Marconi a phoney?

Change and expansion in New Zealand telecommunications in the interwar years

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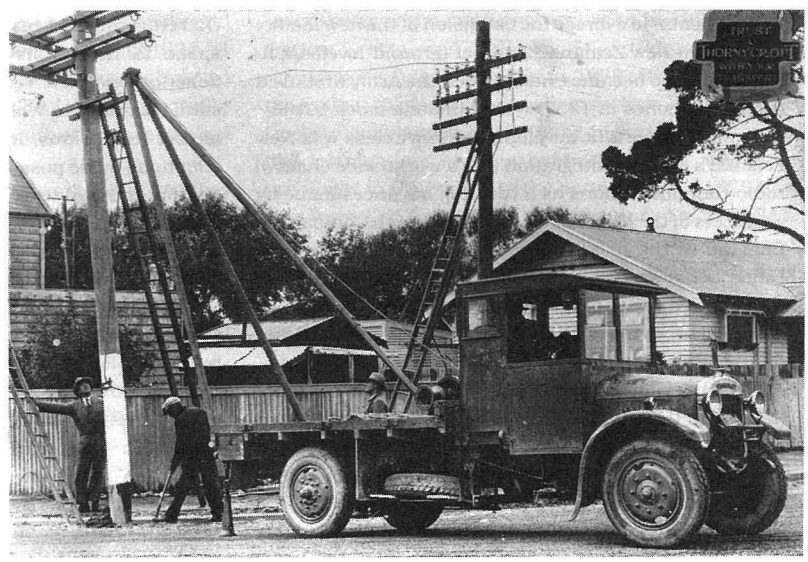
The question in this paper's title was inspired by a George and Ira Gershwin song called 'They All Laughed'. This was among several well-known Gershwin melodies written for the 1937 film *Shall We Dance*? At one point this song, a tart satire on all who would debunk people of vision, says 'they told Marconi wireless was a phoney'. The song concludes by making the point that he, Edison, the Wright Brothers and all the rest had the last laugh.



Telephone linesmen at work, 1920.

Clearly, Marconi was no phoney in New Zealand or elsewhere in the interwar years. The achievements of this solemn, industrious Italian-Irish genius, in short-wave radio, more than anything else, brought voices and news half a world away instantly into our home. By early 1930 wireless technology allowed New Zealanders to telephone London, hear the King address them in their homes (from Christmas, 1932 on) and, later, to tune into the rantings from Berlin of another leader. It was entirely appropriate that, upon Marconi's death in July 1937, two minutes silence was observed by wireless telegraph stations in New Zealand and throughout much of the world.

In the period, radio, first as a tool for telecommunications, then for public broadcasting, attracted much publicity because by the 1920s it was the newest telecommunication technology; only as recently as 1911 had the country's first experimental radio station been set up, largely for navigation and weather-forecasting purposes, on top of the GPO in Wellington. Throughout the interwar period, however, the telegraph and, increasingly, the telephone would remain the mainstay of our telecommunications, both supplemented in some instances by wireless technology. (Here, wireless is referred to only as an aid to telecommunications, not as a broadcasting medium).

All three telecommunication technologies would be influenced, in varying degrees, by two broad factors. These were, firstly, the overseas component - comprising technical advances, imperial trade and political ties and the impact of Marconi and his Wireless Telegraph Company ; secondly, the 'domestic' constituent, comprising political, economic, and social demands and some effects (Included here are the Post and Telegraph Department and the impact of several of its Heads.)

Turning to wireless first, this technology's very nature, able to be installed without months of arduous wire - or cable - laying, made its dissemination quicker than that of telephone or telegraph cable systems. In addition, the victors of 1918 soon realised the value of wireless for allowing more effective control of their traditional imperial interests and newer, commercial and aviation ones. International aviation links were growing steadily by the 1930s. IATA (the International Air Traffic Association) was first set up in 1919; by 1931 mail from New Zealand was able to reach the UK by air (for most of the journey). In August 1939 PANAM completed a proving flight from California to Auckland. Aviation and radio came together in New Zealand and elsewhere in the form of

