Technologies of Transportation and Communication: Impact in Colonial Punjab

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Abstract—Technology had been intimately related to colonialism as colonizers found the tools of technology essential to penetrate, organize and develop the unexplored geographical areas which they conquered. Transportation and communication technologies played an important role in consolidating the British rule in India as these were essential components required for quick movement of goods, troops and securing co-ordination between authorities and officials at various levels. The province of Punjab in British India was annexed by the British in 1949 and they immediately started to introduce western technologies of transport and communication for transportation of agricultural produce, security of defence forces and acquiring comprehensive, accurate, and frequent information from every quarter of the region. This paper describes the introduction of western technologies of road and bridge construction, railways, telegraph, telephone, radio transmission and printing press by the British in Colonial Punjab. These technologies created appreciable impact on the colonial Punjabi society which has been highlighted. The paper is intended to contribute to the much needed aspect of History of Technology in colonial Punjab.

Keywords—Colonial Punjab, technology, transportation, communication.

I. INTRODUCTION

TECHNOLOGY has been the harbinger of development of any society, but it has also been used by the colonialists to create, sustain, strengthen and extend control over the colonized nations. Technologies of industrial era especially aided the British imperialism. After annexing Punjab, the British used western technologies as tools for expansion and continuation of British Raj. They realized first of all that having a network of roads and a good communication system is an essential requirement in meeting their objectives. Therefore, they started with repairing old roads and bridges and constructing new ones with western technologies. Due to the strategic position of Punjab, the British invested handsomely on connectivity and mobility by establishing networks of railway. This also secured British military power and connected the province to rest of India. Modern transport facilities gave an impetus to the increase of production, both quantitatively and qualitatively. The British introduced new technologies of communication like modern post offices, telegraph and telephone to aid administrative, military and commercial activities. The technologies which were used to create the modern transportation and communication system

were western and different in many aspects from those which had existed in Punjab before the conquest by the British in 1849. Before introduction of these technologies, the local conditions and territory was scientifically and geographically surveyed. The technical aspects of construction of metalled roads, bridges, railway lines, telegraph, telephone, radio and printing press have not been discussed by researchers of history of technology. This paper attempts to fill this gap in the sphere of transportation and communication. The first section is the introduction while the second section describes the technologies that were employed to improve roads, bridges and introduce railways. The third section discusses the introduction of new technologies of postage, telegraph and telephone services by the British in colonial Punjab. The last section highlights the impact of these technologies on the Punjabi society.

II. TRANSPORTATION TECHNOLOGIES

The British government started road construction in Punjab during the Regency Period of 1846-1848 [1]-[3].[1] The metalled roads made by the British in colonial Punjab were of three types: (i) concrete, (ii) macadamised, and (iii) asphalt or bitumen [4]. The raw-materials for all metalled roads were stones and sand. The macadamised roads had single-sized small angular stones (gravels) mixed with road dust placed in shallow layers and compacted thoroughly. The powdered road dust itself acted as binding material when mixed in water. Concrete roads were made using crushed rock and sand along with cement and water as binding material while the asphalt roads were made by *kankar*, sand and asphalt. The binding substance in asphalt roads was bitumen [5], [6, p.108].[2]

For constructing all types of roads, the surface was first cleared of obstructions and levelled. The mixture was made in the bitumen boilers and then cement and asphalt were added in concrete mixers. This material was spread on the road which was then pressed by the road rollers. Two to three layers were laid to prepare a hard, durable road surface [7]. After metalling of road to a thickness of 3 in. (7.62 cm), the metalled road was allowed to settle for about one month. The road surface was then brushed and coal-tar was applied with a spraying machine. Similarly, asphalt bitumen surfacing was

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[1]The work was classified into military works (cantonments and forts), public works (for civil purpose), roads, bridges, viaducts and canals. The roads were further classified as military roads, roads for external and internal commerce.

[2]Technically, asphalt is hard rocky bituminous limestone of pure carbonate of lime naturally impregnated with bitumen which acts as binder. The asphalt used in British Punjab was known as Maxphalt and Spraymex.

