone centres by the end of this period, but for different reasons.<sup>175</sup>

Opened in October 1880, the Bradford exchange was, from at least 1882 and throughout and beyond the period of my thesis, one of the six or seven largest exchanges in the country in terms of subscriber numbers. The exchange was used very intensively from the early 1880s; by 1894 it was the fourth busiest telephone centre in Britain.<sup>176</sup> The tariff in Bradford was, by November 1885, £15.<sup>177</sup> However, it is likely that this was a recent reduction from something closer to £20, as in October 1885 the chairman of the NTC, Robert Raynsford Jackson, told a meeting of the Leeds Chamber of Commerce that the only other town of comparable size and commercial importance to Leeds to have a £15 rate, as they did, was Birmingham.<sup>178</sup> Although cheaper than the largest telephone centres, this would still have been expensive enough to have excluded the majority of potential smaller users, such as shopkeepers, as was complained in neighbouring Leeds.<sup>179</sup> These types of users, many of whom could be seen on the independent companies' exchanges, comprise a very small proportion of the 1888 Bradford list of subscribers.<sup>180</sup>

This list reveals that the majority of Bradford telephone users were involved in the wool trade in some way, such as dyers, dye agents, manufacturers of looms, wool combers, wool spinners and wool and yarn merchants.<sup>181</sup> Most of these subscribers would have talked with one another on a very frequent basis, but would have had little need to talk to those outside of their industry. Thus the Bradford exchange comprised a high proportion of closed network users. Other examples of similar telephone centres were Manchester and Liverpool, with their involvement in the cotton industry, which probably resulted in them

175 Milne, 2007, pg. 166 (n.27).

176 'Telephony', in the *TJER*, vol. 14 (1884), pg. 226 (this article was reproduced from the *Bradford Observer*, a local periodical); BT Archives, TCB 304/1, file 2, Statements Prepared from the Records of the Receiver and Accountant General's Office Showing the Number of Exchange Subscribers in the Towns Licensed to the Various Telephone Companies [c.May 1884]; Milne, 2007, pg.166 (n.27).

177 The *Electrician*, vol. 16 (1885), pg. 5 (n.124).

178 Leeds Incorporated Chamber of Commerce – Meeting Held on the 16<sup>th</sup> October, 1885, pg. 5 (n.80).

179 *Ibid.*, pg. 6.

180 NTC, List of Subscribers, Yorkshire District, January 1888, pg. 40-63.

181 *Ibid.*

remaining very busy telephone centres throughout and beyond this period.<sup>182</sup> The fact that subscription to these exchanges cost £20 until the reduction of rates in 1891 would have made them even more exclusive. Nevertheless, although one of the bigger exchanges in terms of the number of lines, in 1894 Bradford was still smaller than Glasgow, Birmingham, Sheffield and of course London. However, none of these had as many calls per exchange line per year, on average, as Bradford.<sup>183</sup> I argue therefore that Bradford was for a long time one of the more closed of the UTC group exchanges, being moderately expensive, comprising a high proportion of subscribers involved in a single industry, and being very heavily used.

Next, Aberdeen is an important exchange to consider because it was here that concerted action from users and non-users first made a significant difference to the provision of telephone service. The Aberdeen exchange was opened around autumn 1881,<sup>184</sup> with a subscription rate of £15.<sup>185</sup> In January 1883, inspired by the cheap telephony in Dundee, a meeting was called of commercial and professional men to consider whether they should start their own, cheaper, telephone company in opposition to the NTC.<sup>186</sup> Nearly everyone present was willing to join an exchange for £6 a year. Occupations represented at the meeting included drapers, doctors, firms in the building trade such as engineers and a granite works, barristers,<sup>187</sup> and merchants, including grocers, druggists and coal merchants. Many of these would have been interested in the telephone exchange as an open network. At a second meeting, Robert Raynsford Jackson, the chairman of the NTC, came to convince the community not to oppose his company, and offered concessions.<sup>188</sup> A committee was formed, and negotiated a reduction in the NTC's proposed rates of subscription to £10 within one mile of the exchange on a lease of three to five years.<sup>189</sup> The

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182 Milne, 2007, pg. 166, 173 (n.27).

183 Ibid., pg. 166.

184 'Aberdeen Town Council', in the *Aberdeen Journal*, 2 August 1881, pg. 6; 'The Telephone and Harbour Offices', in the *Aberdeen Journal*, 11 October 1881, pg. 5.

185 The *Aberdeen Journal*, 2 February 1883, pg. 6 (n.42).

186 'Telephonic Facilities in Aberdeen', in the *Aberdeen Journal*, 24 January 1883, pg. 6.

187 Called in Scotland 'advocates'.

188 The *Aberdeen Journal*, 2 February 1883, pg. 6 (n.42).

189 The *Aberdeen Journal*, 9 February 1883, pg. 6 (n.1).

committee recommended adopting this as it was one of the lowest prices for a UTC group exchange anywhere in the country.

After these negotiations, the Aberdeen exchange grew very rapidly; whereas in December 1882 there were 26 paying telephone subscribers in Aberdeen, by November 1883 this had increased by an unprecedented degree to 208, making the exchange larger than the longer-established exchanges in Edinburgh and Birmingham, which had 200 and 160 subscribers respectively.<sup>190</sup> In February 1884 there were 278 subscribers,<sup>191</sup> and by November 1884 there were about 350.<sup>192</sup> The fact that these figures were being reported nationally is further evidence that this growth was quite remarkable for the period. By the end of October 1885, the number of exchange users was 463.<sup>193</sup> The Aberdeen exchange was thus the fourth biggest NTC system, behind Dundee, Glasgow and Bradford, and by inference the seventh largest in the country, with only London, Manchester and Liverpool being bigger. It was larger, the article noted, than Leeds and Birmingham, with 388 and 373 subscribers respectively. I attribute this rate of growth, one of the fastest in the country, to the lower tariff conceded by the NTC in response to the action of the Aberdeen commercial community.

The users who would thus have been joining, as represented at the meeting, would have included a larger proportion of open network users than elsewhere, as the cost was lower. In addition Aberdeen, with half the number of exchange lines Bradford had by 1894, nevertheless had nearly as many calls per line per year, making it a very intensively used exchange.<sup>194</sup> Thus, compared with Bradford, Aberdeen was a cheaper exchange which was larger relative to the size of the town. I argue that this was because Aberdeen was a much more open exchange as a result of the united action of users and non-users – inspired by the local company in Dundee – putting pressure on the NTC. However, on the whole larger UTC group exchanges were more closed networks, serving specific professions, businesses or industries.

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190 BT Archives, TCB 304/1, file 2, Statement Prepared from the Records of the Receiver and Accountant General's Office Showing the Number of Exchange Subscribers in the Towns Licensed to the National Telephone Company [c.May 1884].

191 'National Telephone Company, Limited', in the *TJER*, vol. 14 (1884), pg. 93; 'Telephonic', in the *TJER*, vol. 14 (1884), pg. 110.

192 'The Aberdeen Telephone Service', in the *TJER*, vol. 15 (1884), pg. 354.

193 '1885', in the *Electrician*, vol. 16 (1886), pg. 152.

194 Milne, 2007, pg. 166 (n.7).

## 5. Exchange use and the question of ownership

I now consider how the different purposes for which exchange telephony was used, open and closed networks, impacted on discussions about exchange telephone ownership. Particularly important were the questions of competition versus monopoly, and of local versus national exchange service provision – whether by a company or by the state. I argue that subscribers desiring closed networks were less concerned about the problems of competitive telephony – namely that subscribers on one system were unable to talk to those on the other – than those who required open networks. As long as the other subscribers with whom the closed network users wished to speak were on the same exchange, that was sufficient. Such an opinion was expressed by one grain merchant, Anton Kufeke, in Glasgow in 1898.<sup>195</sup> Although outside my period, this perspective would also have been found earlier. Kufeke said that if there were rival systems, then those in his trade, who really desired only to speak to one another in a closed network, would simply have joined one exchange en masse, and would not have been concerned about other users. It is easy to understand why for such a user a small Post Office exchange, as described above, would have been worth paying for, especially with its technical advantages.

It was however certainly more in the interests of those who required open networks to want a single, unified exchange system, as such users lost out when half the population of subscribers were on one exchange and half on the other.<sup>196</sup> For example in 1895, when discussing the establishment of a municipal exchange in Glasgow, a representative of a cab and carriage hiring firm noted that if there was no intercommunication with the existing NTC system, they would have to subscribe to both exchanges or risk losing half of the available telephonic business.<sup>197</sup> Similarly, in Preston in 1881 the main cab firm, Harding and Co., had to subscribe to both Sharples' local exchange and that of the L&C,<sup>198</sup> and in 1898 one Glasgow daily newspaper proprietor expressed the same concern.<sup>199</sup> As most open network users were smaller firms, such as shops, as noted above, a subscription to two exchanges would probably have been too expensive. Thus I argue that the difference in

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195 Telephone Exchange Service in Glasgow, 1898, evidence of Anton Kufeke, q.180-2 (n.50).

196 As noted by John White in Aberdeen; see first epigraph.

197 Telephone Service, 1895, evidence of Robert Kay, q.2200 (n.62).

198 The *Preston Chronicle*, 16 April 1881, pg. 4 (n.58); the *Preston Chronicle*, 15 October 1881, pg. 1 (n.59).

199 Telephone Exchange Service in Glasgow, 1898, evidence of John Yuille, q.8855 (n.50).

views regarding how the exchange network should be run was not a division between large and small businesses, but between different types of subscribers with these different requirements.

An additional divide in such discussions regarding who would be best to provide telephone service was between those who only wanted local or regional trunk service, and those who wanted national trunks. I have discussed examples of these above, such as the manufacturers and colliery companies which wanted to speak regionally,<sup>200</sup> and the stockbrokers and newspapers which benefited from being able to speak longer distances across the country.<sup>201</sup> All of these factors played a role in negotiating questions of ownership in situations of contention. A controversy which arose in Sheffield in May 1892 sheds light on this process, revealing those users who desired open and those who desired closed networks, and those who wanted national and those who wanted regional communications. The interactions of these subscribers, and the way in which different requirements were accommodated, shaped the system which subsequently emerged; the prevailing notion of telephone purpose shaped the resulting model of telephone ownership.

### 5.1. The Sheffield message rate controversy

John Tasker's local company was purchased by the NTC in March 1892, before which, as the *Sheffield and Rotherham Independent* pointed out, the public had been “perplexed”<sup>202</sup> by the facilities offered by the rival companies. The newspaper also noted that large firms had found themselves needing to subscribe to both, with two instruments, two lists, and two payments. However, by the end of April Sheffield subscribers were angry that the NTC had decided, as an experiment, to change the tariff from a flat rate to a message rate. Whereas the former meant a fixed amount was paid for unlimited usage, the latter was a yearly rate including a limited number of calls, in this case 1,000, and subsequently all extra calls would cost 1d. One example of the frustration of subscribers, as expressed in the correspondence columns of the *Sheffield and Rotherham Independent*, is given in the second epigraph to this chapter. The *Sheffield and Rotherham Independent* called this new tariff “fanciful, mischievous, and indeed suicidal”,<sup>203</sup> and argued that it would strangle telephone use.

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200 Milne, 2007, pg. 173 (n.27); Testimonials of Subscribers to the Mutual Company, [April 1892] (n.63).

201 Telephone Service, 1895, evidence of Harcourt Everard Clare, q.1224 (n.62); Telephone Exchange Service in Glasgow, 1898, evidence of John Yuille, q.8860-3 (n.50); the *Sheffield and Rotherham Independent*, 27 November 1879, pg. 5 (n.82).

202 'Summary of News', in the *Sheffield and Rotherham Independent*, 12 March 1892, pg. 5.

203 'Summary of News', in the *Sheffield and Rotherham Independent*, 30 April 1892, pg. 5.

Although Baldwin, Kingsbury and Milne all mentioned this case, they portrayed it as large users resisting a new system which, whilst costing them more, would have meant cheaper telephony for smaller users.<sup>204</sup> However, this was not how the subscribers viewed it; for some it would have meant the most expensive exchange telephone subscription rates in the country.<sup>205</sup> When the message rate was announced, subscribers were furious, and called a large meeting to decide on a course of action.<sup>206</sup> To indicate the severity of the situation, the general manager of the NTC, W. E. L. Gaine, was present. Three suggestions were proposed by subscribers as solutions to the problem, each comprising a different model of ownership. One, inspired by Provand's Mutual Company in Manchester, was that Sheffield telephone users should begin their own company along co-operative lines. The second was that they should ask the New Telephone Company to open a competing exchange, and the third was that they should come to terms with NTC. I argue that the users proposing these options were influenced by their different notions of telephone purpose.

For example, the first subscribers to mention starting a new local company were steel manufacturers, for example, William Brittain, the president of the Chamber of Commerce, and Robert Colver.<sup>207</sup> Users in the steel industry were united in this regard, and the members of the Cutlers' Company, the Rolling Mills Association and the Tilters and Forgers' Association had all decided to give up their telephones together if the new tariff was not retracted. Although the NTC had national trunk lines, and could offer communication with Birmingham, Manchester, Liverpool and London,<sup>208</sup> they preferred to begin their own exchange, with no immediate hope or expectation of having extensive trunk line service. These were users who required a closed network, and were content with their telephone service if they could speak to just a small group of other subscribers. They also required regional trunk communications, and as Tasker had previously supplied this, they would have felt they could supply this for themselves. These users preferred to start their

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204 Baldwin, 1925, pg. 607 (n.7); Kingsbury, 1915, pg. 481 (n.9); Milne, 2007, pg. 168 (n.27).

205 The *Sheffield and Rotherham Independent*, 30 April 1892, pg. 5 (n.203).

206 The *Sheffield and Rotherham Independent*, 10 May 1892, pg. 7 (n.41).

207 Ibid.; from 1891 English census: William H. Brittain, merchant and file and steel manufacturer, Robert Colver, steel manufacturer.

208 'Telephonic Communication between Sheffield and Other Towns', in the *Sheffield and Rotherham Independent*, 28 September 1888, pg. 3; 'The Telephone', in the *Sheffield and Rotherham Independent*, 21 December 1889, pg. 6; 'Extension of the National Telephone Company's Service', in the *Sheffield and Rotherham Independent*, 23 January 1890, pg. 3.

own company because they could then get the exchange telephony they wanted, and they were not concerned that competition could be bad for open network users.

The first subscribers in favour of asking the New Company to establish a competing exchange were stock and share brokers, such as Arnold Watson and Francis Smith.<sup>209</sup> Such subscribers would also appreciate a closed network over an open one. However, as noted above, this was one of few professions which had a use for national telephony in this period, so it is not surprising that instead of advocating a local company to compete with the NTC, they preferred the New Company, which would more quickly have been able to provide national trunks to connect them with Manchester and London.<sup>210</sup> Also in favour of the New Company was Frederick Rawson, a cutlery manufacturer and merchant, who may have preferred the New Company over a local company because he desired to sell his goods nationally. This combination of the desire for a closed network and the need to communicate nationally led such telephone users to propose a competitive company which could readily supply national communication.

Some users spoke in favour of the NTC. For example, John Standall, a house decorator, said that the company had always been very fair and generous when he dealt with them, and when he wrote to them complaining about the revised tariff, he was told that if he did not want it then his current agreement, the flat rate, would remain unchanged.<sup>211</sup> A solicitor, Herbert Hughes, suggested that a committee be formed to negotiate with the NTC directors, and he, as well as others such as John Leader, a printer and publisher, hoped that the NTC would come to terms.<sup>212</sup> These subscribers all might have benefited from an open network in order to receive the messages of potential customers or clients. Thus it was in their best interests to avoid competition and instead to attempt reconciliation with the NTC. Although one subscriber who publicly supported this plan, George Howson, was a cutlery manufacturer, he appears to have been in the minority amongst his colleagues in industry.<sup>213</sup>

These subscribers were not the only ones to advocate these respective positions. For example, John Martin, a surgeon, also spoke in favour of the founding of a local company, as did Sir William Leng, the editor of the *Sheffield Telegraph*, both of whose business

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209 From 1891 English census: Arnold T. Watson, share-broker and accountant, and Francis E. Smith, stockbroker.

210 Milne, 2007, pg. 176 (n.27); Michie, 1985, pg. 70 (n.84).

211 The *Sheffield and Rotherham Independent*, 10 May 1892, pg. 7 (n.41); from 1891 English census: John Standall, house decorator.

212 From 1891 English census: Herbert Hughes, solicitor, and John Daniel Leader, printer and publisher.

213 Ibid.: George Howson, cutlery manufacturer.

interests would, I have argued, be best served by the provision of an open network.<sup>214</sup> Additionally, William Skelton, a shovel manufacturer, publicly supported the attempt to bring in the New Company, instead of arguing for a local company, as others in his industry did.<sup>215</sup> Nevertheless, I argue that in the first two instances these users were following the lead of some of the main sources of their business; surgeons would have benefit immensely from being connected to the incredibly dangerous factories and foundries of the steel industry, and a newspaper would likewise have received much news, especially breaking news of accidents, from the same source.<sup>216</sup> Skelton, in supporting competition over reconciliation with the NTC, still fitted the pattern of his industry; however, it is possible that he had broader trade connections which encouraged him to prefer a company which could assure him national trunks earlier over a local alternative.

When the committee appointed to negotiate with the NTC reported back, the company had abandoned its message rate plan, and lowered its proposed flat rate tariff to £8 for one and a half miles, £10 for two miles, and, for private houses, £7 for two and a half miles.<sup>217</sup> This, the *Sheffield and Rotherham Independent* reported, was probably the best telephone deal in the country, and was accepted at a meeting of the subscribers.<sup>218</sup> One notable concession was that doctors' houses should be considered as private houses and not as places of business; this might have defused and won over such sceptics as Dr. Martin, a passionate advocate for a local firm. Thus, under threat of competition, the NTC was forced to cooperate with and concede to its united subscribers. The result was a more open network, instead of competition, because the existing community of subscribers had been quite open. Sheffield telephony was never relatively expensive, and in the period before the amalgamation of the NTC and Tasker's company it was even cheaper, with the NTC

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214 The *Sheffield and Rotherham Independent*, 10 May 1892, pg. 7 (n.41); from 1891 English census: John W. Martin, surgeon; Millar, A. H., 'Leng, Sir William Christopher (1825–1902)', rev. Dilwyn Porter, *Oxford Dictionary of National Biography* (Oxford University Press, 2004) [<http://www.oxforddnb.com/view/article/34495>, accessed 7 Jan 2014].

215 'Telephone Management', in the *Sheffield and Rotherham Independent*, 14 May 1892, pg. 5; from 1891 English census: William S. Skelton, shovel manufacturer.

216 Indeed, such accidents were often very serious, and were quite comprehensively reported, for example: 'Shocking and Fatal Accident', in the *Sheffield and Rotherham Independent*, 30 July 1870, pg. 11; 'Shocking Accident at Messrs. Vickers' Works', in the *Sheffield and Rotherham Independent*, 7 September 1886, pg. 5.

217 'Summary of News', in the *Sheffield and Rotherham Independent*, 26 May 1892, pg. 5.

218 The *Sheffield and Rotherham Independent*, 31 May 1892, pg. 7 (n.172).

charging only £5 in order to undercut the local company.<sup>219</sup> As in Dundee, I argue this resulted in a more open network.

Indeed, the cases of both Dundee and Aberdeen reveal similar patterns; in both there was a discussion whether or not to establish a local company to compete with the larger one, and although the outcomes were different – competition in Dundee, and concession in Aberdeen – the deciding factors were much the same. In Dundee the jute industry formed the core group arguing for the local company, and this fact, plus the fact that it originally charged £10 as opposed to the rival company's £20, meant that it was successfully formed and proceeded to run for some years.<sup>220</sup> In Aberdeen, users of the NTC exchange, and non-users, were tempted by the prospect of £7-10 subscriptions, instead of the £15 offered by the NTC.<sup>221</sup> However, it appears that the initial advocates of the scheme, smaller merchants, were won over instead by the NTC's concession rate of £10, as well as, I argue, the prospect of an open network if there was only one system. This was the implication of the merchant John White's comment, given in the first epigraph, that it was preferable to avoid competition where possible for the convenience of the community.<sup>222</sup>

Thus, local developments in exchange telephone ownership were shaped by the proportions of different types of exchange subscribers in each town. This depended in part on the concentration in the town of a trade or industry which required frequent communications within a closed group of users. As demonstrated in the case of Bradford, a heavily dominant industry could maintain a telephone exchange system as a largely closed network. Those who desired open networks had a greater incentive to see the system grow than did those users who required for their business needs only a closed network, and were thus more likely to push for a compromise with the main provider of telephony rather than start their own exchange system.

## 6. Conclusions: the historiographical importance of studying provincial regions

In this chapter I have demonstrated that telephone exchanges were not homogeneous during the 1880s and early 1890s, and that local developments were dependent on

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219 Ibid.

220 The *TJER*, vol. 15 (1884), pg. 234 (n.143); 'Proposed New Buildings and Alterations in Dundee', in the *Dundee Courier*, 16 November 1880, pg. 4.

221 The *Aberdeen Journal*, 24 January 1883, pg. 6 (n.186).

222 The *Aberdeen Journal*, 9 February 1883, pg. 6 (n.1).

contingent factors such as the uses to which subscribers put their exchange connections. The development of exchange systems was different around the country as the providers of telephone services encountered the varied needs and demands of users and potential users. These needs and demands were determined largely by the business requirements of the different users, and can be seen manifested in the preference for either open or closed telephone networks. This preference regarding the purpose of exchange telephony in turn shaped the development of exchanges. For example, I argue it is impossible to understand the longevity of the small Post Office exchanges, especially in Wales, as noted above,<sup>223</sup> without appreciating that for some subscribers a small, technically advanced exchange was what they needed for their closed network. In instances where competition was considered as a potential model of ownership it was closed network users who benefited most and advocated the hardest for new opposition exchanges. The case of the Manchester Mutual Telephone Company in the next chapter also supports this.

Focusing on what was happening around the country instead of simply in London reveals the extent and nature of the influence users had over their exchange service, and results in a more dynamic picture of British telephony. For example, some users required, demanded and received certain types of exchange services, such as regional or national trunk lines, whilst others were inspired by events in certain important towns such as Dundee and Sheffield to take united action against the larger companies. Dundee was particularly influential, inspiring dissent amongst subscribers in Aberdeen, Leeds and, as will be seen in chapter five, Manchester. My geographical approach explains, for example, why by 1894 Dundee and Aberdeen were the seventh and eighth busiest telephone centres respectively in the country.<sup>224</sup> Without an appreciation of these geographically dispersed centres of telephone development, and how they influenced one another, existing narratives of telephone history leave many important questions unanswered, such as what were the driving forces behind the establishing of the Mutual and New Telephone Companies. This supports the assertion of Charles Withers and David Livingstone, amongst others, that it is important to think geographically about the history of science and technology.<sup>225</sup>

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223 Names of All Telephone Exchanges which the Post Office has at Any Time Opened, 16 May 1899, pg. 2 (n.108).

224 Milne, 2007, pg. 166 (n.27).

225 Withers, Charles W. J. and Livingstone, David N., 'Thinking Geographically about Nineteenth-Century Science', in Livingstone, David N. and Withers, Charles W. J. (eds.), *Geographies of Nineteenth-Century Science* (University of Chicago Press, 2011), pg. 2-3; see also Smith, Crosbie and Agar, Jon (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Macmillan Press Ltd., 1998).