'aeradio', as the use of radio for guiding flying aircraft was initially called. By 1936, when 'main trunk' passenger flights began in this country, aeradio stations were operating at the first air terminals at Harewood, Taieri, Milson (Palmerston North) and Mangere. The future use of aeradio by military aircraft and thus for defence purposes was acknowledged the same year when the new Labour government set up an Aeradio Standing Committee, chaired by its Minister of Defence and with representatives from the DSIR, Air, P & T and Public Works Departments, to oversee the extension of the new facility throughout New Zealand. Another (ground-level) application of radio became evident when the Army first used radio-telephones in 1937 to coordinate a mock battle.[1]

A more important development in wireless was New Zealand's gradual integration into a world-wide chain of radio communications as a result of advances made by engineers of the Marconi Wireless Telegraph Company in England in the mid-1920s. They had refined the so-called 'beam' system, using special directional antennae that allowed the short-wave radio signals to be beamed along clear paths rather than radiated out in more diffuse, less effective signals. Marconi offered to transmit to Australia and New Zealand at 100 words a minute (that is, in telegraph code sent by short wave) for seven hours a day. Despite the disadvantages of wireless telegraphy, as opposed to cable (less security of communication, vulnerability to atmospheric disturbance) and in spite of competition from old established British cable companies like the Eastern Extension Co and newly formed communication giants like ITT and RCA, British wireless technology was by the late 1920s taking about 30% of full rate telegraph traffic within the Empire and 60% of the cheaper rate.

Indeed it was to sort out the competing interests of cable and wireless throughout the Empire and to compete more effectively with ITT and RCA, that a new public company was set up in London in September, 1929. It was called Imperial and International Communications Ltd, and known popularly as 'Cable and Wireless'. It incorporated Marconi's company, the Eastern Extension Co, the Pacific Cable Board and a whole host of smaller entities including the network of 'Empiradio' short-wave stations. The overall policy of the new Company which had capital assets of some £54 million, was determined by an Imperial Communications Advisory Committee, on which New Zealand was represented.

Another result of this new structure for New Zealand was the closing in 1933 of the Eastern Extension Company's trans-Tasman cable first laid in 1876. New Zealand's overseas telegraph traffic, whether sent by cable or wireless, came now mainly through Auckland. The overseas cable room on top of the Auckland CPO, was in 1938 taken over by Cable and Wireless.[2] The following year an expanded radio facility was also opened at Musick Point in Auckland, to supplement the stations at Wellington and Awarua, near Bluff, as the main reception points for radio messages from overseas.

In all this activity pertaining to wireless as telecommunications, the New Zealand government played a much less active role than it did as regards wireless as broadcasting. The main players here were overseas ones; witness the demonstration of the power of overseas radio by the American Admiral Byrd in March 1930. On returning from his 1929-30 Antarctic expedition, he spoke to the publisher of the *New York Times*, in Schenectady, New York, from a studio at 4YA in Dunedin, via relays in Wellington and Sydney, a distance of almost 18,000 kms. In the same year advances in radiotelephony made possible a regular service between Wellington and Sydney and Melbourne from November of that year and one to London from mid-1931.[3] Throughout the rest of the decade there was no great upsurge in overseas telephone calls from New Zealand. However, the Department remained assiduous in attending overseas conferences dealing with international regulation of radio, the allocation of short-wave frequencies within the radio spectrum and so on, an increasing preoccupation of the International Telegraph Union. At its 1932 Conference in Madrid, furthermore, the Union replaced 'Telegraph' (used since its inception in 1865) with 'Telecommunications', the subsequent growth of telephony, cable and radio making the name change necessary.

The government took a much more 'pro-active', as we say today, approach to domestic telephony. The dynamic growth of this in the interwar years was due to the coming together of two factors - technical improvements from overseas and increasing domestic demand, both commercial and residential, which politicians thought necessary to satisfy. Increasing commercial requirements and improved cable technology, for example, led to the laying of the first separate telephone cable across Cook Strait in March 1926 and the inauguration of inter-island tolls in 1927. The so-called 'continuous loading' of this cable with iron-nickel coils reduced the distortions that voice signals in particular were prone to under the sea.