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done after some time of metalling. Where the traffic was heavy, asphalt grouted macadam (penetration system) was applied. It consisted of a bottom layer of stones (2 to 2.5 gauge) upon which hot asphalt was applied at the rate 5.67 to 6.61 lt/sq. mts; intermediate layer of stones (3/4 to 1 in./1.9 to 2.5 cm gauge) over which a coat of hot asphalt was applied at the rate 0.5 to 0.75 gallons (1.89 to 2.83 lt) per yard and then on the uppermost surface, fine clippings were spread and rolled along with sand [6, pp.107, 108]. For road making along with mixers and boilers, several machineries such as presses, drilling and milling machines were used. The asphalt and concrete mixers were actually revolving drums driven by internal combustion power engines [8]. The most important road metalled in colonial Punjab was the Grand Trunk Road [9].[3] Initial effort to construct Grand Trunk road was made between 1830 and 1835 under Lord William Bentinck [10, p.81].[4]

Bridge construction work also was taken up on priority by the British in colonial Punjab. Initially, the British built boat bridges (pontoon bridges) to travel across the rivers and streams. For making these bridges, flat bottomed boats were lined up and secured by fastening to anchors for stabilization. In some cases, deck was made on rectangular iron floats (pontoons) coupled together in pairs and held in position with 1 ¾ inch or 2.8 cm chain cables fastened to anchors of 3 tons each placed upstream and downstream [11, p.109]. Two types of permanent bridges over rivers were constructed employing new technology of road bridge construction. The first was the iron bridges and the second was masonry arched bridges. The major improvement in technique of bridge building in colonial Punjab was through the use of iron in building the piers as well as arches. The technology of iron bridges consisted of deck arches and stone piers constructed on cast iron cylinders. In each span, wrought iron riveted plates were placed to act as arch ribs which were braced together with struts [11, p.312-13]. The masonry arched bridges were made of bricks and stones with piers and abutments founded directly into the hard sub-stratum and sometimes on cylindrical walls and blocks of masonry sunk to sufficient depth in sandy beds. In case of dry river stretches, the whole river bed was traversed by a paving of stone set in mortar. Occasionally piers were constructed of iron or timber [11, p.83,92]. As the strength of masonry arch bridges depended on piers and abutments which were exposed to full force and velocity of the water current, the base of the foundations was secured in solid rock by boring at various depths. While securing the foundations in river, the entry of water was stopped by employing a technique called cofferdam [12][5] in which a single and double row of pointed piles were

formed. When the piles were driven down to the required depth, the water was pumped out by using steam pumps [10, p.99]. The piers and abutments of the bridge were built from rock faced ashlar (stone masonry formed using stones) and heated with rubble masonry (rough uneven stone set in mortar) for strength [10, p.101]. Improvement in construction of masonry bridges was made by strengthening the arches, piers and abutments with iron rods and bands at the point of rupture [11, p.408, 409].[6] Some bridges on the Grand Trunk Road were completed between Lahore and Gujranwala and Lahore and Beas using these new bridge techniques [13].[7]

Railways were developed to secure British military power in colonial India. The military cantonments were connected with each other through railways and roads to serve the administrative, commercial and military needs of the colonial government [14]. The British had to face great physical and technical challenges to introduce railway in vast territory of Punjab covered with numerous rivers and mountainous ranges which involved high engineering proficiency and courage. It required scientific assessment of the local material to be used in railway construction and a well-trained class of local mechanics and artisans to build and operate railways [15, p.22].

Firstly, railway lines and bridges were laid down in colonial Punjab. The masonry, brick and lime works were carried out to lay the proper surface for building of railway lines. Large numbers of hard stones were collected for use in the laying of railway lines. Research was carried out on the soil conditions for laying down of lines [16]. The work of railway lines was divided into three main divisions: (i) the formation line, (ii) the ballast or permanent way, and (iii) station buildings and workshops. The formation level was the completed top of the line embankments, bottom of tunnels and the floor level of viaducts and bridges. The formation level was made consisting of compacted soil to avoid a change in level required by the terrain. The formation work involved building of uniform top surface by removing earth, rocks and gravel. Once the formation work was completed, the ballast or actual road was placed on the level on which the train had to run. It consisted of sleepers, chairs, rails, fastenings, points and crossings. The last task was the construction of station buildings and workshops [10, p.251].