As noted in chapter one, London itself came out of comparisons with other telephone centres quite badly in the late 1880s,<sup>226</sup> and by June 1891 the *Electrician* could say that it was aware of many important businesses which declined to use telephones because of the delays and the cross-talk.<sup>227</sup> Figures compiled by Milne show London to have been only the twenty-seventh busiest telephone centre in the country by 1894, measured in terms of average number of calls per line per year.<sup>228</sup> Additionally, a London-centric history of British exchange development would not have involved much regional or national trunk communication until the 1890s. In May 1887 the *Electrician* reported that telephone communication between Liverpool and Manchester had been disrupted for a weekend. There had been numerous enquiries about when the service would be available again, which demonstrated how important telephony was to the local commercial community. Regarding London, by contrast, the journal remarked that if the metropolis had been entirely cut off from neighbouring towns even for a week no-one would have cared.<sup>229</sup>

I argue that in the 1880s a model of exchange service comprising independent local exchanges around the country connected by Post Office trunk wires was a real possibility. This contradicts somewhat the standard narrative provided by Baldwin and Perry, that the growth of trunk lines and the national nature of the exchange network made it inevitable that a single, national body – first the NTC, then later the Post Office – would come to provide exchange telephony. The important unit for telephone growth in this period was not the country as a whole, but provincial regions. It was within regions, the areas surrounding large towns, that most communication was desired, and not at the national level. Baldwin noted that in the few places where there were regional trunk lines in the early 1880s, telephone development was more noticeable than elsewhere.<sup>230</sup> However, it is not always clear which came first, the telephone usage or the trunk lines. The regional trunk lines did provide an incentive for firms to join the exchanges, but beforehand the early subscribers in many areas were demanding this regional communication, or making it a condition of joining the exchange, as for example happened around Birmingham.<sup>231</sup>

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226 For example, the *Electrician*, vol. 21 (1888), pg. 526-7 (n.18); and: Munro, 1888, pg. 755-6 (n.52).

227 'Notes', in the *Electrician*, vol. 27 (1891), pg. 207.

228 Milne, 2007, pg. 166 (n.27).

229 The *Electrician*, vol. 19 (1887), pg. 46 (n.71).

230 Baldwin, 1925, pg. 475 (n.7).

Thus, the pattern of exchange growth which emerged was driven by user demand, and for this reason it is vitally important to look at the needs of the telephone users, in a way which is not evident in existing histories of telephony, in order to properly understand the growth of the system. Exchange telephony in the 1880s was not a homogeneous or fixed technology, but rather its provision had to be adapted to suit the local requirements of users. In the next chapter I build on this understanding of the factors involved in the development of telephone systems by examining four companies established to compete with the UTC group later in the 1880s and early 1890s, after the larger exchanges were already established. Unlike the threatened local companies of Aberdeen and Sheffield, these were actually started and run in opposition to the UTC, and later the NTC. One, the Mutual Telephone Company in Manchester, was specifically inspired by the activities of the independent companies. Studying these companies demonstrates how the dissatisfaction of telephone users ultimately resulted in the nationalisation of the trunk lines in 1892.

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231 Telegraphs Bill, 1892, evidence of James Staats Forbes, q.367 (n.65).

## **Chapter Five: Opposing the monopoly: dissatisfied users in London and Manchester**

### 1. Competition and nationalisation

“The Lancashire and Cheshire Telephone Company make the maximum possible charge the public will pay, and admit that a great number of people are giving up the telephone because they cannot afford £20 per annum... Telephony from its nature must be a monopoly in the sense that it is better there should be only one company in each town, and as it will be as much a necessity to the mercantile community as gas is to the community generally, it should be carried out by a co-operative association.”

Andrew Dryburgh Provand, Manchester merchant, June 1885<sup>1</sup>

“The telephone should stand on your writing table, or by your bed-side; there should be a switch plug in the basement or in your clerks' office. Your office or basement is rung up, the servant or clerk comes to know whether you will speak to such and such a person, you are not harried and your nerves distracted with the bell ringing when you least expect it, and if you are using the telephone yourself, your main object is to be able to save yourself innumerable letters and journeys by getting 'rapidly' round your list of persons in the shortest possible space of time. At present, nine times out of ten, one abandons the instrument in despair. The exchange system is absolutely inadequate, and the single wire makes the telephone inaudible.”

The Duke of Marlborough, September 1891<sup>2</sup>

Whereas in the previous chapter I examined how notions of telephone purpose affected models of ownership, in this chapter I explore how telephone ownership was affected by notions of telephone entitlement. I examine four different companies which began specifically in opposition to the UTC group, three of which were exchange companies and one of which supplied private wires. This latter company is also useful because it is representative of many other private wire companies which operated during the 1880s. Behind all of these four companies were users and non-users dissatisfied with the service of the UTC group and with its growing monopoly; these individuals believed that private competition, at least in the short term, was the ideal model of ownership and the best way to guarantee a good service to the public. This was in direct contrast to the views of the UTC group. In addition, these opposition companies all attempted, to some degree,

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1 Provand, A., 'Telephone Charges', in the *Manchester Guardian*, 27 June 1885, pg. 6.

2 Marlborough, 'The Telephone', in the *Times*, 5 September 1891, pg. 7.

to increase access to telephony, demonstrating a wider view of telephone entitlement than the UTC group companies. Ultimately, I demonstrate how the actions of those who were not happy with UTC group telephony, as discussed in the previous chapter, led to the government's decision in June 1892 to nationalise the trunk wires.

The views of two of these dissatisfied users are given in the epigraphs above. Andrew Dryburgh Provand, a Manchester merchant and later an MP for Glasgow, wrote to the *Manchester Guardian* in 1885 to complain about the L&C. He claimed he was only one of many dissatisfied users to do so. In his letter he claimed that the £20 they charged for exchange subscription was driving users away. The solution he offered was that a new co-operative telephone company ought to be started when the patents ran out.<sup>3</sup> The users for whom Provand was concerned were mostly businesses. George Spencer Churchill, the 8<sup>th</sup> Duke of Marlborough, on the other hand, when looking in 1891 for support for his New Telephone Company, spoke also to potential domestic users: those gentlemen who wished to use the telephone in their social as well as their business endeavours. He claimed, in a letter to the *Times*, that London telephony was nearly impossible to use, and promised that his company would provide a technically superior system for a lower cost. His vision, laid out in the second epigraph above, was of an efficient, clearly audible service enabling faster connection times, which he argued was not then possible in London.

Both Provand and Marlborough were examples of the widespread discontent with the provision of telephony by the UTC group companies during the period covered by this thesis. Below I examine the four main companies started during this period with the express intention of competing with the UTC group. Amongst these companies were the London and Globe Telephone and Maintenance Company, established in London in 1882, and the Mutual Telephone Company, started in Manchester in 1891. Both provided exchange telephony. The other company, the New Telephone Company, existed in two incarnations, the first supplying private telephony around the country between 1885 and 1889 and the second existing only briefly between 1892 and 1893 with the intention of supplying nationwide exchange telephony. I investigate each of these four companies in turn, examining their origins, their users, and their subsequent impact on British telephony.

This chapter focuses on London and Manchester specifically because these were the two places where companies with the aim of explicitly opposing the monopoly started during this period. This is probably because these cities were, in terms of numbers of users, the largest telephone centres in the country.<sup>4</sup> Although there was competition elsewhere in the country from the independent companies, as examined in chapter four, these local

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3 Provand, 1885, pg. 6 (see n.1).

companies began at the same time as the UTC group companies, often before there was a UTC group company in the area. The companies in this chapter, however, represent those concerns which noted and disagreed with the growing UTC group monopoly and actively intended to oppose it. All attempted to improve telephony through competition. Although, as I will show, Provand believed that ultimately telephony ought to be a monopoly, he argued that it ought to be an accountable monopoly, and that the road to ensuring this was the encouragement, in the short-term, of competition.

Towards the end of this chapter I examine the debate about telephone nationalisation in this period, in particular the questions of whether telephony should be nationalised at all, and if so whether that nationalisation should be partial or complete. In doing so it is important to consider telephone users, as the decision to nationalise the trunk lines was taken in order to meet the needs of users and potential users such as those discussed in this chapter. The most influential histories of British telephony until now, in particular Baldwin and Perry, were written at a time when telephone provision in Britain was a state-run monopoly, and this was not questioned, but rather assumed to have been a natural progression of events. In the 1980s however British telephony was again privatised and competition was reintroduced into British telecommunications.<sup>5</sup> Thus I argue there was nothing intrinsic about telephony which made it inevitable that it would eventually be run as a state monopoly in Britain. In this chapter I demonstrate the ways in which the purchase of the trunk lines was driven by the requirements of users, and also explain why this nationalisation was only partial. This was due to the majority opinion amongst users regarding ownership, namely that some form of competition was the ideal; in nationalising the trunks the government intended to encourage competition by levelling the playing field so that new or small companies could compete with big existing companies. Although this was not ultimately the result, it was nevertheless the driving intention of telephone users and the government.

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4 BT Archives, TCB 304/1, file 2, Statements Prepared from the Records of the Receiver and Accountant General's Office Showing the Number of Exchange Subscribers in the Towns Licensed to the Various Telephone Companies [c.May 1884].

5 Agar, Jon, *Constant Touch: A Global History of the Mobile Phone* (second edition, Icon Books, 2013), pg. 80; [http://www.btplc.com/Thegroup/BTsHistory/History\\_of\\_BT.pdf](http://www.btplc.com/Thegroup/BTsHistory/History_of_BT.pdf) pg. [2] [accessed 19/3/14].

## 2. The London and Globe Telephone and Maintenance Company

Examining the companies which opposed the UTC group's growing monopoly reveals who was dissatisfied both with the efficacy of the existing service and with the prevailing models of telephone ownership and entitlement. The first company to actively oppose the UTC group was the London and Globe Telephone and Maintenance Company in 1882.<sup>6</sup> To set the scene, at this time London telephony comprised multiple UTC exchanges of different sizes, seventeen in August 1882, connected by trunk lines. Exchange subscription then cost £20 a year, and the exchanges were open from 9am until 7pm on weekdays, closing at 5pm on Saturdays. There was no Sunday service. In August 1882 there were 1,932 UTC subscribers, making an average of 14,000 calls a day.<sup>7</sup> By January 1883, this had increased to 2,247 subscribers, and by that November the volume of telephone messages on the UTC system overtook the number of postal telegrams.<sup>8</sup> The UTC's August 1882 list of subscribers advertised seven call rooms in London where subscribers and their clerks could use exchange telephones; particular emphasis was placed on the utility of these rooms to the legal profession due to their proximity to the Law Courts.<sup>9</sup> At that time also the Postmaster General, Henry Fawcett, stressed that the government would not nationalise the telephone companies, and reiterated his commitment to competition in telephony, believing that this would be best for the public.<sup>10</sup> It was against this background that the London and Globe Company began operations.

During its short life, the company became embroiled in a number of legal disputes with the UTC over patents and wayleaves for their wires, both being frequently involved in controversies where each accused the other of sabotage. The UTC eventually bought out the London and Globe in June 1884, and dismantled its plant.<sup>11</sup> When this company has been discussed at all in existing histories its significance as providing an alternative

6 Although Baldwin asserted that this company started serving users in 1881, it was almost certainly not until early 1883 that the first users were actually connected up to the company's exchange at 24 Basinghall Street (Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925), pg. 61).

7 UTC, List of Subscribers, August 1882, pg. [xi]-xii.

8 Ibid., January 1883, pg. [vii]; Batten, John, W., 'A Penny Telephone', in the *Times*, 7 November 1883, pg. 8.

9 UTC, List of Subscribers, August 1882, pg. xv.

10 'The Telephone Industry', in the *TJER*, vol. 11 (1882), pg 120.

11 Ibid., pg. 65.

telephone use-experience to the UTC has been all but ignored.<sup>12</sup> It is important because it demonstrates how early dissatisfaction with the UTC arose, and amongst whom; supporters of the London and Globe, such as the then-Liberal journal the *Pall Mall Gazette*, believed that competition would, by survival of the fittest, produce the best telephone system.<sup>13</sup> In order to ascertain the types of people who were supporting this company, I examine its subscribers through its surviving directories, those from January, February, March, April and June 1884.<sup>14</sup> I first note the technical details of the company's system, and then discuss its users as revealed through the lists of subscribers. Lastly I consider how the London and Globe Company affected the UTC and the public perception of telephony more generally.

## 2.1. The London and Globe system

During the summer vacation of 1882, Silvanus Thompson, noted in chapter three as the co-inventor of the valve telephone, spent some time in London providing advice to the fledgling London and Globe, starting a trend which would see him involved with each of the four new telephone companies established with the intention of challenging the monopoly. He had been interested in telephony for some years, and had already taken out his own patent for improvements in telephony. In this case he declared that the instruments being used by the London and Globe – the Hunnings transmitter and the English Mechanic receiver, both described in chapter three – were separate and distinct from those manufactured under Edison's patent, and were not infringements.<sup>15</sup> Evidence from Baldwin, as well as reports in the *Electrician* and *TJER*, indicates that the London and Globe Company's system was technically superior to that of the UTC. For example, the London and Globe used metallic circuits for subscribers' lines, which would have ensured privacy

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12 Baldwin's account is by far the most detailed (Baldwin, 1925, pg. 61-65, 70-74 (n.6)). See also: Occomore, David, "*Number, Please!*" *A History of the Early London Telephone Exchanges from 1880 to 1912* (Ian Henry Publications, 1995), pg. 15-17, 41, 46; Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977), pg. 84-5; and Holcombe, A. N., 'The Telephone in Great Britain', in the *Quarterly Journal of Economics*, vol. 21, no. 1 (November 1906), pg. 103.

13 'City Notes', in the *Pall Mall Gazette*, 14 August 1882, pg. 6.

14 Although Kingsbury noted that the first London and Globe directory was dated December 1883, I think it is likely that lists were produced earlier than this (Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 361).

15 Thompson, Jane Smeal and Thompson, Helen G., *Silvanus Phillips Thompson: His Life and Letters* (T. Fisher Unwin Ltd., 1920), pg. 115; 'The London and Globe Telephone and Maintenance Company', in the *Times*, 11 August 1882, pg. 13; Baldwin, 1925, pg. 61 (n.6); 'The London and Globe Telephone Company', in the *TJER*, vol. 13 (1883), pg. 36.

and clarity of speech,<sup>16</sup> and also used a multiple switchboard, which as noted in chapter three increased the efficiency of making exchange connections.<sup>17</sup>

Tellingly, Baldwin compared the design of the London and Globe system to that of the Post Office at the time he was writing in the 1920s, saying that they were very similar despite the latter probably having been built without knowledge of the former.<sup>18</sup> This implies that it was a superior system when compared with that of the UTC, and, considering the technical details noted above, the London and Globe Company probably delivered the better use-experience. Annual subscription to the London and Globe cost £10 10s, just over half of the £20 charged by the UTC. Additionally, instead of renting its telephone instruments, the London and Globe sold them to its subscribers.<sup>19</sup> This reduced the cost to subscribers over a longer period of time, which would have made it more affordable still than the UTC subscription. The alternative offered by the London and Globe highlights the problems users saw with the UTC. I argue that the London and Globe system served to raise expectations of telephony; the fact that the UTC was not seen to meet these expectations lowered it in the estimations of users and led to dissatisfaction and discontent.

## 2.2. Subscribers to the London and Globe

I now investigate the subscribers and communities which made up the London and Globe system by examining the surviving London and Globe directories. I thus demonstrate two things: firstly, that many London and Globe users were firms which benefited from open networks – as explained in chapter four – in order to reach and be accessible to their wealthy customers. Secondly, I demonstrate that firms which were previously telephone non-users were important supporters of the company. Although Baldwin noted that there were very few London and Globe subscribers who were not also already subscribers to the UTC system, I contest this.<sup>20</sup> To provide some overall context, a comparison of the London and Globe directories to one another shows that the company's system grew slowly, from 105 subscribers in January 1884 to only 158 in June. The number of extra subscribers in each list was small and did not show signs of increasing. In

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16 Baldwin, 1925, pg. 61 (n.6).

17 Occomore, 1995, pg. 41 (n.12).

18 Baldwin, 1925, pg. 64 (n.6).

19 'The London and Globe Telephone and Maintenance Company', in the *Times*, 9 August 1882, pg. 11.

20 Baldwin, 1925, pg. 65 (n.6).

January 1884, the *TJER* commented that 600 firms had signed up to become subscribers, and 50 private wires had been applied for, of which 29 had been erected at that time.<sup>21</sup> Thus, private wire telephony was a very small proportion of the company's business.

Studying the directories reveals that some subscribers had two or three lines to the company's exchange. Subscribers with two lines in the February directory were a firm of stationers and printers, a mahogany merchant, an ostrich feather merchant, and a firm of solicitors, all of which had two premises connected to the exchange. Henry Webster, a sewing machine maker, had three lines. In the March directory, a bottled beer merchant, a firm of builders and a fruit, pea and potato merchant had acquired second exchange lines for separate premises, and J. F. & G. Harris, mahogany merchants, had acquired a third. A piano maker had joined with two lines. From February, J. Shoolbred and Co., general merchants, had one line to their store and another specifically for their counting house. I argue that such firms used the exchange as a way to communicate between their own premises, and this was one reason why the London and Globe had so few dedicated private wires. On the more expensive UTC system, this was less practical, and, as Milne noted, firms which relied on this for intercommunication sometimes found connection times to be too slow and the quality of the lines to be so bad that it was better to have a private line.<sup>22</sup> However, on the technically superior London and Globe system, this would have been feasible.

The three prominent subscriber groups on the London and Globe exchange were the legal community – with many solicitors listed, as well as the Legal Club and the Royal Courts of Justice Chambers – ship makers, owners and brokers, and merchants dealing in luxury goods such as fur, ostrich feathers, silk, mahogany and wine. These groups comprised the majority of London and Globe users. The importance to exchange telephony of the shipping community especially will be seen again later in this chapter with regard to the Mutual Telephone Company. Other smaller groups of subscribers were firms in the metal industry – including the Metal Exchange – makers and suppliers of musical instruments, especially pianos, and theatres and ticket offices. Conspicuously absent, considering users of other telephone companies, were railway companies and the financial community, of which there were only one or two representatives, some of whom tried the system in January and were then absent from the February directory. Nevertheless, few

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21 'London and Globe Telephone and Maintenance Company, Limited', in the *TJER*, vol. 14 (1884), pg. 16-7.

22 Milne, Graeme J., 'British Business and the Telephone, 1878-1911', in *Business History*, vol. 49, no. 2 (March 2007), pg. 171-2.

users left the system within this period. There was only one bank, and also only one hotel, and no cab firms. Below I consider reasons why some businesses used the London and Globe and others did not.

### 2.3. Use and non-use of the London and Globe system

The patterns that emerge between these firms, apart from the provision of legal service, are that many dealt either with the construction or employment of ships, or with luxury items. Pianos, sewing machines, fur, silk and ostrich feathers, very fashionable in the period, fell into the latter category, as did art cabinets and mahogany, along with theatre ticket services. Two ostrich feather merchants both had two lines each in the June directory, and one alcohol producer, Pimm's, had two lines, with one expressly listed for use if the other was engaged.<sup>23</sup> Milne suggested that businesses with multiple lines such as this were often heavy telephone users, so it is likely that this firm had, or anticipated having, a considerable amount of telephone business.<sup>24</sup> As well as using exchange lines to connect their premises for their own purposes, what most of these luxury goods dealers had in common was that they would all have benefited from an open network to reach potential – wealthy – customers. This would have made them more likely to join a cheaper exchange in the hope that the lower price, and the quality of the system, would result in a large network of reasonably wealthy domestic users. Most of these firms, with the exception of an instrument maker and a fur merchant, were not UTC subscribers. Thus I argue that for these types of companies the difference between a £20 subscription and a £10 subscription was very important. Thus the London and Globe's lower subscription cost enabled a broader range of firms to become exchange users.

On the other hand, the absence of the financial community may have been because they and their business customers already had UTC connections; as they would not have benefited from a large number of domestic users as much as the merchants mentioned above, they would have had less reason to subscribe to the London and Globe. In addition, for stockbrokers, who required more closed networks, there was little incentive to join the new exchange if other financial institutions were not also subscribers. Likewise, although there were many railway companies on the UTC system from the early 1880s,<sup>25</sup> such businesses probably did not need open networks, but rather did business with a definite

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23 London and Globe, Lists of Subscribers, April and June 1884.

24 Milne, 2007, pg. 176 (n.22).

25 UTC, List of Subscribers (Professions and Trades), February 1882, pg. 72-3.

rather than an indefinite number of firms. Hotels on the other hand were large users of UTC telephones who benefited from open networks.<sup>26</sup> One example of telephone use by a hotel was given in a provincial newspaper account from 1882, which was reprinted by the UTC in its lists of subscribers for many years.<sup>27</sup> The journalist noted how the telephone was used by a guest to buy and sell stocks, by a hotel clerk to order theatre tickets, and by the manager to order supplies. However, such businesses may have been less able than large merchants or ship-brokers to justify the expense of two telephone connections. Cab firms likewise needed open networks, as noted in chapter four, and so tended to oppose competition. In this case however, an extra £10 on top of their £20 UTC subscription may have been difficult to justify whilst the London and Globe exchange remained so small.

I have compared the London and Globe's February 1884 directory with the February 1884 UTC directory, the only one which overlaps with the period for which London and Globe directories have survived.<sup>28</sup> The majority, nearly two thirds, of the London and Globe subscribers did not appear in the UTC directory. Those subscribers who did use both would have been the wealthiest users, for whom the high rental charge was no object. For example, a stationery and printing firm called Bradbury, Wilkinson and Co. had two lines on both systems. Other examples included ship owners and brokers, solicitors, accountants, metal merchants and the *Graphic*. I argue that such subscribers would have been enticed by claims of higher quality telephony, having found the UTC system quite frustrating to use, as noted in chapter three.

Regarding the firms which only appeared in the London and Globe directory, whilst their absence from the UTC directory is not conclusive proof that the firms in question did not have UTC telephones, it is significant evidence. These firms included the luxury goods merchants noted above, and also opticians, advertising agents, drapers, sewing machine manufacturers, a coal merchant, an estate agent and a corsetiere. In addition, there were many solicitors; indeed, more of the solicitors on the London and Globe system were solely London and Globe subscribers than were subscribers to both companies. The London and Globe system attracted some of the same types of users as the cheaper independent exchanges discussed in chapter four; for these firms, at £10 exchange use became a worthwhile investment. My analysis therefore demonstrates that fewer London and Globe subscribers were also with the UTC than Baldwin claimed. Thus it was predominantly non-

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<sup>26</sup> Ibid., pg. 48.

<sup>27</sup> Ibid, pg. 10.

<sup>28</sup> UTC, List of Subscribers, February 1884.

users, and not existing UTC users, who provided the main impetus for the growth of the London and Globe.