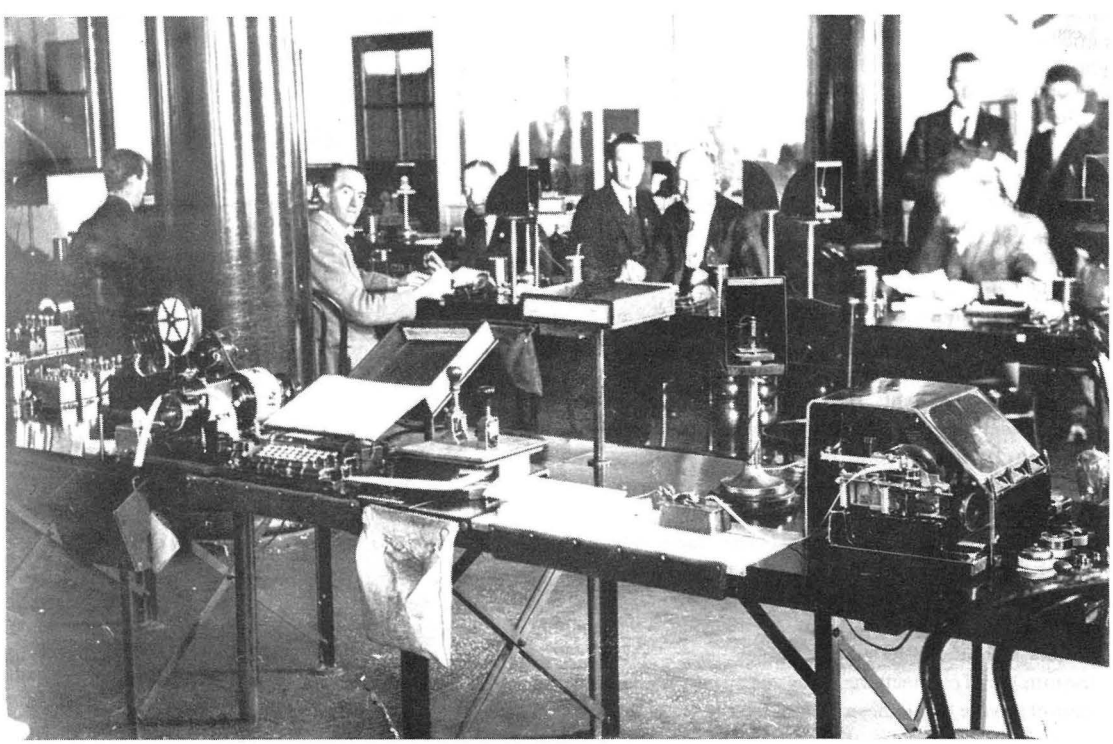
Furthermore, overseas applications of radio technology were speedily adopted by the P & T Department, to enhance the carrying capacity of land-based telephone wires. This was the so-called 'carrier' system, that is, the application of wireless frequency modulation techniques, first successfully demonstrated for telephony by the German, Ernst Ruhmer in 1909. Put very simply, modulating the frequencies on a telephone circuit above the 3 kHz (3000 cycles per second) necessary for ordinary conversation, it was found, created extra voice channels on the wire. By demodulation, the incoming voice

channels on the one wire were then reproduced as normal voice signals and sent to their intended destination. From 1929 on, the government steadily enhanced the country's main telephone trunks, especially the Wellington-Auckland one, with 'carrier' equipment. By the late 1930s this had provided 118 additional, long-distance circuits, without the laying of extra wire. Better telephone transmission, the growth of automatic switching and returning prosperity all contributed to our maintaining the relatively high telephone density of the 1920s (that is, the number of telephones per thousand people) even during the Depression years. By 1934, at 101.2 phones per thousand people, we were outranked only by Canada (119.8) and the USA (139.4); Australia and the UK, by contrast, were seventh and ninth-ranked that year.[4]

Some details about our speedy absorption of overseas improvements in telephone switching and instrumentation are relevant here. In the interwar period New Zealand, as a country with little light manufacturing but a heavy demand for phones, continued its beneficial policy, going back to the 1880s, of selecting the best of overseas suppliers, mainly from America, Britain, Germany or Sweden, and particularly equipment reliable and adaptable enough for New Zealand conditions. In 1919, automatic switching equipment of the more advanced, 'rotary' variety began to be installed at selected exchanges in the provinces and suburbs.[5] Suburban and provincial centres were deliberately chosen as technical guinea pigs, to put on trial this new application before it could be extended to the bigger centres.