The railway track (line) consisted of continuous pair of end connected rails, secured at a certain distance apart from each other by suitable fasteners, embedded in a mass of ballast. The ballast was the formation composed of a variety of hard materials such as broken stones, gravel, pebbles, brick and sand [10, p.264]. Owing to the generally flat level character of the soil, the rail lines were laid for the most part on

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[3]It was given special attention as from a political and military point of view it bonded together all important northern cantonments and maintained communication with Peshawar (biggest frontier station). It was one of the longest roads in the world and the British had started improvements on this route in 1839 [9].

[4]A very large proportion of work on Grand Trunk Road was completed before 1848. After 1855, it was extended to Peshawar, a total distance of 1500 miles starting from Calcutta. In Punjab, it passed through Karnal, Ludhiana, Lahore, Jhelum and Attock before extending up to Peshawar [10].

[5]A cofferdam was a box made by driving four rows of timber sheet piles,

open at the top and bottom, but completely surrounding the site of the proposed pier. The cofferdam was emptied to obtain a dry river bed for excavation work [12].

[6]Improvement was made by reinforcement of arches with metal frames and iron frames which were embedded in Portland cement. Further, the arches were embedded in the concrete using curved roller beams [11].

[7]Six large bridges were completed of which one had three arches of 30 feet (9 mr) span. The earth work was completed with kankars and stones while embankments were made by bricks [13].

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embankment of moderate height. The rail lines were laid on the slippers of cast iron, wrought iron and steel as the slippers made of wood were damaged due to climatic conditions [17, p.17].[8] For the 5 ft. 6 in. (14.22 cm) standard railway gauge, the slippers were 10 ft. (3 m) long and 12 x 6 in. (182.88 cm) in section. The rails were made of cast iron weighing 75 to 100 loubes per yard [10, p.268]. The modern technology of railway bridge construction in British Punjab was demonstrated during 1859 to 1865 when six bridges were built between Lahore and Multan for the North Western Railways. These structures were spanned by wrought-iron lattice-girder structures. The girder spans were standardized to a length of 111 ft. (33.3 m) [18].

III. COMMUNICATION TECHNOLOGIES

In colonial Punjab, the modern communication system was set-up with the establishment of the postal system to aid administrative, military and commercial activities. A set of postmen were appointed in every district in 1851 itself and arrangements were further strengthened by 1853. The postal services started to gain the confidence of people as the number of letters started to increase. Nearly three and a half lakh (0.05 million) letters were posted in 1856-57 and in 1865, the number increased to nine lakhs (0.9 million). A postal mail service called Government Bullock Train was also started [19, p.143]. The mail was carried in carts drawn by the horses and also by covered wagons drawn by bullocks. From Multan, postal communication was carried both by land, steamers and boats. Other means were the private and public servants, mail runners, horses, camels, bicycles, motor-vehicles and railways [19, p.146]. By 1931, every town in the Punjab had suitable postal facilities, and on average every 13 villages enjoyed the advantages of a post office [20]. At the time of partition, area served per post-office in Punjab was 19 square miles (30.4 sq. km) serving a population of 6,457 [19, p.148].

Another modern communication technology introduced in colonial Punjab was the electric telegraph [10, pp.500, 501].[9] The principle on which the electric telegraph worked was that an electro-magnetic current could pass along a conducting wire to a great distance and could be made to move a magnetic needle, at any point on its course, through signals which could be conveyed according to an established code with incredible speed from one end of the wire to the other. The signals would express letters of the English alphabet and the ten numerals or their combination. This way, communications could be made at one place which could be read at once at the other place, miles away. The apparatus of an ordinary aerial electric telegraph consisted of a line of conducting wires made of galvanized iron, suspended on earthen ware tubes or insulators, carried on poles spaced at certain distance apart from station to station. Each aerial wire formed a circuit and carried a distinct set of signals. Electric current was generated through galvanized batteries. The electric telegraph therefore, was a combination of three separate physical forces, viz. electricity, galvanism and magnetism [10, pp.495-496]. In colonial Punjab, the first telegraph line was laid from Sutlej via Lahore to Multan and extended further up to Peshawar [21].[10] Telegraph Offices were initially opened at five military stations, Ambala, Jullundur, Lahore, Peshawar and Rawalpindi [19, p.146]. After 1935, the technology of telegraphy was improved with the adoption of high speed telegraphy via improved wires and conductors using high speed baudot system as well as the teleprinter system [22, p.102].