#### 2.4. The London and Globe versus the UTC

Finally, it is important to assess the impact which the London and Globe had on the telephone situation in London. The London and Globe Company drew criticism in the periodical press around the country for a couple of cases where its workmen caused a general nuisance to the public. On one occasion, noted in chapter three, workmen removing some of the company's overhead wires dropped a wire onto the street below, knocking off several gentlemen's hats and injuring an elderly lady.<sup>29</sup> This was much publicised around the country.<sup>30</sup> In another incident, a wine merchant sued the company for damage caused to its roof by workmen who had been putting up wires after permission to do so had been expressly denied.<sup>31</sup> It is not clear that this merchant was a subscriber to either company.

Conflicts between the two telephone companies could also reflect badly on both of them. The London and Globe's exchange was only a street away from the UTC's Coleman Street exchange, so UTC wires already crossed the roof of the other exchange; the London and Globe requested that they be taken down, but the UTC ignored them. Some London and Globe operatives subsequently lassoed wires across the UTC's wires, shorting them out, and sometimes they connected a battery to them, ringing the bells of the UTC subscribers and annoying the UTC switchboard operators.<sup>32</sup> The *Leeds Mercury* reported that renters on the UTC system were in these cases frustrated when their telephone bells rang to find that there was no-one at the other end.<sup>33</sup> The paper noted that there was a general feeling that the telephone service was unreliable, commenting: "[a]t present the public may well exclaim, 'A plague on both your houses.'"<sup>34</sup> In July 1884, when the London and Globe admitted in court to charges of placing its wires where it had not received permission to do

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29 'Singular Accident in the City', in *Reynolds' Newspaper*, 28 October 1883, pg. 1.

30 For example: 'The Danger of Overhead Wires', in the *Liverpool Mercury*, 29 October 1883, pg. 5; 'Politics and Society', in the *Leeds Mercury*, 29 October 1883, pg. 5; 'Gleanings', in the *Birmingham Daily Post*, 29 October 1883, pg. 7; 'Latest London News', in the *Aberdeen Journal*, 2 November 1883, pg. 5.

31 'Telephone Companies and the Public', in the *Pall Mall Gazette*, 8 April 1884, pg. 7.

32 Occomore, 1995, pg. 15 (n.12).

33 'Thursday, May 24th, 1883', in the *Leeds Mercury*, 24 May 1883, pg. 4.

34 Ibid.

so, the judge accused the company of being impudent and unscrupulous.<sup>35</sup> Thus, I argue that one of the results of these squabbles, and the bad publicity they generated, was to make non-users of the telephone more hostile towards telephone companies in general.

At the broader level of the debate about monopoly versus competition, the London and Globe Company served to draw out the views of the larger existing companies. When in January 1882 the question was raised of whether the London and Globe should be granted a licence, the UTC companies asserted that competition would only be detrimental in the case of telephone service. They argued that with another supply system such as water or gas, the existence of two systems was not actively harmful to the end user; in the case of telephony it was. With two systems, a subscriber would need to pay for both in order to communicate with all the subscribers who could equally well be served on one system.<sup>36</sup> However, as I have argued in chapter four, this argument was only convincing to open network users; closed network users could gain much benefit from supporting a rival exchange company.

## 2.5. Summary

The contribution of the London and Globe to the public debate on the purposes for which exchange telephony should be used was to highlight to the public the notion that it could be an emergency service for summoning the police or fire departments. They claimed in 1883 that this application was put into practice in the US but not in Britain.<sup>37</sup> I have discussed in chapter four how widespread the use of telephony by fire departments became. I have argued also that most of the London and Globe users desired open exchanges; this fits the pattern of the cheaper exchanges examined in chapter four, which also had a larger number of open network users, and indicates that cheaper exchanges encouraged open networks. Regarding telephone entitlement, the company demonstrated to the public that a cheaper service than the UTC was providing was possible in London. Although some wealthy firms joined the new exchange as well as the UTC simply to see how the more technologically advanced system worked, I argue that the London and Globe also made exchange telephony more accessible and affordable for some who were previously non-users, such as smaller firms and households. This was similar to the independent

35 'Palace Chambers, Westminster, Co. v. London and Globe Telephone and Maintenance Co., Limited', in the *TJER*, vol. 15 (1884), pg. 54.

36 BT Archives, TCB 304/2, file 68, Brand to Fawcett, 29 April 1882; Johnson to Brand, 25 April 1882; Jackson to Fawcett, 27 April 1882; Moseley to Fawcett, 27 April 1882.

37 *The Times*, 9 August 1882, pg. 11 (n.19); 'The London and Globe Telephone and Maintenance Company', in the *Times*, 1 May 1883, pg. 17.

companies, discussed in chapter four, and demonstrates the uses to which exchange telephony was put when it was cheaper.

### 3. The Mutual Telephone Company

A rather different experiment in opposing the NTC was attempted in Manchester in 1891 in the form of a co-operative telephone company, in which the subscribers were also the shareholders. The promoters argued that this would be more beneficial for users because the directors of the recently amalgamated NTC were more concerned to keep their shareholders happy than to provide their subscribers with a good service. The Mutual Telephone Company was floated on 4 February 1890 and opened its exchange on 28 February 1891.<sup>38</sup> In March 1892 its business was sold to the New Telephone Company, run by the Duke of Marlborough, on which more later, and from there both passed into the hands of the NTC in 1893.<sup>39</sup> After this the exchange continued to run until it was shut down in October 1896.<sup>40</sup> Studying the Mutual Company reinforces the point, noted in chapter four, that users desired the providers of their telephone service to be accountable to them regarding the cost and quality of the service. The lower price of the Mutual system was also based on a broader conception of telephone entitlement than that of the NTC, and impacted on telephone prices around the country. Lastly, the Mutual Company was also instrumental to the realisation of the Duke of Marlborough's plans regarding his New Telephone Company, which led to the nationalisation of the trunk lines.

Despite its importance, this venture has been dealt with briefly, if at all, in existing histories.<sup>41</sup> These accounts also do not deal adequately with the company's ultimate end, which Baldwin placed, effectively, in 1892.<sup>42</sup> However, the exchange, run by the NTC after their purchase of the New Company, served over a thousand subscribers for another four years after that. Unfortunately, no directories have been preserved, and so knowledge of

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38 Baldwin, 1925, pg. 194 (n.6).

39 Ibid., pg. 237.

40 'The Telephone Service in Manchester: Proposed New Company', in the *Manchester Guardian*, 28 January 1897, pg. 9.

41 Holcombe, 1906, pg. 117 (n.12); Baldwin, 1925, pg. 192-7 (n.6); Robertson, J. H., *The Story of the Telephone: A History of the Telecommunications Industry of Britain* (The Scientific Book Club, 1948), pg. 42; Stein, Jeremy, 'Ideology and the Telephone: The Social Reception of a Technology, London 1876-1920' (Ph.D. thesis, University College London, 1996), pg. 124.

42 Baldwin, 1925, pg. 197 (n.6).

subscribers must be pieced together from other sources. These include the company's first prospectus and its Memorandum of Association, adverts in newspapers which include Mutual Company numbers, and a small booklet of testimonials produced when the company was being sold to the New Company. From these it is possible to see some of the kinds of firms and communities which made use of mutual telephony, and what they thought about it. Below I first give a brief summary of Manchester telephony leading up to the establishment of the Mutual Company, then describe the company's instruments and exchange. Next I consider who subscribed to the company, and examine the reasons why most NTC subscribers did not use the Mutual Company. I conclude by considering the impact of the Mutual Company on British telephony.

### 3.1. Dissatisfaction with the existing service

I will first explain the context behind the formation of this company. Its founder, Andrew Provand, was a Glaswegian merchant who ran a shipping firm in Manchester, and was the MP for Glasgow Blackfriars and Hutchesontown from 1886 to 1900. In a letter to the *Manchester Guardian* in 1885, Provand noted that many people had been writing to the paper to complain that the cost of subscription to the L&C, £20, was too high.<sup>43</sup> Himself an L&C subscriber,<sup>44</sup> Provand argued that until the companies' telephone patents began to run out in 1890, they could charge as they pleased, and pointed out that the L&C admitted that many people had been giving up the telephone because it was too expensive. Citing statistics suggesting that cheaper telephony was possible, and that it would be likely to increase subscriber numbers drastically, Provand proposed establishing a cheaper, co-operative telephone company in Manchester once the patents expired.<sup>45</sup> He estimated there would be at least 4,000 subscribers instead of the current 1,300.

Provand was inspired by the cases of Dundee and Preston, discussed in chapter four; later he would also make repeated reference to telephone charges in other countries, for example France, Germany, Holland, Canada, Sweden and Australia, to support his claims that cheaper telephony was practicable.<sup>46</sup> Provand believed that co-operative telephony

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43 Provand, 1885, pg. 6 (n.1).

44 L&C, List of Subscribers for Manchester and District, February 1885, pg. 65.

45 Provand, 1885, pg. 6 (n.1).

46 BT Archives, TCB 304/2: file 37, Prospectus of 'Co-operative Telephones', 11 November 1889; file 39a, Transcript of Provand's Letter to the *North British Daily Mail*, 14 December 1889; file 40, cutting from the *Manchester Guardian*, 6 December 1889; file 44, The Mutual Telephone Company Limited. Prospectus, 2 May 1890.

would be beneficial across the country. Manchester, where the cotton industry dominated the town, including the telephone network, would be a good place to start; if the cotton trade decided to adopt the new system en masse, he argued, it would be successful. The complaints detailed in chapter three indicate that when Provand put his plans into action subscribers were still not satisfied with the newly amalgamated NTC in Manchester. The response to Provand's call for potential subscribers in 1889 was very positive, and plans were made to establish the company.<sup>47</sup> The response from the press was not always favourable, but there was broad agreement that the current rental charges were too high.<sup>48</sup> Thus Provand's efforts in establishing the Mutual met a perceived need for better exchange telephone provision.

However, as a model of ownership, Provand did not advocate competition in exchange telephony as the ultimate goal, as did the London and Globe. He believed exchange telephony ought rightly to be a monopoly, with only one exchange company active in each area in order to minimise the duplication of plant and reduce the costs for subscribers.<sup>49</sup> Nevertheless, as he did not believe that the government would ever nationalise the telephone companies, he argued that local telephone services should be provided by co-operative companies for whom the best interests of the public and those of their shareholders were one and the same. This highlights one of the underlying concerns of telephone users in this period, who wanted those providing telephone service to be directly accountable to those who used it. I have noted this in chapter four in the case of Aberdeen, where one of the key concerns of dissatisfied users was local control. This was also one of the strengths of the independent companies. Having considered the demand for the Mutual Company, I will now discuss the technical details of the exchange system which the company established in opposition to the NTC.

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47 BT Archives, TCB 304/2, file 40, cuttings from the *Manchester Guardian*, 3, 6 December 1889; also file 41, cutting from the *Manchester Guardian*, 24 December 1889.

48 The *Manchester Guardian* said “[t]he present rate is absolutely prohibitive to a very large public which would gladly avail itself of the great convenience... conferred on the world by Mr. Graham Bell's wonderful discovery” (the *Manchester Guardian*, 6 December 1889 (n.46)). The *Telephone*, a technical publication which was critical of the scheme, called the estimates “simply ridiculous” and “moonshine”, but nevertheless agreed that “[t]wenty pounds is too high a rental to charge, even in large towns like Manchester, and the sooner the National Telephone Company adopts uniform and reduced rates for their whole system the better for them” (BT Archives, TCB 304/2, file 41, cutting from the *Telephone*, 16 December 1889).

49 Provand, 1885, pg. 6 (n.1).

### 3.2. Instruments and exchange equipment

Like the London and Globe Company, the system of the Mutual Company was also in some respects technically superior to that of its rival, thus demonstrating to existing users and non-users alike that better telephony was practical. For example, metallic circuits were used throughout, and the exchange had the capacity for 2,500 renters, with eventual provision planned for 6,000. The company's May 1890 prospectus claimed that this would be one of the largest exchanges in the world.<sup>50</sup> Therefore it would take less time to connect subscribers than if they were spread out between different exchanges. The company also employed a version of the call-wire system, as described in chapter three, which was intended to speed up the process of making calls. Although this was the cause of many problems in Glasgow, it did not seem to provoke the same complaints in Manchester; indeed, letters from users praised the speed with which connections could be made.<sup>51</sup>

Testimonials from prominent electricians, included in the prospectus, vouched for the superiority of the Mutual's system over that of its rival. Amongst them was one from Silvanus Thompson, reprising his role as an authority on telephony and as a proponent of telephone competition. Major General Charles Webber, seen in chapter two in the context of the use of telephony by the Army, also wrote in favour of the Mutual Company's system, and advocated competition and a broader notion of telephone entitlement than had been implemented by the UTC group. Webber noted that “[t]he day when the telephone monopoly (which has been made such a bad use of) terminates, will see the birth of a new era”,<sup>52</sup> in which the extended use of the telephone would have a significant impact on daily business practice and would bring great benefits to commerce. These testimonials all agreed that the Mutual Company's use of metallic circuits and call-wires would make its system better than that of the NTC. The details of the Mutual Company's system, as well as its success at a local level, were important later for the Duke of Marlborough when he attempted to convince potential supporters of his New Telephone Company that a better alternative to the NTC system in London was practical.

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50 Mutual Telephone Company Prospectus, May 1890 (n.46). Baldwin described the switchboard used as being a special type of horizontal multiple, designed by the company's general manager and chief engineer, Alfred Rosling Bennett, which could put 5,000 subscribers' lines within reach of a single operator (Baldwin, 1925, pg. 195 (n.6)).

51 BT Archives, TCB 304/3, file 1, Testimonials of Subscribers to the Mutual Company, [April 1892].

52 Mutual Telephone Company Prospectus, May 1890 (n.46). As noted in chapter two, Webber was a Royal Engineer and former managing director of the UTC. He was however, in favour of expanding access to exchange telephony through competition.

Letters were received by way of testimonials from some of the first subscribers to the system as early as April 1891, expressing their appreciation for the system over the NTC alternative. These imply that the Mutual Company's exchange delivered a better telephone use-experience than the NTC system; many commented on the rapidity and efficiency of connections, the clarity of speaking and the lack of noise on the lines, and the privacy of conversation.<sup>53</sup> One subscriber said using a telephone on this system as opposed to the NTC's felt more like "being in private conversation".<sup>54</sup> It was also faster than the NTC system, on which it seems subscribers often had to wait some time for the operator to make a connection.<sup>55</sup> Although Mutual subscribers could not use NTC trunk lines, the company did have two of its own trunk wires to Bolton.<sup>56</sup> Mutual subscribers eagerly awaited the opening of more trunk lines, as the Bolton line, a metallic circuit, was mentioned very favourably in the testimonials as being better than the NTC trunk wires, and not prone to buzzing noises. NTC trunks in the Manchester area, including those to Liverpool, were single wires, and were known to be noisy.<sup>57</sup> However, as I demonstrate below this lack of access to regional trunk lines was one of the key reasons why the Mutual Company, despite its efficiency and low cost, did not tempt many NTC users away from the larger company.<sup>58</sup>

### 3.3. The subscribers

In order to better understand who were the dissatisfied telephone users and non-users supporting the growth of the Mutual Company, I now examine a variety of sources, for example lists of firms included in the company's prospectus and Memorandum of Association. Additionally, adverts in newspapers which include Mutual numbers indicate the sorts of businesses which advertised their subscriptions and availability on the system. A small booklet of testimonials produced when the company was being sold to the New

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53 Testimonials of Subscribers to the Mutual Company, [April 1892] (n.51).

54 Ibid., pg. 4.

55 Ibid., pg. 9.

56 Bennett, A. R., *The Telephone Systems of the Continent of Europe* (Longmans, Green and Co., 1895; reprinted, Arno Press, 1974), pg. 9. Another was planned to Farnworth, although it is not clear whether this was ever brought into operation ('Mutual Telephone Company, Limited', in the *Manchester Guardian*, 10 December 1891, pg. 1).

57 Munro, J., 'Remarks on Some of our Telephonic Systems', in the *Electrician*, vol. 21 (1888), pg. 755.

58 UK Parliament, Report from the Select Committee on the Telephone Service, 1895 (350) XIII.21, pg. 318.

Company also contains a selected number of named subscribers' opinions.<sup>59</sup> Unfortunately these sources may not provide an adequate cross-section of the Mutual's subscribers; it is possible that they do not represent the majority of subscribers who were enticed by the promise of cheap telephony and who were previously non-users of the telephone. However, the available material does allow for an evaluation of the general subscriber experience, which would not have differed from user to user.

The Mutual Company gained subscribers more rapidly than the London and Globe Company. The exchange opened on 28 February 1891 with 170 subscribers;<sup>60</sup> on 14 July 1891 the *Manchester Guardian* carried an advertisement which announced that by 22 July, 500 subscribers would be connected, and by the end of August there would be 700.<sup>61</sup> By 22 March 1892, when the Mutual Company was handed over to the Duke of Marlborough's New Telephone Company, 1,006 exchange instruments were connected with nearly another 500 on order.<sup>62</sup> Post Office official John Lamb later noted that in less than two years the Mutual gained as many members as the National had in a dozen years.<sup>63</sup> Alfred Rosling Bennett, the general manager and chief engineer of the company, later noted that after about 18 months the company had 1,389 lines.<sup>64</sup> At the end of 1894 the company had 1,800 subscribers.<sup>65</sup>

The company's initial prospectus, which was issued to gather support in 11 November 1889, included a list of about 140 firms which had already pledged their support.

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59 Testimonials of Subscribers to the Mutual Company, [April 1892], pg. 1 (n.51).

60 Telephone Service, 1895, pg. 318 (n.58).

61 'Mutual Telephone Company, Limited', in the *Manchester Guardian*, 14 July 1891, pg. 1.

62 BT Archives, TCB 304/3, file 1, Testimonials of Subscribers to the Mutual Company, [April 1892], pg. 1; New Telephone Company circular, 20 April 1890. This does not necessarily mean 1,006 subscribers; however, a March 1892 advertisement announced the imminent issue of a new list of subscribers containing over 1,100 names ('The New Telephone Company, Limited', in the *Manchester Guardian*, 29 March 1892, pg. 1).

63 Holcombe, 1906, pg. 117 (n.12).

64 Bennett, 1895, pg. 9 (n.56). Bennett worked as an engineer for the UTC and the NTC in London, Scotland, Ireland and the North West of England from 1880 until 1890, and from 1883 was general manager and chief engineer of the NTC. After working as the general manager and chief engineer of the Mutual Company he took on the same role for the Duke of Marlborough's New Telephone Company.

65 'New Telephone Company: The Manchester Business', in the *Manchester Guardian*, 20 December 1894, pg. 6.

When informing the Post Office Engineer-in-Chief of these developments James Doherty, the Post Office Superintending Engineer for Manchester, said that the list of names was very influential indeed, and would “carry great weight in Manchester.”<sup>66</sup> Listed in Isaac Slater's 1889 Manchester and Salford directory, many of them, including the most important names among them as identified in Post Office correspondence, were merchants or shipping firms, similar to many of the London and Globe subscribers. Provand himself owned a shipping firm, specialising in transporting cotton and woollens to China and Japan. Many were also based around the same few streets in central Manchester. Both the *Manchester Guardian*, which reported positively on the progress of the company,<sup>67</sup> and the *Manchester Examiner*, two daily Liberal newspapers, were also included.

Other subscribing firms identifiable from the company's Memorandum of Association, from newspaper advertisements, and from the booklet of testimonials were mainly merchants. They also included an analytical chemist and a chartered accountant, auctioneers, estate agents, cabinet makers, bleach works, calico printers, makers of ladies' clothing, mill owners, private tutors for those intending to attend university, engineers, and the Co-operative Wholesale Society. These firms were characterised by one or more of four things: they did business internationally, they had multiple premises, sometimes in different towns, between which they needed to keep in close contact, their business was very dependent on responding to events quickly, for example the estate agents and auctioneers, or they dealt in perishable goods, for example fish.<sup>68</sup> Unlike the London and Globe subscribers, these users were less likely to deal in luxury goods. Bennett later noted that, at £5 a year, “numbers of packing-case makers, sign-writers, plumbers, &c.” who could not have afforded to join the NTC joined the Mutual.<sup>69</sup> I argue that these latter users, and some of those listed above, such as the estate agents and cabinet makers, would have been open network users, as discussed in chapter four.

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66 BT Archives, TCB 304/2, file 40, Doherty to Graves, 23 November 1889.

67 The *Manchester Guardian*, 6 December 1889 (n.46).

68 BT Archives, TCB 304/2, file 44, 'Memorandum of Association of the Mutual Telephone Company, Limited.'; 'Artistic Furniture, Upholstery', 13 July 1891, pg. 1; 'Capes, Dunn, & Pilcher', 19 December 1891, pg. 12; 'John Alker, Land Agent and Valuer', 21 March 1892, pg. 2; 'Clyde Road, Albert Park', 23 April 1892, pg. 11; 'Private Tutors', 8 June 1892, pg. 2; 'Wheatley Kirk, Price and Goulty', 11 June 1892, pg. 12 (all advertisements from the *Manchester Guardian*); Testimonials of Subscribers to the Mutual Company, [April 1892] (n.51).

69 Bennett, 1895, pg. 7 (n.56).

Certain commercial, political and geographical communities appeared more prominently amongst these subscribers. Many of the initiative's initial supporters were, like Provand, in the shipping industry.<sup>70</sup> Also, the names of some local Liberal activists were among the names of the subscribers.<sup>71</sup> Provand was a Gladstonian Liberal, and one of the most comprehensive accounts of his ideas was a long article published in the very Liberal newspaper the *North British Daily Mail*, owned by Provand's fellow Glaswegian Liberal MP, Charles Cameron. Both the *Manchester Guardian* and the *Manchester Examiner*, early supporters of the company, were Liberal papers. Lastly, regarding geographical factors, the initial supportive shipping firms were based mainly around the same area, and for the first meetings Provand chose Memorial Hall in Albert Square, right in the geographical centre of the community. These similarities imply that Provand's personal position in the community had much to do with the growth and success of this venture; had a different dissatisfied user attempted this, I believe it would have looked very different.

#### 3.4. Non-use of the Mutual Telephone Company

Despite the fact that the Mutual Company was much more affordable than the NTC, charging only £5 a year to shareholders and £6 to non-shareholders, and was seen by many to be providing a superior service, the majority of NTC users did not switch over to the cheaper company. By April 1895, when 1,349 subscribers were still on the Mutual exchange and the NTC had 3,374 subscribers, 492 renters subscribed to both systems; only 27 NTC subscribers had left the bigger company to join the Mutual.<sup>72</sup> Although the company and its exchange had by that point been taken over by the New Telephone Company, and subsequently by the NTC, this implies that over 800 of the company's subscribers had not previously been telephone users. Thus I argue that the majority of Mutual subscribers were non-users who had taken up the offer of cheaper telephony, as indicated by Bennett. This was similar to the case of the London and Globe Company. In addition, only a small percentage of NTC subscribers tried the Mutual Company.

One reason why more NTC subscribers did not join the Mutual Company exchange was because of the lack of trunk lines. Many testimonials from subscribers requested more

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70 'The Telephone Inquiry: Mr. Provand, M.P., and the Manchester Mutual Company', in the *Manchester Guardian*, 30 July 1898, pg. 5.

71 For example, Samuel Knowles ('Heywood Division Liberal Council', in the *Manchester Guardian*, 26 February 1889, pg. 4), and William Dale ('Liberal Meeting at Royton', in the *Manchester Guardian*, 19 October 1891, pg. 6). Both appear in the booklet of testimonials.