Thus rotary automatic exchanges of the WE 7A variety were opened at Masterton in May 1919, Courtenay Place, Wellington, in October of that year, then at Blenheim, Hamilton and Oamaru between 1920 and 1922. Installation at the main centres began in 1925 at Wellington Central and Wellesley St, Auckland. Christchurch went fully automatic in 1929, Dunedin shortly thereafter. This development gave New Zealand, the Department claimed in 1930, the highest percentage of dial telephones (i.e. those connected to an automatic exchange) in the world; in the period 1923 to 1929 this rose from 17% to 50% of all phones, ahead of the USA's estimated 25% in that year.[6] Most of the New Zealand rotary system incidentally used the reverse dialling pattern, numbered from 1 to 9, rather than the other way around, as in the UK, that is why we dial '111' here rather than '999', the full turn of the dial being necessary to ensure a definite connection for emergency purposes. (The reason for the New Zealand pattern has not been established for sure, but may relate to the number sequence on the first 'Strowger' (i.e. pre-rotary) dial phones used before World War One; because of patent

Wellington Telegraph Office staff, using 'Murray multiplex', 1928.



rights or other reasons WE continued with this sequence on equipment imported to New Zealand and some other countries).

Side by side with this development was the upgrading of office telephony with overseas equipment, to meet specific commercial demands. An office 'Interphone' system, with up to 20 connections and made by the Swedish and UK branches of Ericsson, was installed first in Wellington in 1925, along with private office switchboards, made by WE, Northern Electric or Ericsson. Up to the 1930s office telephones in widespread use were the Ericsson or WE candlestick type. Households relied on the older, wall-mounted phones by Peel Connor, a British company and on the candlesticks. In the 1930s the new look, skirted 'neophone', by Ericsson or WE, became more common in New Zealand offices, then homes; here the receiver and microphone were combined in one device, placed on top of the dialling instrument. Almost all this equipment was imported, though WE and the UK supplier, GEC, opened liaison offices here, in 1913 and 1929 respectively; the manufacture of phones and other equipment by GEC, locally (Porirua) was a post World War Two development. It should be mentioned that much of our interwar *telegraphic* equipment was a British-American hybrid, comprising British high-volume machine telegraphs and 'Creed' and American 'Morkrum' teleprinters.

New Zealand engineers sometimes made modifications to imported telephonic equipment, to meet local needs, especially with rural telephony. Here farmers and others were demanding a system that allowed automatic switching of party and individual lines; this also coincided with the Department's own wish to avoid the costs of maintaining one telephonist at local, distant locations. By March 1929 the Department's technical laboratory had completed tests on converting (mainly Ericsson) 50 or 100-line switchboards to automatic use. The country's first RAX (Rural Automatic Exchange) was installed at a then rural Heretaunga in November 1931, the second at Porirua in August 1937.

The above physical advances in the telephone network were both cause and effect in one overwhelming post-war development; that is, more people than ever, both households and businesses, were wanting phones. Between 1918 and 1936 mass telephony became a reality in New Zealand. Because of the Department's non-distinction between domestic and business phones before 1923, it is not clear in what year exactly residential phones outnumbered business; probably at some point in the 1910s. For in 1923, when the Department made a long overdue rationalisation of its telephone rentals, introducing four classes of payment according to the number of connections to the various exchanges, the ratio of private to business phones averaged out, nationwide, at 63:37; by 1940 it had risen to 74:26.[7]

After 1918 there was a sharp burst of growth to compensate for the war-imposed slowdown between 1914-18. This would explain why in 1922-23, for the first time the Department's telecommunications revenues outstripped those from non-telecommunications sources (i.e. postal business and agency work for other government departments).[8] The upsurge in automatic telephony, better long distance and inter-island (toll) services and the consequent lower use of telegrams would also explain why by 1930 revenues from telephone tolls alone (£406,994), quite apart from the annual telephone rentals, exceeded those from telegrams (£376,989).[9]