The telephone was introduced in British India in 1881 and in Punjab in the twentieth century [22, p.103].[11] The telephone worked on the principle of converting sound (human voice) into electronic signals that were transmitted via cables to another telephone which reproduced the sound to the receiving user [17, p.55], [23], [24].[12] In 1914, the first automatic system called Keith Line Automatic System was installed at Simla with an equipment of 700 lines [17, p.55]. In the same year, there was only one, 50-line magneto exchange in Amritsar which was converted into 300-lines central battery system in 1922. It was further converted into an automatic system in 1925 [25]. In 1931-32, the wireless service of telephone was started and the trunk line facilities were increased by installation of four additional trunk circuits. The erection of sufficient circuits between the big centres and introduction of the carrier system enabled the use of one pair of wires for a number of circuits [26]. By 1935, open rack pre-2000 type strowger equipment was used in telephone exchanges [17, p.56].

Transmission of information through capacitors and amplifiers, also known as Radio Transmission or Radio Broadcasting began in 1927 by a private company called Indian Broadcasting Company (IBC) at Bombay [17, p.4], [27, p.6].[13] In January, 1936, Indian Broadcasting Service was

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[8]Before 1912, rails of 75 lbs (33.75 kg) and 60 lbs (27 kg) per yard were used on main and branch lines respectively and later on rails of 92.15 lbs (41.46 kg) per yard were used. After 1930, new types of metal rails were developed for high speed traffic. These types of rails were called duplex joint sleeper [17].

[9]In India, the electric telegraph was introduced by Sir William Brooke O' Shaughnessy in 1839 when he constructed a line of wires in the vicinity of Calcutta. He used bamboo poles, one wire system, earth circuit and induction machine to send the messages [10].

[10]The line followed the Grand Trunk Road covering a distance of 837 km. The construction work of the first telegraph line was commenced in the latter half of 1853. By October 1854, the line was in working order as far as Lahore, and Peshawar by January, 1855 [21].

[11]Following a government decision, licenses were granted to Oriental Telephone Company to establish telephone exchanges in Calcutta, Madras, Bombay and Rangoon. By 1895, a few other local companies operated telephone networks in major cities including Karachi and Ahmedabad [22].

[12]One of the first communication devices was invented by John Philipp Reis in 1860. His telephone device was based on conversion of sound into electrical impulses. However, it was Alexander Graham Bell who invented the electric telephone in 1876 using amplitude modulation (oscillating current and voltage) which he referred to as undulating current. Early telephones used a single wire for the subscriber's line, with ground return used to complete the circuit. The single wire system of 1880's gave way to the two wire system (one for incoming and other for outgoing transmission) in 1900 and magneto instruments were replaced by central battery system.

[13]The history of radio or wireless technologies in India, however, goes back to early 1920s when enthusiastic entrepreneurs working on broadcasting technologies established Radio Clubs at Bombay, Calcutta and Madras. In 1934, Radio Station at Delhi was established and in 1935, new transmitters were installed by Marconi Company [17].

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renamed as All India Radio and its operations were transferred to Department of Communication in 1937 [28]. In the same year, new medium wave stations (5 kW) were started at several places including Lahore and Peshawar [27, p.19]. Rural Broadcasting Programs were initiated by the All India Radio in the same year and the Lahore Radio Station was among those where rural programmes evinced a good response [27, p.39].