72 Telephone Service, 1895, pg. 318 (n.58).

trunk lines,<sup>73</sup> and Provand himself remained a subscriber to the NTC system once the Mutual Company was operational.<sup>74</sup> I have discussed in chapter four how important regional telephony was to many firms, and this case supports my argument that one of the main attractions for many early business users of exchange telephony was the use of regional trunk lines. It would not have made good business sense to abandon this trunk line access. James Staats Forbes, the chairman of the NTC, alluded to this in an 1892 interview with the Chancellor of the Exchequer George Goschen, in which they discussed the government purchase of the NTC's trunk lines; Forbes asserted that the NTC's possession of the trunk lines was allowing them to compete against the Mutual Company.<sup>75</sup> Bennett later noted that the Mutual was “continually reproached with the fact that their subscribers could not communicate with Liverpool and other distant towns”.<sup>76</sup>

I argue that users who required trunk connections to speak to Liverpool and towns around Manchester would have been those who preferred a closed network. As I have demonstrated in chapter four, those who required open networks often placed more emphasis on local exchange connections; these were the kinds of smaller subscribers whom Bennett mentioned as joining the Mutual Company exclusively. On the other hand, the small percentage of NTC users who joined the Mutual as well were probably wealthier, closed network firms who required regional telephony but were seeking a more efficient service. This is supported by the subscriber testimonials cited previously, and explains why there was a demand for the Mutual to expand its trunk line service.<sup>77</sup> This desire for trunk lines led the directors of the Mutual Company to accept Marlborough's offer to become part of his New Telephone Company on condition that he would provide capital to build the desired trunk wires. This was stated explicitly some years later by William Thomson, an analytical chemist and a subscriber to the Mutual from its earliest days.<sup>78</sup> Thomson believed that if the Postmaster General had previously declared his intention to nationalise

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73 Testimonials of Subscribers to the Mutual Company, [April 1892] (n.51).

74 NTC, English Districts Telephone Directory, April 1891, pg. 366.

75 BT Archives, TCB 304/2, file 30, Memorandum of Forbes' Interview with Goschen, 1 March 1892.

76 *The Manchester Guardian*, 28 January 1897, pg. 9 (n.40).

77 Testimonials of Subscribers to the Mutual Company, [April 1892] (n.51).

78 Thomson, William, 'Municipal Telephones', in the *Manchester Guardian*, 5 March 1896, pg. 9; Thomson was mentioned in the Memorandum of Association of the company.

the trunk wires, which would have placed them soon at the disposal of the Mutual's subscribers, the company would not have been sold.

Additionally, as I have noted in chapter three, many wealthy users did not care whether subscription was £20 or £5, and did not care if people could not join because it was too expensive.<sup>79</sup> I have explained this further in chapter four: such subscribers were content with a smaller, closed network which contained the people with whom they wished to speak. They did not benefit further from more people being on the exchange. Although Provand argued that it was to everyone's benefit that more firms joined the exchange, thus increasing the utility of the system, this view was only held by those who desired an open network. Given the dominance of the cotton trade in Manchester, it is likely that the majority of the NTC's users required closed rather than open networks. One anonymous subscriber to both systems, in a letter to the *Manchester Guardian*, emphasised the need for greater efficiency as a higher priority than a lower price. He noted that if the price was lowered too much there was a danger that it “might enable most of the small householders in the suburbs to order their groceries &c., and so block the lines, to the detriment of business people in the city, who have already too much trouble.”<sup>80</sup> Thus, for those who could afford it, remaining on the more expensive system with all of the other subscribers with whom they wanted to speak may have been preferred.

### 3.5. The effect of the Mutual Telephone Company on national telephony

Finally, the significance of the Mutual Company for telephony more generally must be addressed. The methods and technical aspects of the Mutual's exchange and plant influenced the New Telephone Company which purchased it, as will be demonstrated below. The company itself acted as an example to other dissatisfied users: there were attempts to establish mutual companies both in Yorkshire and in Scotland through Provand, but neither succeeded.<sup>81</sup> Provand tried hard to acquire separate licences for companies to be based in Leeds and Glasgow, for which promotions had begun around the same time as he was gathering support for the Manchester company. However, these were refused on the grounds that the licence already granted for the Mutual Company had no local limitation, therefore the existing company could simply establish exchanges elsewhere. The argument

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79 For example: Provand's letter to the *North British Daily Mail*, 14 December 1889 (n.46).

80 Subscriber, 'Municipal Telephones', in the *Manchester Guardian*, 15 February 1896, pg. 5.

81 BT Archives, TCB 304/2, file 82, Provand to Raikes, 10 November 1890; file 78, Blackwood to Raikes, 15 October 1890.

that businesses in Scotland and Yorkshire desired their own local companies did not sway the Postmaster General, Henry Cecil Raikes.

Baldwin noted, though, that only NTC resistance prevented the Mutual Company from establishing an exchange in Liverpool, and, indeed, the capital had been raised to do so.<sup>82</sup> Later in the 1890s, when an agitation commenced for municipal telephony coordinated by local authorities, the main Manchester proponents of the new scheme, William Thomson among them, had been part of or inspired by the Mutual. Many years later there was even an attempt to begin a New Mutual Telephone Company on the same grounds as the old, an initiative in which many of those instrumental in establishing the old company were key, including Bennett. It seems, however, that Provand was not involved. The scheme was promoted for several years; there were certainly those who refused to give up on the idea of cheap mutual telephony.<sup>83</sup>

A more immediate effect, though, was the impact the company had on the NTC. The low rate charged by the Mutual pushed down the NTC's rate. An advertisement for the establishing of a New Mutual Telephone Company argued that when the capital of the Mutual had been subscribed, the NTC lowered their rate to £15 a year. A further universal reduction was made to £10, outside London, in January 1891, just before the opening of the company's exchange that February.<sup>84</sup> Indeed, the *Economist* thought it was "tolerably clear that the reductions were dictated by force of competition."<sup>85</sup> The Mutual Company was thus the catalyst responsible for securing a better rate – if not its own low £5 rate – for most of the rest of the country. Indeed, Provand would later say that his intention had always been to bring about a reform of the system rather than to stay in the telephone business long-term.<sup>86</sup>

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82 Baldwin, 1925, pg. 194 (n.6).

83 (All articles from the *Manchester Guardian*.) 'The Manchester Telephone Service', 8 February 1896, pg. 8; Ratepayer Number Two, 'Municipal Telephones', 18 February 1896, pg. 9; 'The Manchester Telephone Service: Proposed New Mutual Company', 28 October 1896, pg. 3; 28 January 1897, pg. 9 (n.40); 'The Telephone Service in Manchester: Competition Advocated', 4 August 1898, pg. 10.

84 The *Manchester Guardian*, 28 October 1896, pg. 3 (n.83); Baldwin, 1925, pg. 194 (n.6).

85 'The Telephone Service', in the *Economist*, 27 February 1892, pg. 282.

86 The *Manchester Guardian*, 30 July 1898, pg. 5 (n.70).

### 3.6. Summary

The Mutual Company contributed to the debate about telephone ownership by providing a middle way between private and public telephony which prioritised the accountability of the supplier to the subscribers. Mutual telephony, for a short period, allowed the system to be run by a company without the restrictions of a government department, but with the accountability to its subscribers that came with having the users as shareholders. In maintaining such a low cost, it broadened access to exchange telephony in a similar way to that done in Dundee. Thus it embodied a broader view of telephone entitlement than most companies in the period. This gave more people the option to try it, and to become enthusiastic enough about it that they would be willing later on, after it had gone, to fight for a cheap, efficient telephone service. Also similarly to Dundee, the Mutual demonstrates the importance of provincial developments, and how events in some towns influenced those in others throughout the period of my thesis. It is not possible fully to understand these developments without considering, as I do, these local developments.

### 4. The New Telephone Company

Two companies went by this name during the period of this thesis. The first supplied private telephony from 1885 until 1889, and the second intended to supply exchange telephony in 1891, but never opened any new exchanges. Here I focus on the impact these two separate concerns had on the development of British telephony. The continuity between them was the Postmaster General's licence, which, granted to the company in its first incarnation, later enabled its resurrection. The first New Company was founded by Silvanus Thompson to sell his patented valve telephone in 1884, but, after a few years of successful operation, it fell afoul of the UTC's patent lawyers in 1889.<sup>87</sup> The second New Company was established by George Spencer-Churchill, the 8<sup>th</sup> Duke of Marlborough, in 1891, with promises of plenty of capital and a vision of an alternative system of telephony to compete nationally with the NTC. This venture, however, floundered after the sudden death of the Duke, and the company was liquidated.<sup>88</sup>

The first incarnation of the company has not been examined thoroughly in existing histories, only meriting a brief mention in Baldwin.<sup>89</sup> This may be due to the exchange-centric nature of the majority of telephone historiography. Stathis Arapostathis and Graeme

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<sup>87</sup> Baldwin, 1925, pg. 85-7 (n.6).

<sup>88</sup> Ibid., pg. 233, 237.

Gooday have discussed it in relation to patent disputes but do not examine its users.<sup>90</sup> While Marlborough's venture has featured more widely, its full significance for understanding the nationalisation of the trunk lines has not been explored.<sup>91</sup> Given the private wire nature of the first company's business, it is unnecessary here to consider networks of users. However, as a provider of private wires, in opposition to the UTC group companies which also supplied this service, the first New Company can be seen as representative of many other similar companies around the country in this period. Private telephony fostered alternative notions of telephone purpose to exchange telephony, as will be discussed below. The second company, with its aspirations to be actively competitive in London and Manchester, had the intention and the ability to provide a comprehensive alternative national telephone service, and had a lasting impact on British telephony.

#### 4.1. Silvanus Thompson's New Telephone Company

As I have argued in chapter one, it is important when examining British telephony to include private telephones and telephone innovations as well as exchange telephony. Focusing on the earlier version of the New Company allows me to recover here some of these uses and users. This company is important not only because it provided the opportunity for the Duke of Marlborough to start his own company, or because it was representative of other private companies in this period such as Alan Archibald Campbell-Swinton's Equitable Telephone Association.<sup>92</sup> It was also key because these private telephone users, and users of the other private wire companies, were also dissatisfied with telephony as supplied by the UTC group. Thus this dissatisfaction was not confined to exchange users. Rather, private wire users should also be seen as contributing to the general demand for change which led to the nationalisation of the trunk lines in 1892. By the time the New Company was established in 1884, Silvanus Thompson had long been interested in telephony.<sup>93</sup> Thompson had performed early experiments with Bell's first instrument in 1876, and had continued a personal correspondence with the inventor.

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89 Ibid., pg. 85-87. Feuerstein cited Baldwin (Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990), pg. 242).

90 Arapostathis, Stathis and Gooday, Graeme, *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain* (The MIT Press, 2013), pg. 104-5.

91 Baldwin, 1925, pg. 232-37 (n.6); Feuerstein, 1990, pg. 245 (n.89); Stein, 1996, pg. 126 (n.41); Holcombe, 1906, pg. 116-119 (n.12).

92 Baldwin, 1925, pg. 88-9 (n.6).

93 Thompson and Thompson, 1920, pg. 45, 131, 108-15 (n.15).

Interested in questions of telephone invention primacy, Thompson wrote a paper on, and an 1883 biography of, the German schoolmaster and inventor Philipp Reis; for the rest of his life Thompson asserted that Reis had been the first to invent a working telephone in 1861.<sup>94</sup> In 1882, as mentioned previously, Thompson provided advice to the London and Globe Company as it started up with the intention of competing with the UTC in London.<sup>95</sup> He would also later advise the Mutual Company, and reviewed its plans as noted above. Apart from Arapostathis and Gooday's treatment of Thompson's patent disputes with the UTC, Thompson is an under-researched figure in the early history of British telephony.<sup>96</sup> This account of the significance of his telephone company goes some way towards rectifying this. I first examine the context of private wires at the time of the founding of the company, bringing back into focus their widespread use and importance for understanding the development of telephony more generally. I then discuss the instruments employed by the New Company, the prices they charged and the uses they promoted, and then examine who used their telephones.

#### 4.1.1. The context of private wires

I argue that in looking at the growth of telephony, it is important to consider the existing context of private telegraph lines.<sup>97</sup> Private telephone wires were first employed commercially in Britain in 1877, and were used both for domestic and for business purposes. Many businesses used telephone instruments on existing wires which they had previously worked with ABC private telegraph instruments. One firm in Manchester, David Moseley and Sons, began using a telephone on its private telegraph wire between its warehouse and its works in November 1877.<sup>98</sup> This firm later went on to supply private wires to other firms in Manchester.<sup>99</sup> In December of that same year, experiments were carried out in Swansea between two police stations by J. B. Saunders and Co., Cardiff

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94 Thompson, Silvanus P., *Philipp Reis: Inventor of the Telephone. A Biographical Sketch* (E. & F. N. Spon, 1883, reprinted, Kessinger Publishing, 2007). Arapostathis and Gooday argue that this book was written as a legal document, providing testimonials and technical details for future use by those who desired to contest the Bell or Edison patents by proving that the Reis telephone had already been capable of transmitting speech (Arapostathis and Gooday, 2013, pg. 98 (n.90)).

95 Thompson and Thompson, 1920, pg. 115 (n.15).

96 Arapostathis and Gooday, 2013, pg. 103-10 (n.90).

97 For more on private telegraphy, see ongoing PhD research by Jean-Francois Fava-Verde, University of Leeds.

98 'The Telephone at Work in Manchester', in the *Manchester Guardian*, 15 November 1877, pg. 5.

telegraph engineers, using an existing ABC wire.<sup>100</sup> Such initial experiments also served as marketing for the instruments concerned, and were often conducted using these telegraph wires. One, carried out with Edison instruments between London and Norwich in December 1878, used the lengthy private telegraph line of J. & J. Colman, the mustard manufacturers.<sup>101</sup> In this way existing telegraphic infrastructure served as the starting point for practical commercial telephony. ABC instruments could be substituted for telephones and swapped back again if necessary.

From early 1878 Bell's agents in Britain supplied his instruments on private wires around the country. The Telephone Company took on this role upon its formation that June. Some of the first private lines erected in London connected wharves and their offices, demonstrating the importance of trade and specifically of river traffic and the movement of goods to early telephone use.<sup>102</sup> One such company was Petty, Wood and Co., a wholesale food retailer and distributor.<sup>103</sup> As the UTC later noted, companies which dealt with perishable food items had an additional incentive to adopt the telephone if they hoped it would speed up their business.<sup>104</sup> From January 1878 until July 1880 Blakey and Emmott, mentioned in chapter four, provided many Yorkshire firms with private telephony, but also local government authorities such as the Halifax, Blackburn and Leeds corporations.<sup>105</sup> These municipal bodies used private telephony to communicate with their waterworks, gasworks or fire brigades, and thus aimed to improve the efficiency of the services for which they had responsibility.

In the Liverpool area, early private wire users at this time included newspapers, steamship companies and iron working firms, specifically owners or editors who wanted

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99 'Have You Heard the Telephone?', in the *Manchester Guardian*, 3 July 1878, pg. 1; 'Visit of the Earl of Derby to Mr. Bright', in the *Manchester Guardian*, 4 January 1879, pg. 7.

100 'Experiments with the Telephone at Swansea', in the *Western Mail*, 8 December 1877, pg. 3.

101 Kingsbury, 1915, pg. 194, 418 (n.14).

102 Baldwin, 1925, pg. 21 (n.6).

103 This company noted that, although the telephone was useful, it took some practice to use it well (The Telephone Company, List of Subscribers, February 1880, pg. 20). Established in 1816, this company still trades today as Petty Wood: <http://pettywood.com/about/history> [accessed 12 June 2014].

104 UTC, List of Subscribers, August 1880, pg. 7.

105 Baldwin, 1925, pg. 102, 106 (n.6); 'Telephonic Communication', in the *Leeds Mercury*, 28 April 1880, pg. 1.

lines from their offices to their homes.<sup>106</sup> Thus, these early telephones were employed by users at the top of their respective commercial concerns to conduct or oversee business. This provides an example of the ways in which early telephones were used to reinforce existing social hierarchies, as Carolyn Marvin has noted.<sup>107</sup> In addition, however, Poor Law Guardians used private wires to connect their offices with local workhouses, for example in Manchester and Preston.<sup>108</sup> In these cases one of the main incentive for telephone use was health and safety, in the form of the prevention of serious fires. I have noted this trend already in chapter two. In May 1879, a Telephone Company pamphlet listed nearly forty people and organisations who were using private telephones, including Queen Victoria's household and important institutions and companies.<sup>109</sup> In February 1880, the company included another such list in its directory, which included 150 users, including aristocrats, railways, doctors, coal companies and many London docks and wharves (Fig. 5.1.).<sup>110</sup> Apart from London, Edinburgh, Manchester, Liverpool, Bristol, Birmingham, and Cardiff were also represented. Some of these private wire users, for example a soap and candle making firm in Bristol, said that their telephones were in constant use throughout the day.<sup>111</sup>

By April 1881 there were 186 UTC private lines.<sup>112</sup> That year the UTC received £2,988 from private wires; by 1883 this figure was £9,402, implying a more than threefold increase in the private line business of the company between 1881 and 1883.<sup>113</sup> The L&C, likewise, saw its private wire business increase from 472 lines in 1882 to 697 in 1883, and then 828 by June 1884.<sup>114</sup> There were also many other companies supplying private

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106 Roberts, Stan, *The First Hundred Years of the Telephone Service in the Liverpool Telephone Area* (n.d.), pg. 1.

107 Marvin, Carolyn, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford University Press, 1988), pg. 5.

108 'Boards of Guardians: Manchester', in the *Manchester Guardian*, 11 April 1879, pg. 6; Ratepayer, 'Preston Board of Guardians and the Telephone', in the *Preston Chronicle*, 11 February 1882, pg. 6.

109 Baldwin, 1925, pg. 22 (n.6).

110 The Telephone Company, List of Subscribers, February 1880, pg. 12-15.

111 *Ibid.*, pg. 24, 25.

112 Baldwin, 1925, pg. 51 (n.6).

113 'Railways and Other Companies', in the *Times*, 25 July 1883, pg. 11.

telephony throughout this period.<sup>115</sup> I therefore argue that private wires were more important in early telephony than existing histories have acknowledged, and also more popular and more widespread. As private lines were not included in the government telephone monopoly, there was no Post Office royalty to be paid, so it was easier for individuals and companies to provide affordable private telephony.<sup>116</sup> Any company which previously had used a private telegraph wire may have switched to using telephone instruments to work that wire. Many of these firms which used or wanted to use private telephones contributed to the opposition to the UTC monopoly by opting to use instruments supplied by the New Company or one of the other private wire companies.

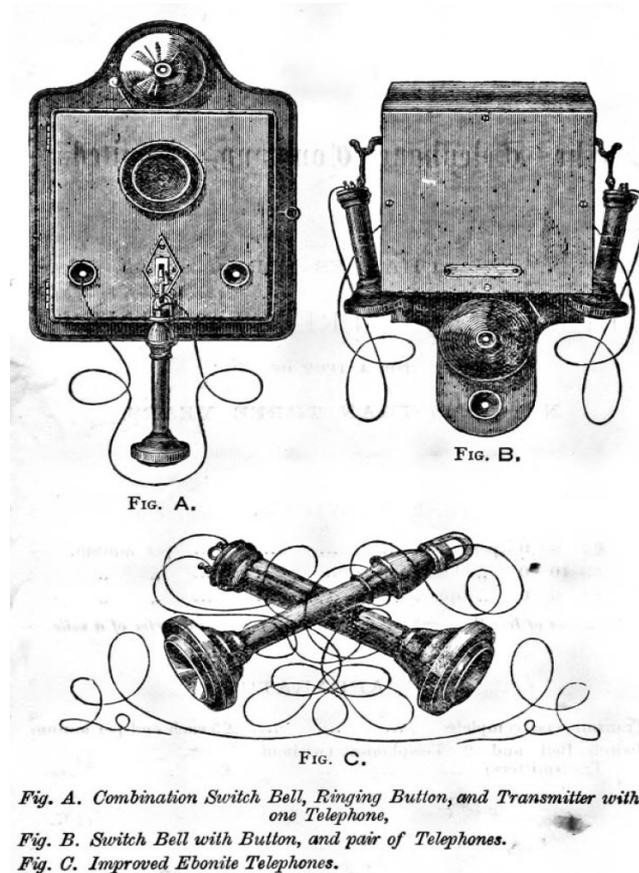


Figure 5.1. Telephone Company instruments for private wires, 1880

Source: The Telephone Company, List of Subscribers, February 1880, pg. 27

114 'The Lancashire and Cheshire Telephonic Exchange Company Limited', in the *TJER*, vol. 13 (1883), pg. 150-1; 'Lancashire and Cheshire Telephonic Exchange Company, Limited', in the *TJER*, vol. 15 (1884), pg. 117.

115 For example: the Equitable Telephone Association (Baldwin, 1925, pg. 88 (n.6)), and the General Electric Company (Povey, P. J., and Earl, R. A. J., *Vintage Telephones of the World* (Peter Peregrinus Ltd., 1988), pg. 164). There may also have been many smaller local companies providing private wires in towns or cities, as Messrs. Moseley and Sons did in Manchester (Povey and Earl, 1988, pg. 64).

116 Kingsbury, 1915, pg. 500 (n.14).

#### 4.1.2. Instruments, prices and uses

Silvanus Thompson was one inventor who attempted to supply this demand for private telephony by inventing a telephone which would not infringe the Bell or Edison patents held by the UTC. In 1884 he succeeded in producing a new telephone, using what he called his valve transmitter. The Attorney-General assured him this instrument did not infringe the existing patents.<sup>117</sup> I have described this valve telephone in chapter three, section 2.6. The New Telephone Company, of which Thompson was appointed one of the directors, was established to exploit this instrument. A prospectus was issued in November 1884, and the company began accepting applications to purchase valve telephones from January 1885.<sup>118</sup> Advertisements, which appeared consistently in newspapers across the country from 1885 until the company was wound up in 1889, stressed that instruments would be sold instead of rented, meaning they could be obtained for a cheaper price, without worrying about restrictions, annual royalties, or rentals (Fig. 5.2).<sup>119</sup> The rationale behind this policy was directly opposed to that of the UTC; the New Telephone Company aimed to encourage telephone use by ensuring its instruments were more widely available.



Figure 5.2. New Telephone Company advertisement, 1885

Source: the *Morning Post*, 28 July 1885, pg. [1]

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117 Thompson and Thompson, 1920, pg. 115 (n.15). See also Arapostathis and Gooday, 2013, pg. 104-5 (n.90). Although these sources note that the valve transmitter was used in conjunction with the Reis receiver, contemporary periodical evidence indicates that when the instrument was marketed commercially the 'English Mechanic' receiver was used.

118 Thompson and Thompson, 1920, pg. 115-6 (n.15); 'Valve Telephone', in the *Morning Post*, 19 December 1884, pg. [1].

119 'Cheap Telephones', in the *Morning Post*, 28 July 1885, pg. 5; 'New Telephone Co., Limited', in the *Electrician*, vol. 16 (1886), pg. 464.