The political direction of the Department in the interwar years impacted strongly on telecommunications. During that period the Postmaster-Generalship was no

longer the senior portfolio it was from the 1870s to early 1910s when it was held at times , often in conjunction with the Premiership, by senior politicians such as Vogel, Seddon and Ward. From 1912 it was retained by lower-ranked ministers; Heaton Rhodes was seventh, J.G. Coates ninth when first appointed PMG in 1912 and 1919 respectively, Coates did not keep the portfolio when he became Prime Minister in 1925. The trend to giving the department to promising ministers on the way up to better things or older politicians unable to rise further continued, it should be added, with the first Labour and subsequent governments. Ward himself returned to it in 1915-19 and in 1929-30 simply because he was so identified with it during his long tenure from 1891-96 and 1899-1912.[10] The relative decline of the P & T portfolio can be explained in part by the fact that telecommunications was no longer the dominant, new electrical and mechanical technology that it was twenty years or so earlier; it was competing now with hydro-electricity, broadcasting, automotive and aerial transport. Also, it would be overshadowed from the 1930s by others like Health, Social Welfare, Transport, Electricity and so on, which also excited greater party differences than P & T did.

This said, politicians could not be indifferent to public demand, especially commercial and rural pressures for improved telephony; the needs of rural users weighed particularly heavily with Reform Party politicians. As part of his land settlement plan for returned soldiers, Massey in 1919 offered those setting up farms half-rates for telephone calls and annual rentals as well as deferred payment on wiring and insulators for the construction of private lines on farms. An amendment to the 1913 *Country Telephones Act* made it easier still for local bodies to lend to farmers, to upgrade and maintain their own private lines. (Such lines and in one or two instances, private switching systems, i.e. in the lower Wairarapa, lingered on till the 1950s). Parliamentary Questions were often a spur to hastening or initiating an enhancement to the network such as the replacement of iron wire by more efficient copper, the connection of nearby homesteads or small villages, formerly dependent on a sole telephonist, to a newly opened exchange in the vicinity. Such upgrading was evident in the Kaikoura area in 1922, for example, following Questions asked in 1921.[11] Furthermore, the 1923 reorganisation of rental charges gave rural users the easiest deal (tariffs there ranging from £4 to £$8 p.a. compared to £8-10 to £15 in the cities) and, as noted, much time was spent in bringing automatic switching to rural regions through special automatic exchanges.

There is no doubt, too, that local MPs in the interwar years, as at other times, continued to try and reap electoral advantage from the opening or upgrading of telephone exchanges, bridges and other important facilities in their area, priming the parish pump in other words. This did not always work; between 1900 and 1982 for example, only just under one-third of exchange inaugurations coincided with an election year.[12] Other factors could intervene, such as the MP's overall record for his electorate, a national swing against the government that brought about the enhancements and so on. For example, in the General Elections of 1919, the sitting members for Masterton and Wellington East,

Opposite: 'Candlestick' telephone adapted for automatic exchanges in the1920s.
Below: 'Neophone', 1930.

where exchanges had been upgraded to automatic working that year, got reduced majorities, in part because the rise of a third party vote (i.e. NZ Labour Party) offset expected gratitude from the local voters.[13]

Turning from the political to economic aspects of interwar telephony, we can see that more telephones, especially for the commercial sector, more office extensions and automatic switching of calls made it easier to do business. It is difficult to quantify the effects here; obviously, say a 5% increase in a region's telephone listings did not imply an overall economic growth of 5% there in the same period. Much telephone growth appeared very large because in some more isolated areas it could be from a zero or near - zero base.