Print technology was introduced by Christian Missionaries in Ludhiana by Reverend Newton and Reverend Wilson in 1830s. It was an old-fashioned wooden printing machine [29, p.21]. In 1836, the American Presbyterian Missionary Press established another press having Roman and Indo-Persian fonts at Ludhiana [30]. The printing press industry then grew continuously and new types of lithographic machines came to be used [29, p.22]. By the time of annexation, printing presses were operating at Lahore and Bhera in district Sargodha. Soon, presses were also set-up in Amritsar, Multan, Sialkot, Jhelum, Rawalpindi and Jullundur [30 p.89]. Modern printing process consisted of typography for which typed fonts were composed in stone and metal moulds, made in foundries [31].[14] For printing, various types of machines were used in colonial Punjab. The first types of printing machines were hand operated Lithographic machines used by the missionaries to print pamphlets, invitation cards, letters, forms and invoices [32, pp.46-48]. The hand lithographic press consisted of oblong iron framework. It had a cross-head at the centre from which a screw was suspended for raising and lowering the scraper box. A stone carriage rested upon the rails and below it was a plain friction roller or cylinder which was driven either by hand or steam power. When the carriage containing the stone (replaced later by iron bed plate and metal plate of zinc and aluminium in improved machines) was pushed under the scraper box, a long level was pulled down raising the friction roller and jamming the carriage and stone, firmly against the scraper. The roller was then made to revolve by turning the handle and the carriage was driven under pressure and the impressions were taken [32, pp.73-74]. With the establishment of newspaper industry in colonial Punjab, the second type of lithographic machine called simple flat-bed type machine began to be used in which the bed had a reciprocating motion and the paper was transferred automatically from the first impression cylinder to the second, and then conducted by tapes to the self-acting sheet-flyer. The machine had four inking rollers over the entire form and a table distribution [33, p.15].

The third type of improved press machine was the rotary printing press which printed on both sides of the sheet at one operation. In this machine, two impression cylinders and two form cylinders were placed side by side in a horizontal frame. The impression cylinders occupied the centre, with the form cylinders at each end. The two forms were secured to their cylinders and inked, the fountains and distributing cylinders being placed at the ends of the press. The sheets were supplied by feeders. A rotary machine could print 4000 to 5000 perfected eight-page sheets of ordinary size per hour [33, p.13]. The modern rotary presses were adopted by the Civil and Military Gazette Press of Lahore, *The Times of India*, *The Pioneer* and *The Tribune*. These publications used page lay-outs and formats similar to that of European papers [29, pp.101-103].

IV. Impact of Transportation and Communication Technologies

The impact of modern transportation communication technologies in colonial Punjab was huge. There were 1,036 miles (1657 km) of metalled roads in 1891 which increased to 2,619 in 1911. By 1931, the length of metalled roads was 4,073 (6516 km) that increased to 5,473 (8756 km) in 1944 in colonial Punjab [34], [35].[15] Besides road construction, a number of road bridges were constructed in colonial Punjab. In 1931, there were road bridges over the Chenab, the Beas, Sutlej and Jhelum rivers. A large number of smaller bridges were also constructed or rebuilt and boat-bridges were thrown across the river Chenab [36]. In 1891, 29,920 people were employed in road and bridge construction work. This number increased to 40,384 in 1901 and further went up to 1,25,478 by 1931 [37].

With the construction of a network of roads and bridges connecting villages with *mandis* and large towns, movement of raw-materials and manufactured goods to markets became quick and efficient. New trade centres were established and large grain markets came up. The import and export of goods increased manifold. The roads helped in expanding trade by providing affordable transportation for bulky and heavy goods and also for perishable goods like fruits, vegetables and milk in colonial Punjab [19, p.28]. Furthermore, travelling in general became comfortable and quick for common people.

With the metalled roads, gradual introduction of motorized vehicles was made possible with means of transport like motor cycles, cars and lorries by the second decade of the twentieth century in the colonial Punjab. In 1913, there were 146 motor-cycles and 316 cars and lorries plying in colonial Punjab. This number increased to 209 motor cycles and 2,140 cars and lorries by 1930 [36, p.50]. By 1946, there were 14,312 motorized vehicles that included 2,628 motor-cycles, 6,260 cars, 3,441 public service vehicles and 1,983 goods vehicles [35, p.23]. The wealthy classes in colonial Punjab developed a liking for foreign made cars. Popular motor-cars brands advertised were Chevrolet, Buick, Ford, Austin, Coventry, Chrysler and Studebaker. This reflected the changing consumption pattern of wealthy population of the Punjab [38], [39]. Importantly, the increase in use of motor vehicles provided employment to 30,780 people in 1931 connected with running of motor vehicles [40]. Significantly, the number of people engaged in transportation drawn by pack animals (bullocks, camels, horses, donkeys) declined from 2,00,307 in

[14]They were composed into matter for printing either by hand, by the compositor or by machines known as linotype and monotype which worked on the keyboard principle like a typewriter. Typography could be done in various languages like English, Hindi, Urdu and Gurmukhi.