As receivers the company supplied English Mechanic instruments, as disclaimed from Bell's original patent. These were also used by the London and Globe Company, as noted above, and I have discussed them in chapter three, section 2.1. By using these instruments the New Company hoped to avoid accusations of patent infringement by the UTC, and for some years this hope was realised.<sup>120</sup> In January 1886 the *Electrician* noted that the company's telephones seemed to be free of the UTC's master patents, and that the company itself was a strong one, capable of defending its patents in court. However, the journal considered that the instruments themselves might have been constructed better; the company had tried to make the instruments too cheaply in order to sell them at affordable prices, but it would have been better to charge a little more for a more carefully built telephone.<sup>121</sup>

The price of the instruments decreased as the company modified its telephone and produced new models; in March 1886 the company was selling a pair for £16.<sup>122</sup> In December 1886, at the company's annual meeting, it was announced that a new, stronger model was now being produced. Around December 1887, too, the company produced a simpler, cheaper model for use on short lines. Later, in June 1888, the company was marketing its instruments at £5 for the apparatus for two ends. This included bells, batteries and 100 yards of wire, with the telephones themselves costing £2 for use on a 1 mile line, or £6 for use on long lines.<sup>123</sup> This was probably cheaper than a UTC private wire, for which prices were not included in the directories of the period; these simply stated that estimates depending on distance would be given on request, and that the amount would then be a fixed annual charge.<sup>124</sup>

Although some advertisements noted that the company was prepared to accept applications from parties interested in establishing local exchanges using their instruments, there is no indication that any were ever established.<sup>125</sup> One advertisement in 1885

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120 'Telephonic Litigation', in the *Electrician*, vol. 16 (1886), pg. 303.

121 '1885', in the *Electrician*, vol. 16 (1886), pg. 172.

122 'Telephone Infringements', in the *Standard*, 25 March 1886, pg. 7.

123 'Railways and Other Companies', in the *Times*, 21 December 1886, pg. 11; 'Scientific Notes', in the *Graphic*, 31 December 1887, pg. 730; 'Electric Telephones', in the *Birmingham Daily Post*, 16 June 1888, pg. 7.

124 UTC, List of Subscribers, February 1886, pg. xviii.

125 For example: 'New Telephone Company', in the *Morning Post*, 28 July 1885, pg. [1].

recommended the use of valve telephones in private country houses, and in 1887 the company suggested that the most recent model of its telephone was very useful in hotels, hospitals, clubs and other large buildings; this new instrument was specifically marketed as being cheaper and more efficient than the existing technology of speaking tubes.<sup>126</sup> Such suggested applications for private telephones offer a window onto the debate over purpose in this period. In selling its telephones so cheaply, and recommending them for country houses, the New Company was promoting a more domestic use for the telephone alongside its use in business interactions. Whereas exchange telephony was typified by the carrying on of business in a qualitatively different fashion than could be done by telegraph, letter or messenger, private wires within buildings would probably have been labour saving devices for communicating with or between servants.

This was an important use for these telephones, and thus through this company many users were introduced to the question of telephone purpose by analogy with speaking tubes. However, I argue that if this was the public perception of this type of telephone service then many may not have had reason to pay to replace a system which was already working. If the technology being replaced was a speaking tube, then the advantage of being able to hear the other person's voice was not such an advance as it was when compared with the telephone replacing the telegraph in business use. The difference between the telephone and the speaking tube was only quantitative, and not qualitative; thus the incentive to replace it, even when supplied relatively cheaply, was not so great. Therefore more of the people who used this kind of telephone may have been doing so simply because it was a new technology, and possibly a status symbol. It did not make such a difference to daily life because the older alternative, the speaking tube, had done a similar job beforehand. Nevertheless, this section indicates how broad were the potential use of and demand for private telephone instruments; there were many more users apart from exchange subscribers who had reason to oppose the UTC monopoly.

#### 4.1.3. Valve telephone users

Some of the users of the New Company's telephones were mentioned in a short list of testimonials published in the *Times* in March 1886.<sup>127</sup> The testimonials came from around the country, including Liverpool, Gloucester and Poole. Indeed, an advertisement placed above the testimonials claimed that they desired to extend their reach even further, to

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<sup>126</sup> 'Telephones for Country Houses', in the *Morning Post*, 27 April 1885, pg. 6; 'Scientific Notes', in the *Graphic*, 31 December 1887, pg. 730.

<sup>127</sup> 'New Telephone Company, Limited: Testimonials', in the *Times*, 8 March 1886, pg. 13.

Europe, India and the British colonies. The testimonials expressed approval that the instruments fitted worked well, and were clear even in a noisy environment. A contractor in Liverpool, Wilfrid H. Fleming, had installed six instruments for the Count de Casteja, Marie Emmanuel Alva de Biaudos Scarisbrick, at his residence Scarisbrick Hall, with which the Count was very pleased. They also worked well over longer lines, one user having had a line fitted between Bournemouth and Poole, a distance of five miles, over which he said conversation was still very good: “for clearness and distinctness of articulation they are equal to the best.”<sup>128</sup>

A London company, The Electrical Apparatus Company, had been very impressed with their telephones, saying they were equal to any telephone now in use. Some of the highest praise came from G. Durham and Co., Stockport, who commented: “I have fixed a many hundred [telephones] when I was with the Telephone Company, Limited. They were of various makes, and I can say that yours are as perfect to converse with as any that have yet come under my experience, when perfectly regulated.”<sup>129</sup> He noted also that, unlike the more commonly used Blake transmitters, the New Company's telephones did not make use of springs which, in the former instrument, were known to rust, and often broke. Other satisfied customers included the Bessbrook Spinning Company and Messrs. Huntley and Palmer's, the biscuit manufacturers in Reading.<sup>130</sup>

It was common that local electrical engineering firms would purchase instruments from the New Company and erect them for customers in their local areas. Fleming, mentioned above, was one such example of this in Liverpool. In January 1886 the *Electrician* noted that the UTC had threatened him regarding his use of the valve telephones and the English Mechanic receivers, which he was supplying in the area. However, the journal did not think that such threats could be acted upon given that the valve transmitter was supposed not to infringe the UTC's Edison patent, and the receiver had been expressly disclaimed from the Bell patent. The New Company, it also noted, was a powerful association capable of defending its rights.<sup>131</sup> The UTC subsequently withdrew its accusations.<sup>132</sup> Another example was George Gilmore, who purchased instruments from the

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128 Ibid.

129 Ibid.

130 '1886', in the *Electrician*, vol. 18 (1887), pg. 194.

131 'More Litigation', in the *Electrician*, vol. 16 (1886), pg. 204.

132 'Telephonic Litigation', in the *Electrician*, vol. 16 (1886), pg. 303.

New Company for use on the Isle of Man in about 1888. Although he wanted to use these to establish an exchange, there was not enough local interest.<sup>133</sup>

Other similar cases were listed amongst the names of other users of New Company instruments given in an article in the *Electrician* in January 1887. For example, small firms installed valve telephones in the Broadmoor Asylum, in the public offices in Jersey, for firms in Canterbury, and across Yorkshire and Lancashire.<sup>134</sup> By January 1887 the New Company was considering establishing provincial sub-companies, and was communicating with representatives in Glasgow, Dundee, Edinburgh, Liverpool, Manchester, Preston, Bristol, Cardiff, Birmingham, Oxford, Cambridge, and others.<sup>135</sup> This indicates that local companies wanted to be able to supply a local demand for private telephony; whilst they were unable to do this through the UTC, the New Company conducted good business in this area. I argue that this was a large contributing factor in the spread of private telephone use during the period over which the New Company was active.

#### 4.1.4. The demise of the New Telephone Company

On 12 April 1889 the UTC brought a case against the New Company for infringements of Edison and Bell patents, and secured an injunction, restraining them and anyone else from owning or using any more valve telephones.<sup>136</sup> Thompson was surprised and disappointed, but the company was wound up in June, having suffered a total loss of capital.<sup>137</sup> The NTC threatened users of the valve telephone with legal action if they did not also comply with the infringement ruling by returning their instruments within the month.<sup>138</sup> According to Baldwin, 200 were recovered.<sup>139</sup> However, the *Electrician*, in May 1889,

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133 Roberts, n.d., pg. 9 (n.106); BT Archives, TCB 304/3, file 36, Lamb's Memorandum on the State of the Telephone Companies, 22 March 1892.

134 '1886', in the *Electrician*, vol. 18 (1887), pg. 194; 'The New Telephone Company', in the *Electrician*, vol. 18 (1887), pg. 227.

135 'The New Telephone Company', in the *Electrician*, vol. 18 (1887), pg. 274.

136 Baldwin, 1925, pg. 86 (n.6).

137 'High Court of Justice', in the *Times*, 3 June 1889, pg. 11; 'Proposed Amalgamation of Telephone Companies', in the *Times*, 5 June 1889, pg. 13; Thompson and Thompson, 1920, pg. 117 (n.15).

138 For example: Jackson, B. F., 'Telephone Patents', in the *Sheffield and Rotherham Independent*, 18 April 1889, pg. 3.

139 Baldwin, 1925, pg. 87 (n.6).

noted that this figure was over 8,000.<sup>140</sup> Thus, many more valve telephones were in use during this period than have been previously acknowledged.

The figure given in the *Electrician* implies that by the time it ceased supplying valve telephones, the New Company was responsible for nearly as many private wires across the country as the amalgamated NTC. That it had sold over 8,000 instruments implies there were around 4,000 private lines; by January 1889 the UTC's London system included 1,438 private wires.<sup>141</sup> By November 1889, the amalgamated NTC, comprising the UTC, NTC and L&C, had 4,702 private lines.<sup>142</sup> This means that the New Telephone Company was considerably larger and more important than previous histories have recognised, and this history goes some way towards recovering its significance in the period. However, Thompson's involvement with the New Telephone Company did not end there; within a couple of years he was helping the Duke of Marlborough with his plans for restarting the New Telephone Company, as I shall discuss below.

#### 4.1.5. Summary

The case of the New Telephone Company provides an example, like Provand's Mutual Company, of users dissatisfied with existing telephone provisions taking matters into their own hands. Indeed, this was a more difficult situation, as the New Company was acting in the face of a company with a track record of attacking anyone they thought might be infringing their patents. Provand never had to fight a patent battle. The New Company succeeded in making money and providing telephony for about four years before it was forced to stop. In December 1887 the *Graphic* commended the New Company on providing a “good public service in breaking down the monopoly which previously existed in this instrument.”<sup>143</sup> I argue that this was essentially due to its broader conception of telephone entitlement, which was the reason it sold instruments for low prices instead of renting them. The company also contributed to the debate regarding telephone purpose by promoting the use of telephones within private homes as substitutes for speaking tubes.

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140 'Notes', in the *Electrician*, vol. 23 (1889), pg. 2.

141 Baldwin, 1925, pg. 230 (n.6).

142 '1889', in the *Electrician*, vol. 24 (1890), pg. 244.

143 'Scientific Notes', in the *Graphic*, 31 December 1887, pg. 730.

## 4.2. Marlborough's New Telephone Company

No new telephone systems were ever established by the second incarnation of the New Telephone Company before it was taken over by the NTC. Thus the company had no users except for those of the existing Mutual Telephone Company exchange in Manchester. Here I examine instead the situation surrounding its establishment, specifically the company's "enthusiastic and enterprising"<sup>144</sup> proponent, the Duke of Marlborough. This allows me to develop a more detailed picture of the complaints of dissatisfied users in the early 1890s, just before the nationalisation of the trunk lines. In particular, Marlborough's role in telephony at this time is worthy of more investigation than it has yet merited; as Stein noted, Marlborough was one of the most ardent critics of the NTC, and his criticisms were important because they were made publicly and because similar criticisms were made by politicians and newspaper editors.<sup>145</sup> I begin by detailing the establishment and subsequent ending of the company, and then explore the impact it had on telephony in the period. I first examine the role it played in the nationalisation of the trunk lines, and then the effect it had on the cost of telephony in London.

### 4.2.1. Conception, founding and demise

Biographical material on George Charles Spencer Churchill, the 8<sup>th</sup> Duke of Marlborough, is sparse,<sup>146</sup> and must be gleaned from his obituary and from information in biographies of his brother, the Conservative politician Randolph Churchill.<sup>147</sup> Politically Marlborough was generally inclined towards Liberalism, and often appeared as a Radical.<sup>148</sup> He was also responsible for founding a few business endeavours concerned with promoting electric lighting.<sup>149</sup> By the time he got involved in the telephone debate in 1889, he had

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144 Baldwin, 1925, pg. 237 (n.6).

145 Stein, 1996, pg. 126 (n.41).

146 He does not even have an entry in the Dictionary of National Biography.

147 'Obituary: The Duke of Marlborough', in the *Times*, 10 November 1892, pg. 7; Foster, R. F., *Lord Randolph Churchill: A Political Life* (Clarendon Press, 1981); James, Robert Rhodes, *Lord Randolph Churchill* (Weidenfield and Nicolson, 1959).

148 Foster, 1981, pg. 15, 61, 123 (n.147).

149 James, 1959, pg. 120 (n.147); the *Times*, 10 November 1892, pg. 7 (n.147). As Gooday has argued, it was not unusual for aristocrats to be involved in furthering such endeavours: Gooday, Graeme, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (Pickering and Chatto, 2008), pg. 2, 33, 78, 117.

harboured an interest in telephony for some years. In 1890 he noted that he had seven telephones in his house, probably meaning his London residence, Carlton House.<sup>150</sup> In one of his many later letters to the *Times* on the subject, he noted that “[f]or the last six years I have had over 60 telephones established here [at Blenheim Palace, Woodstock]. They are twin-wire French instruments. I have two exchanges; the principal one has about 46 ways on it. A small boy runs this exchange all day”.<sup>151</sup> Marlborough claimed that this experience had given him some expertise, and thus some authority to express an opinion on how the telephone system ought best to be organised.

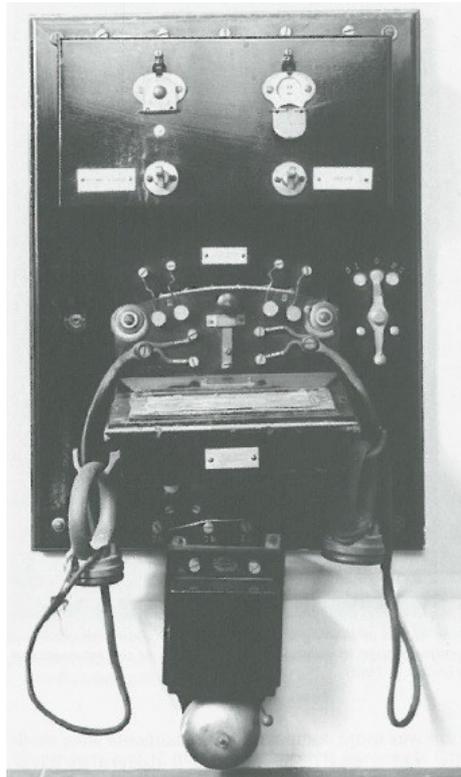


Figure 5.3. A telephone installed at Blenheim Palace

Source: Povey and Earl, 1988, pg. 26 (n.115)

Marlborough initially supported telephone nationalisation, and raised the question of government telephone policy in the House of Lords on 4 July 1889, condemning the proposed amalgamation of the UTC and the L&C with the NTC.<sup>152</sup> Beforehand he had visited Raikes to discuss the matter. Marlborough argued that the UTC's system in London was expensive and inefficient, and that the wires “had been put up in a haphazard fashion

150 Marlborough, *Hansard*, HL Deb, 7 July 1890, vol. 346, col. 908.

151 Marlborough, 1891, pg. 7 (n.2).

152 BT Archives, TCB 304/2, file 22, Memorandum Prepared for Lord Salisbury [Prime Minister]; Marlborough, *Hansard*, HL Deb, 4 July 1889, vol. 337, col. 1429-39.

without regard to future requirements or public convenience... they would have to be thoroughly overhauled and erected on a systematic plan.”<sup>153</sup> The Duke's proposal in the House of Lords was that a joint committee of both Houses be established to consider the policy to be adopted towards the telephone companies. However, as Raikes pointed out that it was too late in the Parliamentary session to form a committee at the time, it was decided that it should wait until the next session.<sup>154</sup> Marlborough did, however, make his support for nationalisation clear, saying that: “[t]he Government alone is able to undertake this system and develop it and work it properly”.<sup>155</sup> When Raikes later announced that the telephones would not be nationalised, Marlborough attempted to remedy the problems he saw with the telephone system himself.

Meanwhile, two groups approached Raikes between June 1889 and July 1891 with the intention of starting large new companies. Both wanted to affiliate themselves with the Post Office and eventually hold a new government-sanctioned monopoly over British telephony. Both suggested that they share their profits with the Post Office instead of paying the 10% royalty as current companies did, and offered Post Office representation on their boards of directors. Raikes declined their licence requests.<sup>156</sup> In April 1890, Marlborough came to the aid of the first group, called the Exploration Company, which had access to considerable capital through the involvement in their venture of many wealthy bankers and merchants in the City, including the Rothschilds.<sup>157</sup> By October 1891 the other group, led by former UTC and NTC directors Dillwyn Parrish and Colonel Gouraud, also joined Marlborough.<sup>158</sup> When his petitions to Raikes to grant a licence to the Exploration Company were unsuccessful, Marlborough acquired the licence of the first New Telephone

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153 BT Archives, TCB 304/2, file 13, Memorandum of Marlborough's Interview with Raikes, 20 June 1889.

154 Ibid.; Marlborough, 1889, col. 1439 (n.152).

155 Marlborough, 1889, col. 1432 (n.152).

156 BT Archives, TCB 304/2, file 36, Lamb memorandum, 1 November 1889; file 38, Blackwood to Raikes, 26 November 1889. On the Exploration Company: *ibid.*, file 38, letter, Post Office to Exploration Company, 11 December 1889. On Parrish's company: *ibid.*, file 102, letter, Post Office to Colonel Gouraud, 3 September 1891.

157 On the availability of capital: BT Archives, TCB 304/2, file 20, Blackwood to Raikes, 25 June 1889; file 36, Lamb memorandum, 1 November 1889. On Marlborough's intervention: *ibid.*, file 59, Rawlins to Lamb, 31 April 1890.

158 BT Archives, TCB 304/2, file 105, Memorandum of Interview, Mr. Parrish and Mr. De Crano with Mr. Lamb, 6 October 1891.

Company, not yet liquidated.<sup>159</sup> With Rothschild capital and disaffected former NTC directors in his camp, Marlborough started the Pioneer Telephone Company to provide capital for the New Company.

Marlborough next came to an arrangement with the Mutual Telephone Company, and it was purchased in January 1892 by the Electric and General Investment Company, of which Marlborough was a director. The Mutual passed to the Pioneer Company in February. When the New Company was incorporated on 27 July, the Mutual was passed to them.<sup>160</sup> The New Company, of which a third of the shares were held by the NTC and which had four NTC appointed directors on its board, had made arrangements with several electric lighting companies across London to use their underground electric lighting wire tubes for telephone wires. In a letter to the *Times* on 29 August 1891 Marlborough laid out his plan to provide good telephone service on a metallic circuit system for £10 subscription per annum. The plan was based on detailed proposals advanced by Alfred Bennett, the general manager and chief engineer of the Mutual, who assumed the same role as part of the New Company.<sup>161</sup> The New Company's plans had been examined and approved by Silvanus Thompson, who again provided input and support to a competitive telephone venture.<sup>162</sup> The Duke received some incredulous replies from supporters of the NTC.<sup>163</sup> However, others, who favoured competition, wrote in support of his plans.<sup>164</sup>

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159 BT Archives, TCB 304/2, file 59, Lamb memorandum, 22 April 1890; file 67, Marlborough to Raikes, 24 June 1890; file 68, Marlborough to Raikes, 30 June 1890; file 68, Marlborough to Raikes, 12 July 1890; file 73, Marlborough to Raikes, 26 July 1890.

160 Baldwin, 1925, pg. 197, 236 (n.6); 'The New Telephone Company, Limited', in the *Times*, 28 July 1892, pg. 15.

161 Marlborough, 'The Telephone', in the *Times*, 29 August 1891, pg. 7.

162 The *Times*, 28 July 1892, pg. 15 (n.160).

163 For example, Ferdinand Faithfull Begg, a stockbroker, repeatedly questioned Marlborough's assertion that £10 was a practical subscription price, and was never satisfied with the responses he received, bringing it up again in September 1892 (Begg, F. Faithfull; 'The Telephone', 3 September 1891, pg. 8; 'The Telephone', 8 September 1891, pg. 5; 'The Telephone', 11 September 1891, pg. 11; 'The Telephone', 19 September 1891, pg. 8; 'The Telephone', 3 September 1892, pg. 9; 'The Telephone', 13 September 1892, pg. 4 – all from the *Times*).

164 One supporter was the engineer Alan Archibald Campbell Swinton, who in 1887 had been part of a separate initiative providing private wire telephones of his own design, before his company, the Equitable Telephone Association, had succumbed to UTC legal action (Swinton, A. A. Campbell; 'The Telephone', 8 September 1891, pg. 5, and, 'The Telephone', 15 September 1891, pg. 9 – both from the *Times*; see also: Baldwin, 1925, pg. 88-9 (n.6)).

The company gained support quite quickly; in front of an 1898 Select Committee on the municipalisation of the telephone, John Williams Benn, chairman of the Highways Committee of the London County Council, noted that in May 1892 the New Company had obtained 3,000 subscribers at their rate of £12 12s.<sup>165</sup> However, by August 1892 it was clear that the New Company was co-operating with the NTC, and some of those who had previously supported Marlborough's endeavour now expressed their dissatisfaction and regret that the two companies were not competing in the public interest as had been expected.<sup>166</sup> Marlborough's defence was that this co-operation was in the public interest, and, regarding the price, that he was now unwilling to sacrifice the dividends of the shareholders in order to make a further tariff reduction down to £10; this would come in time.<sup>167</sup> Marlborough believed that he could maintain control of the company because he held the casting vote on the board of directors, and so was confident that the company would not fall completely into NTC hands.<sup>168</sup> He could thus compete with the NTC, whilst also offering his subscribers intercommunication with NTC subscribers.<sup>169</sup>

However, when Marlborough died suddenly on 9 November 1892 the balance of the board of directors was disrupted, and the New Company, now controlled by its majority of NTC directors, went into voluntary liquidation.<sup>170</sup> Marlborough's ideas about telephone supply indicate the uncertainty which surrounded the question of telephone ownership and exchange service provision in this period. He initially supported competition as the next best thing to nationalisation.<sup>171</sup> However, in holding a state monopoly as the ideal, it is likely that he believed some sort of unity of provision was preferable. Thus, in establishing the New Company, he attempted to combine the best elements of competition and monopoly, providing a service which was both convenient to users, through

165 UK Parliament, Report from the Select Committee on Telephones, 1898 (383) XII.1, evidence of John Williams Benn, q.2461.

166 For example: Webber, C. E., 'The Development of the Telephone', in the *Times*, 24 August 1892, pg. 9. As noted above, Webber had also supported the Mutual Telephone Company in its attempt to promote competition and a broader notion of telephone entitlement.

167 Marlborough, 'The Telephone', in the *Times*, 6 September 1892, pg. 6.

168 *The Manchester Guardian*, 28 January 1897, pg. 9 (n.40).