The advent of interphone systems for offices in the mid-1920s certainly made it more convenient for the public to do business with them. Within the P & T Dept itself in Christchurch, for example, extensions listed grew from twenty-seven in 1921 to seventy-four in 1940. In Auckland between 1922 and 1940 the number of savings banks listed, excluding the POSB, remained about the same, at seven, but the total extensions listed for of these grew from twentytwo to forty.[14] The greater ease of communicating with commercial or government bodies (via the telephone) surely did not harm their annual turnover. Further, the growth of domestic phones, quite apart from business ones, generated more economic activity, especially in the country, where they would be used to order food and supplies from butchers and other retailers that delivered to homes in the area.

An important physical consequence of the increase of telephones within business and government offices was, of course, the advent of more high-rise buildings (or skyscrapers in American terms) in the 1920s; in multi-floored offices interphones made non-face-to-face communication between staff easier than before. Better office telephony in Wellington, for example, from 1925, was surely one factor, amongst others, leading to high-rise buildings such as the DIC (1928) and T & G (1929). There was also a horizontal as well as a vertical effect, that is, the growth of the branch/head offices system, now made easier by better long-distance calling within and between both islands. By the early thirties most localities with over 5000 people (in the North Island at least) could put through toll calls to each other, with varying degrees of ease.

In addition, the Department itself was more aware than before of the need to cultivate businesses as an ongoing market for telephones, with specific needs for each; it could no longer be just an agency to collect subscribers' annual rentals. Thus P & T was becoming by the late 1920s a more commerce-oriented organisation, in the sense defined above (but not, it should be added, to the extent of completely restructuring itself

G. McNamara, Head of Post and Telecommunications Department, 1926-1939.

along such lines, as happened in the late 1980s). A more 'business' approach was linked to the passage of the *Public Revenues Act* of 1926, relevant sections of which (92,93) were incorporated into a new *Post and Telegraph Act* of 1928. These sections belatedly recognised that the Post Office, as a trading organisation, should retain the income from such activities and not have to transfer it to the Consolidated Fund, as the non-trading departments did. This encouraged the Post Office to increase the profits which it now had greater control over. This was still not total, of course; large-scale expenditures remained subject to political direction up to 1987. Profit and loss accounting, formally introduced in 1922, was also applied throughout the organisation and mechanical methods of preparing accounts, toll invoices etc. date from 1929-30.

Besides this administrative change, of significance in the Department's more 'commercial' approach, were the personalities of its interwar Heads, three men whom Bert Roth in his history of the Post Office Union called 'an unholy trinity'.[15] These men were R.B. Morris, A.T. Markman and G.McNamara. The latter was the longest serving (from 1926 to 1939) and most autocratic. All three shared a similar antagonism toward the Post Office Association, the staff's union. During their time, aggra-

vated admittedly, by the slumps of the early 1920s and 1930s, women lost their right of permanent appointment (as they did elsewhere in the public service), the Post Office Association was de-recognised for a period (1932-3), staff wages and conditions stagnated, and a harsher managerial culture, Taylorite in tone, became evident, especially in the Department's (i.e.McNamara's) blunt observation in its 1928-29 Annual Report that 'it could not carry on efficiently and without loss, if there were drones in the hive'.[16] McNamara himself (from December, 1933) was the first Head to be known as Director-General.

All this, strongly supported by Reform and Coalition Postmaster-General, led to a weakening of P & T's traditional paternalist and staff-orientated management culture during the McNamara years, making it much more concerned with 'service to the public', the commercial community especially, at the staff's expense.[17]

Other 'commercial' changes in the period included the setting up in 1930 of a Commercial Branch, with a small group of telephone salespeople. Also, earlier, in 1928, in cooperation with the Railways, the Department arranged for a special 'commerce' train to tour the country, displaying a range of 'telephonic products and equipment' that could be connected to circuits at each stop. The same year it replied to the demand of a new industry (taxicabs) by installing and leasing direct telephone links between taxi companies and phones on cab ranks.m (Cab radio telephones only became common from 1950 on).