169 Telephones, 1898, evidence of John Williams Benn, q.2451 (n.165).

170 *The Times*, 10 November 1892, pg. 7 (n.147); the *Manchester Guardian*, 28 January 1897, pg. 9 (n.40); Baldwin, 1925, pg. 237 (n.6).

171 Marlborough, 1890, col. 909 (n.150).

intercommunication with the NTC, and accountable to them, through the choice of two companies. I argue that this view developed from his increasing familiarity with the requirements of the industry as he dealt with the practicalities of establishing potentially nationwide exchange service. Thus his case demonstrates that the way in which telephone ownership developed during and after this period was not inevitable or determined, but grew from these contingent factors.

#### 4.2.2. The broader impact of the New Telephone Company

##### 4.2.2.1. The nationalisation of the trunk lines

The New Company, although short-lived, was important in the debate regarding telephone ownership through Marlborough's role in the nationalisation of the trunk lines. This step would probably not have occurred had it not been for his involvement. The first mention of this scheme is recorded in the report of a meeting which Marlborough had with Post Office officials John Lamb and William Preece on 4 November 1891. As noted above, by this time Marlborough had both Rothschild capital and former NTC directors in his camp, and he proposed that the Post Office ought to provide trunk lines. He said that, although he had initially advocated complete nationalisation, in the absence of this policy he thought private companies should be enabled to provide local service using publicly owned trunk lines.<sup>172</sup> The benefit of this course of action was not only that it would level the playing field for new companies, but also that it would enable intercommunication between different companies' exchanges.<sup>173</sup> This addressed the concern that multiple companies meant more expense for users as they needed to subscribe to more than one system in order to talk to all available telephone subscribers.

Although in early 1892 both the New Company and the NTC were attempting to pass Bills through Parliament which would have given them more powers, for example placing wires underground, the Post Office opposed these and proposed instead to purchase the trunk lines.<sup>174</sup> In answer to criticisms in Parliament, Fergusson insisted that the government purchase of the trunk lines would encourage competition, as smaller companies would be

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172 BT Archives, TCB 304/3, file 9, Duke of Marlborough's Interview with Lamb, 5 November 1891.

173 BT Archives, TCB 304/3, file 30, Memorandum of Marlborough's Interview with Goschen, 2 March 1892.

174 BT Archives, TCB 304/3, file 22, Lamb to Marlborough, 12 February 1892.

able to compete on even terms with older, established concerns.<sup>175</sup> The *Times*, never in favour of expensive telephone nationalisation, commented that, whilst this step would not be as costly, it would still be very expensive.<sup>176</sup> The *Electrician*, which considered nationalisation the only practical option for an efficient telephone service, lamented the fact that this was not being proposed, observing also that such dual control of the system was bound to be inefficient.<sup>177</sup> The NTC was against the purchase, arguing that the trunk line network, which they had spent time and money developing, was what enabled them to compete against rivals, for example the Mutual Company in Manchester and the Post Office in Newcastle.<sup>178</sup> However, as Marlborough pointed out, because the New Company was accepting the terms proposed by the Post Office, the NTC also had to accept, or else risk losing out to its rivals.<sup>179</sup>

The bill to nationalise the trunk lines was passed on 28 June 1892.<sup>180</sup> As I have noted in chapter four, a similar strategy to the trunk line purchase was proposed in 1884 by the independent companies as a way of retaining autonomy in the face of the larger companies, in a way which would not compromise the convenience of subscribers. Although this was rejected by Fawcett, I argue that Marlborough, as an aristocrat, was taken more seriously, and his suggestions investigated and subsequently implemented. The Postmaster General at the time, James Fergusson, commented regarding Marlborough in November 1891: “[h]e is very clever and his suggestions are well worth consideration.”<sup>181</sup> This is important to note because, as Gooday has pointed out, aristocrats have often been left out of such histories, or dismissed as negative influences.<sup>182</sup> Given this fact, and the leverage Marlborough gave the Post Office over the NTC, as noted above, I argue that without the user dissatisfaction embodied in the New Telephone Company, it is very unlikely that the trunk lines would

175 'The Post Office and the Telephones', in the *Times*, 30 March 1892, pg. 6.

176 ['The Telephone System'], in the *Times*, 30 March 1892, pg. 9.

177 'The Government and the Telephones', in the *Electrician*, vol. 28 (1892), pg. 540-41.

178 BT Archives, TCB 304/3, file 30, Memorandum of Forbes' Interview with Goschen, 1 March 1892; 'Telephone Reform', in the *Electrician*, vol. 28 (1892), pg. 429.

179 Marlborough's Interview with Goschen, 1892 (n.173).

180 Baldwin, 1925, pg. 578 (n.6).

181 Marlborough's Interview with Lamb, 1891 (n.172).

182 Gooday, 2008, pg. 2, 33 (n.149); Wiener, Martin J., *English Culture and the Decline of the Industrial Spirit, 1850-1980* (Cambridge University Press, 1981), pg. 158-9.

have been nationalised at this point. Therefore Marlborough and his company had a lasting effect on the question of telephone ownership in and beyond this period.

#### 4.2.2.2. The Association for the Protection of Telephone Subscribers

I now discuss how the New Company affected the provision of exchange telephony in London by causing a reduction of the rates. In April 1891 Arthur H. Hastie, a Kensington solicitor and exchange subscriber, published a circular summoning London subscribers to a meeting.<sup>183</sup> Hastie had been a subscriber for many years, but although he considered himself to be served well, he had seen in a report of the recent NTC AGM that the chairman had told the shareholders that the company charged £20 per annum because subscribers were willing to pay it. He desired to band the subscribers together, gaining “the same power towards the Company in regard to the charges as the Company had towards the subscribers.”<sup>184</sup> Similar reasoning guided the actions of disappointed Sheffield subscribers in May 1892, as noted in chapter four. Disenchanted subscribers had been complaining about the London telephone system for many years, but often noted that unless more people took action the companies were unlikely to pay attention.<sup>185</sup> Indeed, from the study of responses to complaints presented in chapter three, I have argued that complainants only effected changes in the system when they had a financial handle on the companies. Individual subscribers did not have this handle, but London users now hoped that the Association might have.

Hastie expected about half of the subscribers in London would join his movement. A committee was formed which, according to the *Pall Mall Gazette*, comprised “the leading men and firms in every trade and profession in the metropolis.”<sup>186</sup> In March 1892 the Association for the Protection of Telephone Subscribers was incorporated. Promoting themselves to other London subscribers, the committee obtained over a thousand members for the Association, including some of the largest and most important businesses in London.<sup>187</sup> The two main complaints were the high cost of exchange subscription and the

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183 'The London Telephone Rates', in the *Electrician*, vol. 26 (1891), pg. 739; occupation and address derived from the 1891 English census.

184 Ibid.

185 Subscriber, 'The Telephone in London', in the *Electrician*, vol. 16 (1886), pg. 232; Irish, W. E., 'The Monopoly in Telephones', in the *Electrician*, vol. 16 (1886), pg. 332.

186 'The Grievances of the Telephone User', in the *Pall Mall Gazette*, 26 January 1893, pg. 3.

187 'The Telephone Service', in the *Times*, 7 May 1892, pg. 6.

inefficiency of the system, partly because the company had not improved their plant or equipment and partly because of the “carelessness, wilful and otherwise, of the staff.”<sup>188</sup> Two of the members of the Association's committee later noted that as soon as it was founded there was a noticeable improvement in the attitudes of the operators, and the efficiency of the service did improve. However, this did not help with the outdated equipment. Representatives of the Association met with the NTC but had no luck requesting improvements to the service. They then asked the Post Office for help, and were told that, if there was no other solution, a Post Office telephone system in London would be an option.<sup>189</sup>

At this point the Association became aware of Marlborough's New Telephone Company, and affiliated themselves with his cause.<sup>190</sup> The Association made an arrangement with the New Company in April 1892, under which the Association agreed to help the company to gain subscribers by promoting it to its own members. In return the company would accept those subscribers at a rate of £12 12s per annum. When the New Company was swallowed up into the NTC in January 1893, the Association attempted to hold the NTC to the New Company's agreements.<sup>191</sup> Although not entirely successful, in March of that year the Association was able to report that the NTC had agreed to reduce the prices of domestic telephones in London from £20 per year to £10 on a five year contract. The price of business telephones would not change, but as the NTC had promised to replace its single wires with metallic circuits, the main concerns regarding efficiency would be dispelled, and the system would be much improved and worth paying for. Although the Association had hoped to secure a better deal from the New Company, the benefits of this agreement with the NTC was that the promised changes would come into effect much more quickly.<sup>192</sup> Thus, the activities of the New Company, combined with the power of united subscriber action, indirectly secured some improvements in London telephony.

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188 *The Pall Mall Gazette*, 26 January 1893, pg. 3 (n.186).

189 *Ibid.*

190 *Ibid.*

191 'The Money Market', in the *Times*, 5 January 1893, pg. 11.

192 Haig, C. R. and Hastie, A. H., 'The Telephone Service in London', in the *Times*, 20 March 1893, pg. 8.

#### 4.2.3. Summary

In July 1892, shortly after the Bill to nationalise the trunk lines passed, the *Electrician* commented that the New Telephone Company now looked like it may just have been a ploy to force the hands of the NTC.<sup>193</sup> If this was correct, then it worked well insofar as it gave more telephonic power to the Post Office and improved the situation in London. These were both goals which Marlborough had advocated from an early stage. Whilst for supporters of complete nationalisation such as the *Electrician* the trunk line purchase did not go far enough, for advocates of private enterprise such as the *Times* it was already too much government involvement in the telephone industry. These different stances highlight the variety of opinions expressed regarding telephone ownership in this period. The fact that the system was not nationalised in this period, despite those who were advocating it, indicates the emphasis placed by the government and much of the popular press on competition as the best way to ensure the provision of an efficient, accountable telephone service.

Marlborough may have been inclined towards encouraging wider telephone use because of his Liberal tendencies. These may have aligned him initially with Provand, although they would have disagreed about the benefits of competition early on. Marlborough later came to downplay the value of competition, a stance similar to Provand's own position. However, he also gave more weight to the needs of shareholders over those of the subscribers than Provand had been willing to grant, which was why the latter had established a mutual company. Advocates of the Mutual would later claim, as seen above, that the only reason they had allied themselves with Marlborough at all was his promise of sufficient capital for the erection of the trunk lines which Mutual subscribers so desperately wanted. Ultimately, although the New Telephone Company created no new users of its own, it was very influential and reveals another way in which dissatisfied users attempted to take control over the provision of exchange telephone service.

#### 5. Conclusions: outcomes of opposition

The cumulative effect of the discontent indicated by these opposition companies resulted in the nationalisation of the trunk lines in 1892. The four companies covered here also impacted on British telephony in other important ways, all driven by the discontent of users with the provision of telephony by the UTC group companies. The threat of the Mutual Company resulted in the NTC monopoly lowering its tariffs around the country,

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<sup>193</sup> 'Notes', in the *Electrician*, vol. 29 (1892), pg. 323.

except for London. The indirect effect of the second New Company was, through the Association for the Protection of Telephone Subscribers, to also reduce rates for domestic subscribers in London, as well as to ensure a guarantee that the single wire plant would be replaced with metallic circuits. The London and Globe Company, the first to actively oppose the UTC group's growing monopoly, demonstrated that a different, more efficient exchange system was possible, especially through its use of metallic circuits and its multiple switchboard. The Mutual Company later provided another example of this improved telephone use-experience. By supplying private telephony in opposition to the UTC group, the first incarnation of the New Telephone Company increased exposure and access to telephony in a few different capacities, from long private wires to systems of intercommunication within buildings. This enabled more people to become users, thus increasing their familiarity with and potentially their desire for the new technology.

In opposing the UTC monopoly, all the companies in this chapter advocated competition in telephone provision, at least in the short term. I argue that the majority of users also thought competition was the best way to improve telephone service, especially exchange service. The fact that this would mean multiple exchange systems was not disadvantageous to these users because, as discussed in chapter four, they required closed networks instead of open networks. The view that competition was beneficial was shared by the Post Office officials in charge of formulating the government's policy towards the telephone companies. The companies and the technical press, for example the *Electrician*, believed that unity of exchange provision was more important in order to avoid duplication of plant and inconvenience to users and non-users alike.<sup>194</sup> However, because in this respect I argue that the policy of the government reflected the attitudes of most telephone users, the Post Office should not be blamed for prioritising the promotion of competition.

Nevertheless, users like Provand and Marlborough not only both demanded that the providers of telephone service ought to be more accountable to users and the general public; they also both either believed initially or came to believe that some form of unified provision of exchange telephony was ideal. Until the nationalisation of the trunk lines, the practicalities of exchange provision at that time made unified provision preferable for open network users. However, the Post Office, and especially Marlborough, expected that the government purchase of the trunks would change this. The competition which would be enabled by the new model of ownership would be beneficial to users and non-users because plant would not be unnecessarily duplicated and subscribers would not have to pay to join

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<sup>194</sup> BT Archives, TCB 304/2, file 68, Brand to Fawcett, 29 April 1882; Johnson to Brand, 25 April 1882; Jackson to Fawcett, 27 April 1882; Moseley to Fawcett, 27 April 1882; 'The Government and the Telephones', in the *Electrician*, vol. 28 (1892), pg. 540-41.

two systems in order to have access to everyone. I argue therefore that the decision to purchase the trunk lines at the end of this period was an attempt to obtain for telephone users and non-users a model of ownership which combined the best of both worlds. On the one hand they would have active competition which would ensure a good telephone service. On the other, they would still be able to communicate with users on rival systems without incurring extra costs. In this way the debate about the ideal model of telephone ownership led to the nationalisation of the trunk lines.

In chapter four I noted Stein's observation that there was nothing inevitable about the way in British telephony developed, and that it may have developed differently. Stein pointed to the Mutual Telephone Company as one example of this because of its lower price and different attitude towards ownership and entitlement.<sup>195</sup> I posit that the other companies I study in this chapter comprise similar examples of how telephony might have developed differently because they also embodied broader conceptions of telephone entitlement through charging lower prices than the UTC group companies. Stein concluded that whereas telephony remained on the whole an elite technology in this period, there were some attempts to broaden access;<sup>196</sup> I have demonstrated that each of the companies covered in this chapter believed in a wider conception of telephone entitlement than the UTC group. None, however, advocated any kind of universal service.

The Mutual Company's low subscription might be taken to imply that Provand intended the telephone to be accessible to a very broad range of people. However, his statement in 1885 that the telephone should one day be as useful to the mercantile community as gas was to everyone implied that his conception of exchange telephony was still primarily as a business tool.<sup>197</sup> Although a cheaper rate would bring more businesses onto the system, it was not to be a more universal convenience, as gas was. Marlborough emphasised that domestic users should have more access to exchange telephony, but nevertheless his intention was that it was to be more available to very wealthy home-owners such as his fellow Peers in the House of Lords who lived in the West End of London.<sup>198</sup> By selling their instruments to subscribers more cheaply than the equivalent UTC group

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<sup>195</sup> Stein, 1996, pg. 124 (n.41).

<sup>196</sup> Ibid., pg. 125.

<sup>197</sup> Provand, 1885, pg. 6 (n.1).

<sup>198</sup> Marlborough, *Hansard*, HL Deb, 14 March 1890, vol. 342, col. 840, 845; Marlborough, 1891, pg. 7 (n.2).

subscriptions, the London and Globe Company and the first New Company also actively attempted to broaden access to telephony.

Regarding the debate surrounding the purpose of telephony, neither the London and Globe nor the Mutual promoted any different specific uses to the existing companies. However, I argue that the first incarnation of the New Telephone Company promoted uses of private telephony which had not been emphasised to that extent beforehand. By the time it was wound up it was responsible for nearly as many private wires as the entire amalgamated NTC; considering that there were also other similar companies supplying private wires, this indicates the role of these opposition companies in promoting alternative uses for telephones alongside exchange telephony. The Duke of Marlborough, also, through the New Company, placed an emphasis on domestic exchange telephony which had not previously been the focus of the UTC group.<sup>199</sup> In addition, through the actions of the Association for the Protection of Telephone Subscribers, Marlborough and his company were also responsible for the reduction of domestic exchange telephone prices. I therefore argue that the two incarnations of the New Telephone Company contributed constructively to conceptions of the purpose of telephony in this period.

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<sup>199</sup> Marlborough, 1891, pg. 7 (n.2).

## Chapter Six: Conclusions

### 1. Shaping British telephony

“Sir, – In a recent leading article on the subject of telephone municipalisation, you very neatly hit off the situation when you say that somehow it has not 'caught on' with the ratepayers... What is the telephone to the great mass of toiling ratepayers? Have they the slightest interest in it, either present or prospective, as a useful or an economic invention? ... It presents no feature calculated to enlist on its behalf those who constitute the great bulk of citizens. It is as you, sir, have said, a kind of luxury to be enjoyed by the rich, or at least those who conduct or carry on business within the city.”

Observer, letter to the *Glasgow Herald*, September 1893<sup>1</sup>

Throughout this thesis I have argued that once telephone instruments were invented, and telephony had been introduced to the public via lectures, demonstrations and periodical articles, telephone usage had still to be invented. Whilst the companies which promoted telephony largely encouraged conversational business use, I have demonstrated that they were not the only ones constructing uses for telephone instruments. I argue that without understanding the needs and actions of users and non-users, it is not possible to fully explain the ways in which telephony developed by the end of the period covered by this thesis, 1893. By this time, the debates regarding telephone ownership, entitlement and purpose had developed. As illustrated in the epigraph above, new questions were being asked about who should provide telephony, who should be able to use it, and what they ought to use it for. After the government had decided in 1892 to promote competition in exchange telephony by purchasing the trunk lines, the New Telephone Company, the main competitor to the monopolising NTC, had been absorbed by its rival. Those telephone users and non-users who wanted competition in order to secure a better, cheaper service therefore turned to the municipalities as potential suppliers of telephony towards the end of the 1890s. My use-focused thesis explains how, as indicated by the epigraph, this began in Glasgow. I discuss this further below.

Whilst today universal, open exchange telephony is an integral part of daily life, this thesis demonstrates that this came about through contingent factors. The proliferation of telephony occurred through suppliers and users negotiating telephone ownership, entitlement and purpose, resulting in the construction of uses for, and users of, the

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<sup>1</sup> Observer, 'The Corporation Telephones, Electric Lighting, and Tramways', in the *Glasgow Herald*, 13 September 1893, pg. 9.

technology. Thus, below in section two I discuss the findings of this thesis with relation to each of these three main themes. I then demonstrate how examining these three debates can be used as a methodological tool to help understand telephone developments outside the immediate geographical or historical scope of this thesis, such as comparisons between British and US telephony, and late 1890s municipal telephony, as noted above. Next in section three I discuss the four main methodological differences between my research and previous histories of British telephony; I conclude this section by explaining Charles Perry's delay thesis, the most influential existing history, as an example of counterfactual history. Finally, in section four I provide suggestions for further research to build upon the findings of my thesis. Throughout this chapter, as noted in chapter one, I also look backwards and forwards in time to compare early telephony to telegraphy and mobile telephony. These comparisons show how my thesis illustrates the importance of users in the development of telecommunications technologies more generally.

## 2. Evaluating questions of ownership, entitlement and purpose

Throughout this thesis I have examined scenarios and case studies which shed light on the wider debates taking place regarding telephony during this period. The questions of ownership and entitlement predominantly involved exchange telephony in particular, the first being concerned with the best way to supply it and the second with who should be taken into consideration when doing so. As will be seen below, I argue that this latter question was the most clear cut of the three debates. Although Kingsbury and Baldwin, both exchange telephone engineers, focused almost exclusively on exchange telephony, and Perry and Feuerstein were heavily influenced by these early histories, I have demonstrated throughout this thesis, especially in chapters two and three, that this was only one application of telephony. The question of purpose, finally, addressed the various uses to which telephony could or ought to be put. Some of these uses, as discussed in chapter two, did not involve the transmission of speech at all. I now examine the themes involved in each of these three questions, and then assess the significance of these debates for the development of British telephony.

### 2.1. Ownership: what was the best model of exchange telephony supply?

The question of ownership was the most complicated of the three debates. When the Victorian public were debating how exchange telephony ought to be supplied during the 1880s and 1890s, there were three overlapping dichotomies to consider: monopoly versus competition, local versus national scale service provision, and public versus private ownership. No consensus regarding these different approaches emerged by the end of the

period covered by this thesis, or even by the end of the century. I now address each of these three dichotomies in turn.

### 2.1.1. Monopoly versus competition

As noted in chapters four and five, arguments for competition in exchange provision continued throughout the 1880s and 1890s, but no agreement was reached between users and providers as to whether competition or monopoly was best. Indeed, the Duke of Marlborough, himself a user and then a provider, had encouraged competition prior to his advocacy of monopoly.<sup>2</sup> The UTC group companies argued that an efficient service could not be provided through competition.<sup>3</sup> The *Electrician*, a specialist technical journal, agreed with this sentiment from at least 1881, but preferred that the monopoly be in the hands of the state.<sup>4</sup> However, users and non-users exerted considerable influence over the provision of exchange service. The fact that competition continued to be entertained in the face of company opposition is itself indicative of the influence of the users. I have argued in chapter four that many businessmen were opposed to monopoly on principle, and did not trust a monopolising company not to abuse its position and take advantage of its subscribers.<sup>5</sup> I conclude that the choice between monopoly and competition in most towns in the 1880s and 1890s was largely down to the predispositions of users in specific towns.

For example, subscribers in Leeds decided in 1880 that they did not want the inconvenience of competition. For the same reason users in Aberdeen likewise decided against establishing an opposition exchange to compete with the NTC, and also because they received concessions from the company.<sup>6</sup> Nevertheless, as demonstrated in chapters four and five, where users and non-users were in favour of competition as a way of bringing down the price of telephony, multiple exchanges did operate, for example in Dundee,

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2 Marlborough, *Hansard*, HL Deb, 7 July 1890, vol. 346, col. 909.

3 Kingsbury, John E., *The Telephone and Telephone Exchanges: Their Invention and Development* (Longmans, Green, and Co., 1915), pg. 202.

4 Perry, Charles R., 'The British Experience 1876-1912: The Impact of the Telephone During the Years of Delay' in Pool, Ithiel de Sola (ed.), *The Social Impact of the Telephone* (The MIT Press, 1977), pg. 81; 'The Government and the Telephones', in the *Electrician*, vol. 28 (1892), pg. 541.

5 For example: Bellum, 'Telephone Rates', in the *Sheffield and Rotherham Independent*, 9 May 1892, pg. 8; 'Telephonic Communication in Aberdeen', in the *Aberdeen Journal*, 2 February 1883, pg. 6.

6 Baldwin, F. G. C., *The History of the Telephone in the United Kingdom* (Chapman and Hall, 1925), pg. 106; 'Telephonic Communication in Aberdeen', in the *Aberdeen Journal*, 9 February 1883, pg. 6.

Sheffield and Manchester. As I have argued, one of the factors in whether users preferred monopoly or competition was their need for open or closed networks. Open network subscribers increasingly benefited as an exchange grew larger, and thus preferred a single, unified system. Closed network subscribers on the other hand were not so concerned if competition meant they could only talk to certain other users on their own exchange, as long as these were the specific users with whom they wished to converse. In this way the purpose for which telephony was used affected the model of telephone ownership preferred by users.

### 2.1.2. Local versus national

By 1892 the majority of telephone exchange service was provided by the UTC group companies, then led by the NTC.<sup>7</sup> The advantage of provision from such companies was that they were all connected with one another, and thus could offer their subscribers, from 1884 onwards, trunk line connections to other towns within the region or around the country. However, as noted in chapter four, some users preferred their exchange telephone service to be provided locally. I argue that a large part of this involved local pride. For example, users in Sheffield and Swansea were very proud of their local companies. Other examples were noted in chapter three; in Preston, George Sharples found it easy to obtain valuable wayleaves from local land-owners for his local exchange.<sup>8</sup> Additionally, in 1890, Andrew Provand attempted to establish mutual telephone companies for Scotland and Yorkshire, based in Glasgow and Leeds respectively, because these would be more popular locally than companies run from London.<sup>9</sup> I argue that often people felt more invested in local companies than in the more remote, larger companies. They may also have been attempting to assert their local identities, specifically against London, through control and provision of their own exchange service.

Thus focusing on these companies in chapters four and five has revealed how the adoption of technology in this case may have been tied to feelings about local, and particularly provincial, identity. Indeed, in the mid-1880s, it did appear possible that a model of exchange provision based on interconnected local companies in different towns around the country might be practical, with trunk lines supplied by the Post Office.<sup>10</sup> This has not been addressed in existing histories; indeed, only Baldwin wrote about the local

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7 'The London Telephone Service', in the *Electrician*, vol. 28 (1892), pg. 436.

8 'Telephonic', in the *TJER*, vol. 14 (1884), pg. 111.

9 BT Archives, TCB 304/2, file 78, Blackwood to Raikes, 15 October 1890, Provand to Raikes, 31 October 1890.

'independent' companies, but he did not consider them as serious concerns with an autonomous group identity and a coherent vision for the future of telephony. By the end of the decade this vision was no longer feasible. Nevertheless, this demonstrates that the model of telephone provision which emerged, that of provision by a single national body, was not inevitable. The alternative, local systems connected up to one another by neutral Post Office trunks, was dismissed by the Post Office in 1884; however, this was later the course taken in 1892 when the trunk lines were purchased at the suggestion of the Duke of Marlborough.<sup>11</sup> This was ultimately unsuccessful, though, as Marlborough's New Company was subsequently absorbed into the NTC.

### 2.1.3. Public versus private

This dichotomy concerned whether the companies or the Post Office could better run the exchange system of the country. The option to nationalise telephony was available to the Post Office in 1879, when the Postmaster General first took action against the telephone companies. However, the Post Office chose not to take control of telephone development because licensing companies to do the work instead was less risky – given concerns about the efficacy of the instruments – and less expensive – given concerns about the cost of the telegraph purchase.<sup>12</sup> One of the benefits of state telephony during the 1880s and 1890s was certainly that the Post Office was able to provide exchange services where the companies were unwilling to do so, because it would have been unremunerative for them. Several of the small Post Office exchanges such as Exeter, Falmouth and West Hartlepool were examples of this.<sup>13</sup> One reason why the question of whether to nationalise telephony was problematic was because it was a question of monopoly versus competition; as noted above, competition in telephony was popular amongst many telephone users. Even after the NTC obtained their virtual monopoly over exchange telephony, there was still the possibility that competition might arise, such as the Duke of Marlborough's New Telephone Company.

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10 BT Archives, TCB 304/1, file 6, Report of a Meeting of the Independent Telephone Companies, 26 July 1884, [pg. 4].

11 'House of Commons, Thursday, Aug. 7', in the *Times*, 8 August 1884, pg. 6; BT Archives, TCB 304/3, file 9, Report of Duke of Marlborough's Interview with Lamb, 5 November 1891.

12 Feuerstein, Raymond, 'The Early History of the Telephone in England 1877-1911' (Ph.D. thesis, University of Sussex, 1990), pg. 87-8.

13 Perry, 1977, pg. 85 (see n.4); BT Archives, TPF/2/13/7/1, file 68, Return Giving the Names of All Telephone Exchanges which the Post Office has at Any Time Opened in the United Kingdom, 16 May 1899, pg. 2.

Support for private versus state ownership also relied on the early experiences subscribers had of exchange telephone service. For example, in March 1892, the Associated Chambers of Commerce met in London and passed a resolution encouraging the government to take over the telephone systems of the country in order to develop them properly. However, the Sheffield Chamber of Commerce opposed this resolution, preferring to trust private enterprise over state ownership.<sup>14</sup> I argue that this was because they had enjoyed a good experience of their own local company, run by John Tasker from 1879 until 1892, and thus believed they had seen this model working better than that of a government monopoly. However, during the message rate controversy of May 1892, discussed in chapter four, most Sheffield subscribers were furious at the NTC; the *Sheffield and Rotherham Independent* then noted that at that point the Sheffield business community would support the proposal that the government ought to purchase the telephone system.<sup>15</sup> On the other hand, Post Office subscribers themselves were sometimes dissatisfied, for example in Hull and Leicester, and requested company telephony instead. Thus, local experiences of exchange telephony shaped the preferences of users for public or private exchange telephony.

## 2.2. Entitlement: who had the right to use telephones?

By looking more broadly than existing literature on telephone history, I have compared and contrasted a wider range of attitudes regarding who was an appropriate user of telephony, and who did not need to be catered for. As discussed in chapter one, Perry noted that the telephone was considered by government bureaucrats to be a luxury rather than a necessity.<sup>16</sup> However, I have argued that this attitude was not limited to official circles in this period, nor was it the only view held by government officials. The UTC group companies also adhered to this view; as noted in chapter three, an 1882 article in the *TJER* examined the policy of the L&C and concluded that its strategy relied on catering to the few at high rates instead of the many at low rates.<sup>17</sup> In chapter three I have also given examples of larger users who were opposed to smaller users taking up time on the system. These users preferred to keep the network small and elitist in order to ensure they received prompt attention at the exchange. It is likely that such firms were predominantly closed

14 'Amalgamation of the National and the Sheffield Telephone Companies', in the *Sheffield and Rotherham Independent*, 12 March 1892, pg. 7.

15 'Summary of News', in the *Sheffield and Rotherham Independent*, 16 May 1892, pg. 4.

16 Perry, 1977, pg. 74-5 (n.4).

17 'Lancashire and Cheshire Telephonic Exchange Company', in the *TJER*, vol. 11 (1882), pg. 318.

network users, as explained in chapter four; they did not require a large, open exchange for their telephone to be useful to them.

Even in Dundee, potentially the paradigm case of inclusive exchange service because of the low rates that prevailed there during the period of competition, the guiding ideology was not inclusivity. Because the NTC charged £5 per annum, and the Dundee and District Company charged £5 10s, many small businesses and shops joined their exchanges because it was seen as being so affordable. As I have argued, this resulted in a very open network, although all of these smaller shopkeepers left the system together when the price was raised to £10 per annum after amalgamation with the NTC in 1885.<sup>18</sup> However, this did not bother Alexander Moncur, who had been the chairman of the local company. In 1895, Moncur said he did not see the exodus of the smaller shopkeepers unable to afford the higher price as detrimental to the system as a whole, as “it did not diminish the number of subscribers who really ought to be on the telephone.”<sup>19</sup> He did not believe these smaller subscribers needed to have telephones. Thus, even in this open exchange, the promoters were not seeking to expand access to telephony, but simply to compete and win in a business environment.

In providing cheap exchange telephony, Moncur – a merchant and power-loom manufacturer and himself a big telephone user<sup>20</sup> – and the Dundee and District Company were not acting idealistically to spread the technology, but running a business to provide themselves with telephony and, if possible, a profit. This attitude also informed the opinion that Moncur expressed with regard to municipal telephony in front of the 1895 Select Committee on Telephone Service: he did not believe the majority of ratepayers would approve of their tax money being spent on a system in which they had no practical interest.<sup>21</sup> This implies that he believed the telephone system would not be universally beneficial, and that most people in most towns would not have any use for the telephone. They should therefore not have been considered when discussing how best to run the system. Thus, I argue that the view that exchange telephony ought to be predominantly for wealthy firms, and not small businesses or householders, was widely held by nearly all providers of exchange telephony, as well as by many telephone users.

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18 UK Parliament, Report from the Select Committee on the Telephone Service, 1895 (350) XIII.21, evidence of Sir John Leng, q.1114.

19 Ibid., evidence of Alexander Moncur, q.2356.

20 Ibid., evidence of Alexander Moncur, q.2293-7.

21 Ibid., evidence of Alexander Moncur, q.2344-8.

There were however some exceptions. Andrew Provand's Mutual Telephone Company, examined in chapter five, set out from the beginning to provide telephony as cheaply as possible in Manchester through cooperative means, rather than reducing rates later to fight competition, as happened in Dundee. Provand also intended for the company to make money; as he reassured an early meeting of interested businessmen, he was not on a “philanthropic or benevolent crusade”,<sup>22</sup> but promoting a viable business proposition. As he might have gained a lot of support in Manchester simply by advocating a £10 rate in opposition to the standard Manchester rate of £20, the fact that he attempted to supply telephony for £5 a year suggests he believed a broader class of business and professional men, as well as private homes, ought to be able to use the new exchange. Through his vision, Provand, although not promoting universal service, nevertheless embodied the broadest conception of telephone entitlement in the period. Charles Webber, a Royal Engineer and managing director of the UTC, mentioned in chapter two, also advocated broader telephone access from at least 1884.<sup>23</sup> As seen in chapter five, he subsequently supported the Mutual Company in its attempt to increase access to telephony.

Conceptions of entitlement were uniformly quite narrow in this period. Unlike the questions of ownership and purpose, there was more of a consensus that telephony, both exchange and private, was for use by businesses and by wealthy home-owners. In this case, there were very few who seriously believed in or advocated the widespread use of the telephone. For example, Carolyn Marvin noted that by 1893 a periodical article speculating about houses of the future did not predict that they would have exchange telephones.<sup>24</sup> When Perry cited the Postmaster General, Arnold Morley, noting in 1895 that telephony, unlike gas and water, was a luxury and not a necessity, he grouped him unfairly with the “short-sighted bureaucrats who regarded penny-pinching more highly than the needs of the public.”<sup>25</sup> This attitude of the telephone as a luxury was prevalent for decades, and was not confined to the government. Regarding entitlement and the development of the exchange network, this thesis demonstrates that there was never an attitude in the 1880s and 1890s that telephony would ever become a universally useful technology in Britain. This makes

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22 'Co-operative Telephones: Proposed New Undertaking', in the *Manchester Guardian*, 6 December 1889, pg. 7.

23 Webber, C. E., 'The Development of the Telephone', in the *Times*, 24 August 1892, pg. 9.

24 Marvin, Carolyn, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford University Press, 1988), pg. 78-9.

25 Perry, 1977, pg. 75 (n.4).

the subsequent prevalence of the technology more interesting, and a fertile area of study for future research into telephone development during the decades following nationalisation.

### 2.3. Purpose: how should telephones be used?

To a large degree the invention of the purposes of telephony lay with the users, for example, the military men who saw telephone instruments as telegraph receivers, or the commercial or professional men who saw their exchange telephones as a marketing tool. Here I address uses of both telephone instruments and telephone exchanges. As I have explained in chapter two, the purposes for which users employed early telephone instruments were not obvious or inevitable. Rather, these uses needed to be constructed and evaluated within a context of existing communications alternatives which were often trusted and reliable. Users of these older methods did not always believe that they needed to be replaced, nor did telephony always appear to them to be a suitable replacement. This process of the construction of uses was shaped by the promoters of the technology, who suggested uses in order to sell their products, and by the users who decided whether or not to adopt the technology for the uses for which it was being promoted. Finally, a third category, the innovators, engaged creatively with telephony and produced new uses which had not previously been envisaged. In the case of exchange telephony, there were two main uses, explored in chapter four: open and closed network telephony. After considering telephone instruments and exchanges, I will compare the early uses of telephony to those of early telegraphy.

Almost everyone who encountered telephone instruments in the first few years after Bell's invention agreed they were technically brilliant and scientifically fascinating.<sup>26</sup> However, it was not clear at that point that telephony could be employed as an everyday means of communication to rival the telegraph, the post, or the messenger. Thus, telephone promoters such as Bell and Reynolds focused on giving people reasons to use the telephone.<sup>27</sup> Most of these applications included the use of telephones as a form of private communication between two points, or within large buildings. Many companies, some listed in chapter five, sold telephones for such private wire purposes. However, as chapter two demonstrates, some users developed and innovated with instruments to suit their own needs, some of which did not involve the transmission of speech at all. For example, Bell telephones were adapted for use as medical instruments and laboratory galvanometers, and for remotely monitoring anemometers. Although such uses have not been examined in

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26 Stein, Jeremy, 'Ideology and the Telephone: The Social Reception of a Technology, London 1876-1920' (Ph.D. thesis, University College London, 1996), pg. 70.

27 William Reynolds's 1877 telephone circular, reproduced in Baldwin, 1925, pg. 696 (n.6).

existing histories, they indicate the variety of telephone uses in this period. Furthermore, the fact that these uses were developed within two or three years of Bell's invention shows how willing people were to engage with the technology.

As noted in chapter three, section 5.2, even the notion of what telephone instruments did, and what a telephone call was, needed to be constructed. The decision to refer to telephony in terms of human sensory experience, or in terms of telegraphy, affected the uses to which telephony was put. Users often employed the former analogy, comparing exchange telephone calls to normal conversations, whereas telephone providers – the companies and the Post Office – considered them to be telegraphic communications. This was a source of tension which resulted in telephone providers restricting the purposes for which users could employ telephones, such as for example the reprimands issued by the Postmaster General to clubs in Manchester in 1884. I argue that it is not possible to explain these events and actions without understanding how differing conceptions of telephony influenced ideas regarding telephone purpose.

I have demonstrated in chapter four that different groups of exchange subscribers put their telephones to different uses. These differences shaped how exchange systems developed in different towns. Jon Agar has described how there existed different 'styles' of use of the mobile telephone in different countries.<sup>28</sup> Similarly, from the evidence given in previous chapters, I argue that, although usage was not homogeneous across the country, the overall 'style' of the majority of British exchange telephony in this period was a series of closed networks, as described in chapter four. The majority of users only desired to speak to a limited number of other users. This is further indicated by the fact that competition was a value which was highly influential in shaping telephone development, as highlighted in chapter five. I argue that most exchange users supported competition in exchange telephony because they wanted closed networks. The Post Office, which also encouraged competition, was reflecting the views of the public to whom it was accountable.

Closed network subscribers required only to speak to other users in their particular trade or industry, and were content with smaller exchanges or with competing systems, as long as the users with whom they wished to converse were on the same exchange as they were. This explains why small Post Office exchanges such as those in the south of Wales and in Liverpool and Manchester subsisted, often with their numbers of subscribers not changing very much, until the end of the nineteenth-century.<sup>29</sup> Users who wanted to be able

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28 Agar, Jon, *Constant Touch: A Global History of the Mobile Phone* (second edition, Icon Books, 2013), pg. 3.

29 Names of All Telephone Exchanges which the Post Office has at Any Time Opened, 16 May 1899, pg. 2 (n.13). This is contrary to the assumption of modern scholars such as Lipartito that

to contact and be contactable by as many people as possible, and for whom having a telephone might mean an increase in business, required open networks. Such users did not use their telephones as intensively as closed network users. However, when exchange prices were low enough – especially in the cases of the local companies and after the rate reductions of 1891 – then open network users began to shape telephone development, which drove the growth of exchanges around the country.

Where the telephone could be beneficial for the health, safety or security of users, such as in mining and medicine, and by the Army, it was adopted quickly. This indicates the concern of such users to experiment with new technologies and to employ those which they found efficacious, even if the uses to which they were then put were not originally foreseen. As noted in chapter two, one common use for telephone exchanges towards the end of the 1880s was by fire departments. The reporting of serious fires was a key application of the technology which people in Britain in the 1880s would have begun to notice around them in their everyday lives, and was probably an important factor in subscription for many users. Agar has similarly noted that early mobile telephones were marketed as a technology which could make people safer by putting them in touch with such sources of help.<sup>30</sup> This comparison demonstrates that despite potential business or social uses, one selling point that appealed to a broader audience was the ability to use telecommunications technologies in an emergency; whereas specific businesses or individuals with whom an exchange subscriber wished to speak may not have had a telephone, the police and the fire brigade were amongst the first subscribers in most areas. Mobile telephones, although too expensive for lengthy business or social calls, were also useful in emergencies.

Comparing the cases of early telephony and early telegraphy reveals the importance of use in shaping telecommunications systems. Roger Barton has noted that John Lewis Ricardo, chairman and largest shareholder of the Electric Telegraph Company from its founding in 1846 until 1856, complained in 1852 of the extreme indifference of the public.<sup>31</sup> Iwan Morus has explained that, beyond its use in railway signalling, it was not then clear how the telegraph should be used because it was so new.<sup>32</sup> The *Times* also

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larger networks were more valuable for users (Lipartito, Kenneth, 'Regulation Reconsidered: The Telephone Industry Since 1975', in *La Modernisation des Télécommunications*, special issue of *Entreprises et Histoire*, no. 61 (December 2010), pg. 169).

30 Agar, 2013, pg. 159-60 (n.28).

31 Barton, Roger Neil, 'New Media: The Birth of Telegraphic News in Britain 1847-68', in *Media History*, vol. 16, no. 4 (2010), pg. 381-3.

commented that in those early years “the value of the invention was little understood”.<sup>33</sup> It appears that, just as telephone promoters needed to find uses for their new technology, equally the public needed to be educated in the potential uses of the telegraph forty years earlier in order to make it a viable commercial proposition. In both cases these uses were not self-evident, which is why many telegraph investors were disheartened by the initial financial losses suffered by the ETC from a lack of revenue, and why, as demonstrated in chapter two, telephone promoters such as William Reynolds needed to suggest practical applications of the instrument to potential investors and users.<sup>34</sup> In both cases also, the development of those applications depended on their popularity, and thus the purposes of these technologies were shaped by those who used them.

#### 2.4. Applying the three themes as a methodological tool

Having analysed these three debates, I now demonstrate how they can be applied to help answer three research questions. The first question is the effect which the nationalisation of the trunk lines had on British exchange telephony. The second is the question at the heart of Perry's delay thesis, which asked why Britain was not more like the US. The third is why municipal telephony came to prominence as a trend in public opinion at the end of the period covered by this thesis, and subsequently manifested itself in the establishing of six municipal exchanges around the country at the end of the nineteenth-century.<sup>35</sup> Of the latter two questions, one lies beyond the immediate geographical scope of this thesis, and the other outside the immediate historical scope, yet they illustrate how these three themes of ownership, entitlement and purpose can be more broadly applied as a useful methodological tool in the history of telecommunications.

Considering first the consequences of the trunk line purchase, the actual outcome was not the same as the result intended by the government. In providing trunk lines to interconnect otherwise separate exchanges around the country, operated by different companies, the government intended to encourage competition instead of monopoly. The ultimate aim was that the model of ownership should shift from being what was, effectively, a national private monopoly controlled by the NTC to competition between local, private companies. In terms of entitlement this would promote telephony to a broader

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32 Morus, Iwan Rhys, 'The Electric Ariel: Telegraphy and Commercial Culture in Early Victorian England', in *Victorian Studies*, vol. 39, no. 3 (Spring 1996), pg. 371.

33 'The Late John Lewis Ricardo, M.P.', in the *Times*, 23 August 1862, pg. 12.

34 Barton, 2010, pg. 383 (n.31); Reynolds's 1877 telephone circular (n.27).

35 Feuerstein, 1990, pg. 205-7 (n.12).

audience as small, local companies would provide telephony where the NTC had not established exchanges, and would be able to offer their subscribers regional and national connections. Additionally, by competing with the NTC, these companies would lower the price of telephony and therefore broaden access to telephony. With more users and lower prices, the purpose for which exchange telephony ought to be used would thus be as a more open national network, instead of as a largely closed, albeit still a national, network. However, with the demise of Marlborough's New Telephone Company, the last remaining competition to the NTC, the result in terms of ownership, entitlement and purpose was that the NTC maintained their virtual private monopoly. Competition did not materialise, the model of telephone entitlement was not noticeably expanded, and the primary purpose of exchange telephony remained unchanged.

These three debates also enable me to explain further why Perry's 'delay thesis', based on an expectation that British telephony should have developed as US telephony did, is misleading. Rather than holding the US to be the normative case and questioning why British telephony deviated from this, it is important to appreciate the different social contexts into which the technology was introduced in each country. This can be demonstrated by examining which models of telephone ownership, entitlement and purpose were prominent in the US. Firstly there never was any question of state ownership of telephony in the US.<sup>36</sup> This may have been because telegraphy was never run by the state, but by private enterprise. Indeed, in terms of ownership Britain was closer to Europe than to the US, as many countries in Europe, such as France, Germany, Austria, Switzerland and Belgium, nationalised their telephony in the 1880s.<sup>37</sup> These countries also all had state-run telegraphy, which made some state regulation of telephony a pressing issue.

With regard to entitlement, I argue there was in the US more of an idea that telephony was a utility which lots of people should have access to; as Preece noted, telegraphy was not as efficient in the US as in Britain, and there were not so many messengers, so demand for telephony may have been higher.<sup>38</sup> I have argued in chapters one and three that the accessibility of the letter post and telegraph, and the prevalence of cheap messenger services, either from office boys or from organisations, made it less worthwhile to use exchange telephony. However, for the debate about telephone purpose,

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36 Ibid., pg. 124.

37 Wallsten, Scott, 'Returning to Victorian Competition, Ownership and Regulation: An Empirical Study of European Telecommunications at the Turn of the Twentieth Century', in the *Journal of Economic History*, vol. 65, no. 3 (September, 2005), pg. 698.

38 Kingsbury, 1915, pg. 208-9 (n.3).

the comparison between the British and US cases is difficult to make; my evidence in this area is derived from very specific British case studies, the research for which I have been unable to repeat for the US case within the restraints of this thesis. Nevertheless, this comparison, based on the three themes of my thesis, demonstrates again that Perry's assumption has hindered rather than helped the social history of telephony. If any useful comparison is to be drawn it ought to be between Britain and other European countries; seen in this context, British telephony was in no way 'delayed'.

I now use the debates regarding telephone ownership, entitlement and purpose to explain the public discussions about telephone nationalisation and municipalisation, and why there was a push for municipal telephony at the end of the 1890s. To answer this I begin by considering the ways in which the telephone ownership discussion impacted on the arguments for and against the complete nationalisation of the telephone system in the late 1880s and 1890s. Three factors shaped the views of users and non-users on nationalisation: the experience of users with national or local companies, or with the Post Office, the preference amongst businessmen for competition over monopoly, and the legacy of the nationalisation of telegraphy in 1870. As an example of this first factor, the effect of the experience of telephone subscribers in Sheffield was such that, when most Chambers of Commerce around the country voted in favour of petitioning for nationalisation in March 1892, the Sheffield Chamber preferred to leave the telephone business of the country to private industry.<sup>39</sup> I argue that this was because these business subscribers to Tasker's Sheffield exchange had been happy with the way business had been conducted by a local exchange firm. Thus, they thought it best that exchange telephony remained in private hands. The other Chambers of Commerce, however, were on the whole not satisfied with the service they had received from the NTC, and therefore petitioned for the government to step in.