During the Great Depression, when telephone revenues declined (7%, for example, between 1930 and 1931 alone[18]), the Department and government acted on the belief that the best way to revive demand and thus commercial life itself was to make it easier for businesses to use the service. In June 1934, in line with overseas trends, 'person to person', collect and transfer charge calls were inaugurated; in December, the half-rate toll call was extended to Sundays and holidays, and a quarter-rate introduced for calls between 11pm and 6 am. A standard three-minute call between both islands now cost 1/6 and, within them, 1/-. By 1936 telecommunication revenues were almost equal to those at the beginning of the Slump (£2,021,563 for 1935-36 vis-à-vis £2,022,632 for 1930-31). As noted, new radio-telephone links with overseas after 1930 did not greatly enhance revenues before the war, the service remaining a novelty for most. By 1934-35 radio-telephone calls to and from New Zealand numbered just 421.

Though telephony took up most of its capital spending in the period and was providing the largest share of its revenues, the Department did not neglect telegraphy. Machine printing telegraphs, called 'Murray multiplexes' after their New Zealand-born inventor, were first introduced between Christchurch and Wellington on 5 December 1921, in time to catch the Christmas traffic. Four messages each way could be transmitted over each circuit at around forty words a minute. Manually transcribed telegrams were thus replaced by type-written messages on paper strips. The system was extended to other centres and increasingly operated by women; women telegraphists had become more numerous from 1916, to replace the men who were conscripted. In smaller centres like Gisborne and New Plymouth cheaper and lower-volume teleprinter systems were operating by the early 1930s; the first one was tested between New Plymouth and Wellington in late 1929.

Machine and some radio-telegraph systems proved invaluable for coordinating rescue and supply work after the Hawkes Bay earthquake of February 1931. Despite the devastation inflicted on the Napier CPO and other facilities in the area, some of the telegraph wires were restored a day after the quake. Radio had also earlier proved its capacity to upgrade the telegraph network in remote regions like Fiordland where the difficult to maintain telegraph line between Preservation Inlet and Bluff, laid in 1908, was replaced in 1925 by a radio transmitter installed at the Puysegur Point lighthouse. This beamed directly to Awarua radio station (near Bluff) details in morse of shipwrecks, trans-Tasman shipping delays, approaching storms and so on.

While the economic advantages of improved telecommunications were often referred to in Departmental and other publications, the social impact of these were much less a matter for official or other comment. What one can say is the fairly obvious - that increasing numbers of householders found the telephone was a useful way of organising their leisure, of making and changing appointments at short notice, etc. This 'social' factor helped explain the upsurge of domestic telephony during this period. Along with the automobile, it obviously played a part in speeding up social as well as economic interchange between the wars, the more so with the increased leisure-time afforded by the introduction of the forty-hour week in 1936. But all of this occasioned very little journalistic comment at the time, if the pages of the *New Zealand Free Lance* or the *Auckland Weekly News* between the wars are any indication. These useful reflections of public opinion and taste. when they dealt with telecommunications at all, concentrated on photos or reports of the inauguration of a new technology or facility; they lost interest in the subsequent daily operation of these. Some issues might carry advertisements for 'an extra upstairs telephone for your household' but little else dealing with telephones.

Generally this approach reflected a wider perception, noted earlier, that telecommunications were by the mid-thirties being taken for granted and superseded, at least

in terms of media attention, by advances in other technologies overseas - the streamlining of cars, trains and planes (the cord, Volkswagen, 'Coronation Scot' and DC3, for example), the beginnings of public television in Britain and Germany and so on. In other, non-journalistic writing such as the fiction of the period, telecommunications appear only as a detail of everyday life, not as something integral to plot and character or a theme in itself.

To conclude, the phrase 'The Bit in Between' is perhaps misleading when applied to telecommunications at least. Far from being the less prominent or consolidating phase suggested by these words, the period was quite dynamic in telecommunication terms. It saw the basis of a mass automatic telephone system laid for urban households and businesses, the eclipse of inefficient/private lines (both telephone and telegraph) in remote areas as the P & T Department, responding to commercial and political/electoral demands, upgraded the network.

Much of the vigour, of the period, also comes from the increasing interplay and overlap between the three technologies of telegraph, telephone and radio. Wireless technology, of course, impacted on the other two, more than they did on it. This allowed telephony to make inroads into, but not yet supplant, the traditional commercial telegraph traffic between towns; personal or commercial telegrams only became negligible by the 1980s.