Regarding the second factor, during the period of this thesis there existed amongst businessmen, who comprised the majority of exchange telephone users, a widespread sentiment against monopolies, as I have noted in chapter four. Such men championed competition as the solution for increasing the quality and decreasing the price of services such as telephony. Thus, the move to public ownership, if it required the relinquishing of the value of competition, may have appeared as a negative step. Thirdly, the purchase of the telegraph network cast a long shadow over telephony in Britain. The cost of the nationalisation, originally estimated at £2.5 million, had by 1891 risen to nearly £11 million and was still growing.<sup>40</sup> As a result the Post Office, following the will of the Treasury and the opinions of the general public, was reluctant to invest more public money into

39 *The Sheffield and Rotherham Independent*, 12 March 1892, pg. 7 (n.14).

purchasing the telephone companies. This was partly because many non-users saw telephony as a luxury to be used by those who could afford to pay for it, and which should not be subsidised by public money, as noted in the epigraph above. This was in turn shaped by the prevalence of closed exchange networks, noted in chapter four, which many non-users saw little benefit in joining at this stage. Thus, conceptions of telephone entitlement and purpose also determined attitudes towards the public or private ownership of telephony.

These three factors explain why there was no consensus regarding telephone nationalisation during the period covered by this thesis. However, one answer to some of the arguments against nationalisation, in particular the preference for competition, was municipal telephony. Such a model, whilst being publicly owned, would remain local instead of national, and would maintain a state of competition with the NTC. The debate about municipal telephony began in earnest at the end of the period covered by this thesis, 1893, in Glasgow. As mentioned in chapter five, section 3.5, commercial men in Glasgow had previously wanted to start their own mutual telephone company in 1890, but had been denied a Post Office licence. As Provand noted, they wanted a local company to provide local service, which they argued would be more popular than the London-based NTC.<sup>41</sup> Subsequently, the unpopular alterations made to the Glasgow exchange system in 1893, as discussed in chapter three, section 3.2.1, acted as a further catalyst to translate feelings against the NTC into action. In addition, the impending nationalisation of the trunks meant that the Corporation would be able to provide regional and national telephone service in competition with the NTC. As a result of all of these factors, municipal telephony began to appear an attractive option for telephone ownership over the course of the 1890s, and in particular to dissatisfied users in Glasgow.<sup>42</sup>

However, for non-users the problem still remained of ratepayers' money being spent on a service which was not seen to be generally beneficial. Thus, I argue that the desire for competition in telephony, and the preference for local, accountable ownership of regional telephony, were the reasons why municipal telephony came to prominence at the turn of the

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40 Kieve, Jeffrey L., *The Electric Telegraph: A Social and Economic History* (David and Charles Ltd., 1973), pg. 161, 180.

41 BT Archives, TCB 304/2, file 82, Provand to Raikes, 10 November 1890; file 78, Blackwood to Raikes, 15 October 1890.

42 Whilst Holcombe noted as early as 1906 that interest in municipal telephony began in Glasgow because so many services – such as water, gas, electric lighting and trams – were already provided by the Corporation, I argue that the desire of Glasgow businessmen to run their own company independently of the Corporation if necessary indicates that the context of municipal control of other services does not give the entire picture when understanding interest in municipal telephony (Holcombe, A. N., 'The Telephone in Great Britain', in the *Quarterly Journal of Economics*, vol. 21, no. 1 (November 1906), pg. 122).

century. Nevertheless, the concerns of non-users that telephony, as a tool for wealthy businesses, should not be subsidised by public money, may explain why municipal telephony was not ultimately attempted on a very broad scale.<sup>43</sup> Thus examining the debates regarding ownership, entitlement and purpose can be used as a methodological tool to explain not only events during the period of this thesis, but also subsequent developments in telephony in Britain and around the world.

### 3. Methodological themes

When studying telephone use throughout this thesis, my approach has differed in four main respects from existing supply-focused narratives, in particular that of Charles Perry. Firstly, I have considered private telephony and telephone innovations as well as exchange telephony, which has revealed the variety of ways in which the public engaged with telephony during this period. Secondly, I have focused on the provinces as well as London in order to see how different events around the country affected one another. This has led me to believe that early telephone development was not national or merely local in scope, but that the most important geographical units were regions. I have also problematised telephone use by highlighting the difficulties subscribers faced when attempting to use telephone instruments or systems. In so doing I have recovered the variety of use-experiences of the time. Finally, throughout this thesis I have emphasised the importance of both users and non-users in shaping the development of telephony; my focus on non-users has been informed by Sally Wyatt's approach, but I argue there are limits to its usefulness as part of a historical methodology. I now address each of these four points in turn, and conclude by noting how Perry's delay thesis is best understood as an example of counterfactual history.

#### 3.1. The early prevalence of non-exchange telephony

Chapters two and five highlight the many uses of private telephony and telephone innovations, and demonstrate that such applications of the new technology were more widespread than previously acknowledged by historians. The Army's use of telephone instruments as telegraph receivers was standard throughout this period, and the success of Thompson's New Telephone Company indicates a desire to use private telephones. Focusing on these uses has contradicted Perry's delay thesis in two ways. Firstly, he assumed that the public wanted to use exchange telephony and were only held back by the

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43 Feuerstein gave a very thorough account of the history of the municipal telephone movement from the perspective of the Post Office and the NTC (Feuerstein, 1990, see in particular chapter six (n.12)).

restrictive policies of the Post Office, which kept prices high and encouraged wasteful competition. However, my findings demonstrate that telephone non-users could be interested in adopting telephony without wanting an exchange connection. Secondly, whereas Perry focused on the role of the Post Office in restricting telephonic expansion, the case of Thompson's New Telephone Company indicates that a demand existed for cheaper private telephony than the UTC group companies were offering. The fact that other companies successfully supplied this demand demonstrates that, independently of the Post Office, the telephone companies did not always work to expand access to telephony.

The various uses of telephony which I have discussed reveal that normally the general public of non-users considered whether or not telephones might be more useful than existing methods of communication. When exchange telephony did not offer sufficient benefits to be worth the investment, sometimes such non-users desired private telephony instead. In focusing on telephone uses which have not been emphasised before, I argue that parallels can be drawn with other telecommunications technologies. For example, most histories of telegraphy have focused on national telegraph systems for the use of the public. However, here as well private telegraphy was also used in the form of Wheatstone ABC telegraph instruments.<sup>44</sup> Indeed, as I have noted in chapter five, the use of these instruments was very important for early private telephony. Ongoing doctoral research by Jean-Francois Fava-Verde at the University of Leeds aims to shed more light on this interesting but thus far under-researched area of telegraph history.

### 3.2. Local, regional and national telephony

By examining telephone developments in the provinces as well as in London, my geographically nuanced approach has demonstrated that provincial regions were more important in early exchange telephone development than local areas or national intercity communications. As I have shown in chapter four, many firms desired regional communications, for example between offices and factories, warehouses or collieries. This accounts largely for the pattern of exchange development around the country in this period, centred on regional hubs such as Bristol, Birmingham, Leeds and Bradford, Manchester and Liverpool, Newcastle, and Glasgow.<sup>45</sup> Some firms benefited from longer distance connections, for example firms of carriers on the canals, or newspapers. However, firms requiring regional use comprised the largest category of early exchange subscribers, and this shaped the development of the network around the country. Demand for telephony over longer distances, such as between London and the north of England, or Scotland, was

<sup>44</sup> Kingsbury, 1915, pg. 80-3 (n.3).

<sup>45</sup> Baldwin, 1925, pg. 475 (n.6).

small. In this way, taking a spatialised approach and investigating provincial telephony has enabled me to demonstrate the extent to which users could shape the development of telephony in their local areas.<sup>46</sup>

I argue that this ability of users to drive specific geographical patterns of technological growth is also evident in the case of early telegraphy. Whilst early telephone development was mainly regional, some of the main early telegraph users wanted national communication. In 1846 the Parliamentary Act which inaugurated the first telegraph company, the ETC, gave the Home Secretary the right to commandeer the telegraph network for a week in times of national disturbance. These powers were exercised in 1848 to obstruct Chartist communications. That year the telegraph was also used by the General Board of Health to coordinate its medical inspectors during a cholera epidemic.<sup>47</sup> Telegraphy was also much used by the railways, to facilitate their extension around the country.<sup>48</sup> Finally, newspapers were also very important telegraph users; by 1854, the ETC's Intelligence Department, which collected and distributed news, supplied over 120 provincial newspapers with parliamentary reports, stock exchange prices, and sporting news.<sup>49</sup> Railways, newspapers and the government were all key to the development of the telegraph network, and all required national communication. The resulting network by the 1850s was one which, as noted by Kieve, failed to serve peripheral areas very well.<sup>50</sup> Thus, both early telephony and early telegraphy demonstrate how the needs of users can shape the geography of technological proliferation.

### 3.3. The heterogeneity of telephone exchanges and instruments

When considering public responses to early telephony, existing histories do not acknowledge the variety of instruments and exchange systems with which users were confronted. As I have demonstrated in chapter three, telephony was neither homogeneous nor necessarily intuitive in the 1880s and 1890s. There were a variety of different types of instruments, and a variety of different ways in which exchange systems were constructed.

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46 See: Smith, Crosbie and Agar, Jon, 'Introduction: Making Space for Science', in Smith, Crosbie and Agar, Jon (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Macmillan Press Ltd., 1998), pg. 2-3.

47 Kieve, 1973, pg. 49-50 (n.40).

48 Ibid., pg. 50-1. For more on the importance of the railways to telegraphy, see: Morus, 1996, pg. 361-7 (n.32).

49 Kieve, 1973, pg. 71 (n.40).

50 Ibid., pg. 73-5.

Thus, using either private or exchange telephones was often challenging and sometimes very stressful during this period. It is not surprising, considering also the expense of the technology, that many would choose not to use telephones, whether from their own experience, from hearsay, or from reading letters and articles in periodicals. The variety of methods of exchange working are evident from the instructions to subscribers provided in telephone directories, and I argue that the agitations of subscribers, especially regarding the speed and efficiency of connections, exerted an influence on some aspects of the workings of these exchanges. For example, the use of multiple boards at exchanges was a good way to improve the efficiency of an exchange, and these were becoming increasingly common at exchanges around the country from the late 1880s.<sup>51</sup>

The development and spread of specific telephone instruments also depended partly on the responses of users; for example, the Edison receiver, which required that a handle on the side of the instrument be constantly turned for the duration of the conversation, was abandoned because subscribers found it too awkward to use.<sup>52</sup> The single wires used for subscribers' exchange connections by most of the telephone companies were subject to considerable disturbing noises through inductive interference. This led also to concerns about the privacy of the system. Metallic circuit systems such as the Post Office exchanges were quiet and more private, but also more expensive. It is only by acknowledging and engaging with these technological nuances that we can understand how telephony developed during this period. These factors lead to the problematisation of telephone use as much as of non-use; using my approach to appreciate the diversity of telephone use-experiences in this period it is thus easier to understand the mixed reactions and responses to telephony up until the early 1890s.

#### 3.4. Using Wyatt's categories of non-users

In chapter one I noted how Sally Wyatt's four categories of non-users – the resister, the rejecter, the excluded and the expelled – are useful because they highlight the heterogeneity of non-use, and the ways in which non-use of technologies can be an active choice.<sup>53</sup> However, I pointed out that I would not apply these categories specifically to telephone non-users in my period because they are more useful as aids for future action,

51 Munro, J., 'Remarks on Some of our Telephonic Systems', in the *Electrician*, vol. 21 (1888), pg. 755-6.

52 Kingsbury, 1915, pg. 201 (n.3); BT Archives, POST 30/398, file 6, Tilley to Manners, 13 January 1880.

53 Wyatt, Sally, 'Non-Users Also Matter: The Construction of Users and Non-Users of the Internet', in Oudshoorn, Nelly and Pinch, Trevor (eds.), *How Users Matter: The Co-construction of Users and Technologies* (MIT Press, 2003), pg. 76.

such as identifying audiences for marketing or policy strategies, and less useful as tools for historical analysis. For example, in chapter two I noted that those who prioritised written records, such as the Army, were concerned that their telephone clerks would have no free hands to take messages. Thus they might be considered rejecters, as they did not use the telephone much for administrative purposes. However, this is in contrast with the telephone's strategic advantages, and the ways in which instruments were adapted for use as field telegraphs. In this respect telephones were used very widely: as Morse instruments and in balloons.

Thus, officers such as General Alison or Major Webber, both quoted in chapter two noting negative aspects of telephony,<sup>54</sup> cannot be categorised as non-users. Rather, they discerned the strengths and weaknesses of the technology, and applied it where it would be an advantage over existing methods of communication, and did not where there was already a superior method. The determining factor in use or non-use of a new technology was thus often whether existing technologies or methods were deemed more fit for specific purposes. As Edgerton has noted, this is why older technologies are often used alongside newer alternatives.<sup>55</sup> I therefore find that applying Wyatt's categories specifically has not been helpful for this thesis, although, as noted in chapter one, considering both users and non-users in terms of being either willing or unwilling in their use or non-use has been helpful. For example, I have noted in chapter four, section 3.1, the existence of unwilling users, those exchange subscribers who only had telephones because their customers or other members of their profession or trade were also subscribers. This demonstrates the inertia of networked telecommunication systems, which I argue can also be seen today on social networking websites.

### 3.5. The delay thesis as counterfactual history

In addressing Perry's methodological biases, and inverting them to produce a more nuanced narrative, it does not appear at all necessary that British telephony should have developed as did US telephony. Thus, Perry's assumption that the telephone should have had a greater impact in Britain during this period appears to be an example of counterfactual history, which involves making conjectures about what might have resulted

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54 Alison to Fielding, 27 August 1886, reprinted in Nalder, R. F. H., *The Royal Corps of Signals: A History of its Antecedents and Development (Circa 1800-1955)* (Royal Signals Institution, 1958), pg. 34; Webber, C. E., 'Orders in the Field and the Means of Communicating them', in the *Royal United Services Institution Journal*, vol. 23, no. 101 (1879), pg. 647.

55 Edgerton, David, *The Shock of the Old: Technology and Global History Since 1900* (Profile Books, 2006).

from certain historical situations had events or conditions been different.<sup>56</sup> While this can be a useful technique for considering how certain contingent historical facts being different might have affected historical events, Perry's delay thesis stemmed from the employment of a subtle but negative type of counterfactualism. Instead of asking how events could have been, he assumed that there was a way in which they actually should have been.<sup>57</sup> Asking how telephony could have developed is a valid counterfactual historical question; however, asking how it should have developed is not helpful for the social historian concerned to investigate how a technology spread. Thus, we should not expect that the growth of British telephony ought to have followed a normative model such as the US as the delay thesis implies. Having thus dismissed this assumption, historians are more free to pursue approaches other than Perry's when investigating British telephone history.

#### 4. Further research

I now present some suggestions of areas arising from my research which merit further study. I have found many uses of telephones in this period which I have not been able to include in detail. For example, local newspapers and technical journals often reported instances of the telephone being used in connection with churches.<sup>58</sup> Comments of columnists that this might in future affect how preachers gave their sermons, knowing that listeners could simply switch off if bored, are worthy of further investigation.<sup>59</sup> I suggest also that research could be done regarding the use of the telephone more broadly construed, for example as a subject for humour in the periodical press.<sup>60</sup> Carolyn Marvin has examined jokes about telephones in periodicals, and used them to comment on people's perceptions of the technology, but her examples were mostly from US sources.<sup>61</sup> In

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56 Radick, Gregory, 'Why What If?', in *Isis*, vol. 99, no. 3 (September 2008), pg. 547.

57 Perry, 1977, pg. 69 (n.4).

58 'Chit-Chat', in the *Sheffield and Rotherham Independent*, 15 July 1880, pg. 5; 'The Telephone', in the *Preston Chronicle*, 18 March 1882, pg. 6; 'Attending Church by Telephone', in the *Electrician*, vol. 19 (1887), pg. 24.

59 'The Swansea Telephonic Exchange', in the *Cambrian*, 8 October 1880, pg. 8; 'Sheffield, Saturday, July 1, 1882', in the *Sheffield and Rotherham Independent*, 1 July 1882, pg. 6; Le Flaneur, 'Men and Things', in the *Sheffield and Rotherham Independent*, 8 October 1885, pg. 5.

60 For example: 'Odds and Ends', in the *Sheffield and Rotherham Independent*, 9 October 1886, pg. 8.

61 Marvin, 1988, pg. 17-32 (n.24).

addition, examples abound of the term telephone or telephonic being employed as a metaphor to describe something rapid or modern – such as a horse or ship, or an item of clothing<sup>62</sup> – or someone who conveyed or spread information quickly and faithfully, such as an unquestioningly obedient underling, or a gossip.<sup>63</sup> Such uses indicate the telephone was considered sufficiently well-known and understood by the mid-1880s to be common cultural currency.

I have noted in chapter five that it is likely there were many small private wire telephone companies operating around the country during this period, probably supplying Gower-Bell instruments, Johnson transmitters or unpatented Bell instruments, as discussed in chapter three. Investigation into these companies and their clients might yield a greater insight into the scale on which people were exposed to telephones in the business or domestic sphere. Looking further afield, a comparison of the independent companies discussed in chapter four with their later US equivalents would, I suspect, prove useful for historians in both countries.<sup>64</sup> Although I have researched the use of the telephone in Swansea with regard to the local company operating there, I have been unable to investigate the Welsh-speaking community's exposure to telephony due to my linguistic limitations; thus I recommend attention be paid to Welsh-language periodicals to discern these communities' responses to telephony.

In addition to these, the ownership dichotomy of local versus national provision of exchange telephony which I have discussed could be extended to discussions about municipal telephony at the end of the nineteenth-century. This would represent a local manifestation of public telephone ownership, as opposed to its national equivalent: central ownership by the Post Office. Although this lies outside the scope of this thesis, I hypothesise from my work that the divide between users when discussing the advantages and disadvantages of the two options was defined by whether they required open or closed networks, and thus preferred monopolies or competition respectively. Thus, as the municipal exchanges would entail competition, I predict they would have been advocated by closed network users, whereas open network users would have preferred nationalisation.

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62 'Ascot Meeting', in the *Western Mail*, 17 June 1881, pg. 4; 'Shipping Intelligence', in the *Western Mail*, 31 December 1881, pg. 4; 'The Ladies' Column', in the *Sheffield and Rotherham Independent*, 30 October 1886, pg. 4.

63 'Imperial Parliament', in the *Sheffield and Rotherham Independent*, 16 February 1882, pg. 2; Black, William, 'Sabina Zembra', in the *Sheffield and Rotherham Independent*, 4 December 1886, pg. 8.

64 For more on independent telephony in the US, see MacDougall, Robert, *The People's Network: The Political Economy of the Telephone in the Gilded Age* (University of Pennsylvania Press, 2014).

Alfred Rosling Bennett was also a key figure in municipal telephony. As this is a use-focused history, I have not gone into detail regarding Bennett and his influence. Nevertheless, I would suggest that his involvements with local, national, cooperative and municipal telephony, and specifically his active advocacy of the latter two, make him worthy of further study. Bennett was an influential electrical engineer who, around 1880, was working as electrician to D. and G. Graham in Glasgow before working for the NTC from 1883 until 1890 as general manager in Scotland. He resigned that post to become general manager of the Mutual Company in Manchester, and subsequently of the Duke of Marlborough's New Telephone Company. When that was absorbed into the NTC, he set up a business in 1893 as a consulting telephone and telegraph engineer. Around the turn of the century he was highly influential in the municipal telephony movement and helped establish exchange systems in Jersey and Guernsey.<sup>65</sup> In 1881, Bennett invented a method of communicating between single wire local lines and metallic circuit trunk wires using induction to effectively transmit the signals from one to the other.<sup>66</sup> This might be of interest to historians of early wireless telegraphy as an example of the practical, commercial application of inductive wireless telegraphy.<sup>67</sup>

## 5. Concluding remarks

In this thesis I have questioned the inevitability and linearity of British telephone development up until 1893. By problematising telephone use I have emphasised the trouble early users had when interacting with telephones. By highlighting the heterogeneity of both telephone instruments and exchange systems, I have demonstrated the wide variety of uses and use-experiences in this period, and the influence users had to shape the systems and instruments which resulted. This included who supplied them, who used them, and what they were used for. Bell's embryonic telephone was only the first of many telephonic advances, including instruments, infrastructure, and innovations. In most cases, the users of these technologies, who are not given much emphasis in the current historiography but who

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65 Birse, Ronald M., 'Bennett, Alfred Rosling (1850–1928)', rev. Brian Bowers, *Oxford Dictionary of National Biography* (Oxford University Press, 2004) [<http://www.oxforddnb.com/view/article/37181>, accessed 15 Jan 2014]; 'Personal', in the *Electrician*, vol. 25 (1890), pg. 451.

66 'Bennett's Telephonic Translators', in the *TJER*, vol. 12 (1883), pg. 21.

67 As discussed by Elizabeth Bruton in her doctoral thesis, 'Beyond Marconi: The Roles of the Admiralty, the Post Office, and the Institution of Electrical Engineers in the Invention and Development of Wireless Communication up to 1908' (Ph.D. thesis, University of Leeds, 2012), pg. 58-9.

often wanted many different things, shaped their development. Throughout the preceding chapters I have sought to recover how this shaping happened, by whom, and why. Equally important, but under-appreciated, was where: the geography of these developments was important because the actors were aware of developments around the country, and reacted accordingly. This also needs to be studied in order to obtain a full picture of British telephony in this period.

As I have recovered the importance of telephony in a number of different areas, my research is useful for a variety of disciplines. For historians of the military or of mining I have revealed significant new uses of telephones which enable a greater appreciation of the technological context of the period. Telephony was particularly effective for communicating urgency, when immediate action was required, and potentially the rapid clarification of information. This thesis is therefore also useful for historians of the emergency services. My emphasis on the heterogeneity of exchange systems around the country is important; later, in the 1930s, these differences were still relevant, as telephone amplifiers for hard of hearing users could only be installed on certain systems. Thus, the types of exchange system in use, some of which dated back to the period covered by this thesis, determined the efficacy of telephony for hard-of-hearing users.<sup>68</sup> For historians of science and of medicine, telephone use fed back into the practice of these disciplines through the application of telephone instruments to medical diagnosis, or as laboratory instruments. Such uses may previously have gone unnoticed. Telephone use also encouraged experiments with inductive interference, later important for wireless telegraphy, and stimulated work with variable resistance materials.

When focusing on the sparsely researched area of telephone history, it is difficult, often impossible, to determine the specific content of telephone calls themselves. For this reason, it may be easier for historians to focus on written forms of communication. Nevertheless, telephone calls were still important in the day-to-day lives of many businessmen and professionals in this period. Indeed, the advent of telephony ushered in a change no less revolutionary than the printing press, which allowed the proliferation of the written word. In the same way, the telephone facilitated the easier transmission of the spoken word, and began what I believe we should call the 'conversation revolution': for the first time people possessed the potential to converse in real time at great distances, and the possibility was both exciting and worrying. Thus, in this thesis I have recovered the significance of telephony in the day-to-day lives of users and non-users, and demonstrated that their interactions with the new technology contributed to the distinctive ways in which it developed in Britain.

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<sup>68</sup> For more on this, see ongoing PhD research by Coreen McGuire, University of Leeds.

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