This paper was delivered at the Stout Research Centre's 1992 annual conference 'The Bit in Between - New Zealand Between the Wars 1918-1936'.

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FOOTNOTES

[1] See *Appendices to the Journals of the House of Representatives* [*AJHR*][1937), H-19, 3

[2] After World War Two, following nationalisation of the parent company by the Attlee government in 1947, the Post & Telegraph Dept. took over Cable & Wireless's remaining New Zealand facilities in 1950.

[3] This New Zealand-Australian service was formally inaugurated by a telephone conversation between Sir Apirana Ngata and the Acting PM of Australia, J.E. Fenton. Apirana Ngata began by saying : 'Tena koe. I hope you understand Maori over there in Australia. Mr. Ransom, our Acting PM, is away on duty, and I am taking his place'. See report in *Otago Daily Times*, 26 November 1930.

[4] Howard Robinson, *A History of the Post Office in New Zealand* , Government Printer, Wellington, 1964, 212-3. Robinson also notes that by 1939 New Zealand had moved to second place (126.9 phones), behind the USA.

[5] The equipment had originally been ordered from the American supplier, Western Electric, at its subsidiary in Antwerp, Belgium. (Shipment and installation had been held up by World War One though, luckily, most of the original order had been evacuated to London before the Germans arrived in August, 1914). In contrast to the earlier, 'step' equipment where each number dialled activated a succession (i.e. step by step) of number selectors on the automatic exchange, 'rotary' made use of revolving (rotary) electro-mechanical switches and a mechanical register. The register stored the numbers dialled, then instructed the selector to make the connection in one go, as it were. 'Rotary' was slower than 'step' for the dialler but its equipment was easier to maintain in exchanges and took up less space.

[6] *AJHR* (1930), F-1, 15.

[7] *AJHR* (1924), F-1, 26; *AJHR* (1940), F-1,18.

[8] The growing share of revenue from telecommunication sources is vividly shown in an early 'slice of pie' diagram in a P & T Annual Report, cf. *AJHR* (1924), F-1, 11.

[9] *AJHR* (1931), F-1, 8.

[10] After Ward died in May, 1930, P & T affection and regard for him were evident in the Staff Association's obituary (July 1930 issue of its journal *The Katipo*) and in the Department's comment that 'his death was deeply deplored in the service'. (*AJHR* 1930, F-1, 8)

[11] *New Zealand Parliamentary Debates* (1921), 514.

[12] Telecom archives, specifically The Register of Exchange Cutovers, Improvements etc, 1900-82, compiled by the Engineer-in-Chief's Office, Post Office Headquarters, in 1982 indicated that only 372 exchange upgradings or openings were performed in election years during this period (31.37% of the total). The Register is held in the Telecom Museum and Archives, Wellington.

[13] In the 1925 General Elections - the year that Wellington Central exchange went automatic - the majority of its sitting MP, Peter Fraser, was reduced slightly as a result of the swing to Reform and that government's upgrading of Wellington's telephone service.

[14] See Auckland and Christchurch Telephone Directories for relevant years. (Copies in National Archive Accession No. W 3327).

[15] Bert Roth, *Along the Line. 100 Years of Post Office Unionism* , Post Office Union, Wellington, 1990, 92.

[16] *AJHR* (1929), F-1, 1.

[17] Furthermore, though a small, but growing cadre of university-trained engineers (T.R. Clarkson, E.H.R. Green, G.R. Milne, D.Donaldson and others) became evident in the period, McNamara, himself with a non-telecommunications background, gave them little leeway. Most reached senior positions in the 1940s or 50s; the first Director-General, with a career solely on the engineering/telecommunication side of the Department, was only appointed in 1960. It should be noted that things improved for P & T staff after 1935, with the advent of the forty hour week, cancellation of the salary cuts of 1931-2, and McNamara's retirement in June, 1939. His successor, J.G. Young, was a much more conciliatory, staff-orientated person.

[18] Total telecommunication revenues declined from £2,022,632 in 1930-31 to £1,919,515 in 1934-35. By 1938 they had returned to late 1920s levels. See *AJHRs* for 1931, 1935, 1938 (F-1), 10, 13,10 respectively.