[15]Besides, there were 19,762 miles (31619 km) of unmetalled roads in 1891 which by 1944, were 19,506 miles (31209 km) [35].

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1891 to 71,914 in 1931 [41].[16] It seems that metalled roads and the use of motor vehicles reduced the number of people engaged in this profession as people started preferring faster and efficient modes of transportation.

The British laid down a vast network of railway lines connecting important towns and cities in the colonial Punjab. The total railway length in colonial Punjab was only 23 miles (36.8 km) in 1863. It increased to 1,056 miles (1689 km) in 1881 and to 4,264 miles (6822 km) in 1901.Further,it increased to 5,369 miles (8590 km) in 1911.The railway length was 5,426 miles (8681 km) in 1921 and after ten years it further rose to 6,160 miles (9856 km). Railway length was 6,192 miles (9907 km) in 1939 [42]-[44]. The railways employed a large number of people in colonial Punjab. In 1891, 17,391 people were employed by railways which increased to 69,822 in 1901. There were 1,49,459 railways employees in 1911 and by the 1931, figure was 1,06,067 [45].

By 1921, railway workshops were established at Ambala, Gurgaon, Amritsar, Lahore, Rawalpindi and Multan [46] and the number of employees were 17,812 [47]. By 1915, Lahore city had the largest concentration of railway workers of all sorts like managerial, clerical, and skilled and unskilled manual labourers in north-western India. In addition, the wages paid to railway workers substantially improved the economy of the city [48], [49].[17] Railways also became the preferred mode of transport in colonial Punjab. Mass adoption of rail travel by the Punjabi people was evident as between 1862 and 1883, 2,84,806 people travelled between Lahore and Amritsar alone [15, p.356]. In 1911, the total numbers of passengers who travelled by railways in colonial Punjab were 5,35,598. The number increased to 6,88,951 by 1921 and ten years later it further rose to 7,40,081, indicating the preference and popularity of rail travel by Punjabis [50].

The establishment of railways had social as well as an economic impact. With enhanced railway connectivity, human interaction and movement across the cities of Punjab increased substantially. For instance, Ferozepore, Lahore and Amritsar started developing into one 'composite cultural triangle', due to the easy connectivity. The barriers of language broke over a period of time and acculturation took place. Pilgrimage increased manifold. People learnt punctuality due to railways. Trade and business increased due to railways [15, p.356]. Railways provided increased facilities for movement of troops to the frontiers or to any places of disturbance at a greater speed and lesser cost. For example, during the Kuka disturbances in 1872 in Punjab, artillery and cavalry regiments were moved quickly from Delhi to Ambala via railways in four days [15, p.356], [51].

The introduction of new technologies of communication like modern post offices, telegraph and telephone in the colonial Punjab resulted in faster delivery of news and happenings. In 1866, the Imperial Postal System was extended to Punjab and branch offices were set-up. The number of post offices increased from 120 in 1868 to 520 in 1875 [52]. The number increased to 2,935 in 1921 and further to 3,778 by 1931. The number of letters delivered by the post offices during 1928-29 were 14,82,43,524. In 1947, there were 57,321 letter boxes, 40,011 in rural areas and 17,310 in urban areas [53], [54].[18] Letters as a means of communication were adopted promptly by all Punjabis.

The first telegraph line was set-up in 1855 in colonial Punjab [52]. By 1931, almost every town had a suitable postal and telegraph office. One out of every 97 villages in colonial Punjab had a post and telegraph office by 1931 [55]-[57].[19]

The telephone system was set-up in the twentieth century in Punjab. At the close of 1921, there were only 15 towns possessing telephonic connections but the number of such towns at the close of 1931 increased to 37 [58]. The telephones in colonial Punjab were generally used by effluent households and the trading community. By the second decade of the twentieth century, newspapers also started publishing articles about the usefulness of telephones. *The Tribune* in 1922 referred to the growing popularity and use of telephones in Lahore [39, p.118], [59].[20]

Printing presses were set-up in all important towns of Punjab like Lahore, Amritsar, Multan, Sialkot, Jhelum, Rawalpindi and Jullundur. Large number of newspapers, periodicals and books were published in English and vernaculars. Newspapers expressed views on social and political issues [30, pp.87, 89]. Imitating the Christian Missionaries, the religious reform organizations like the Anjuman-i-Punjab, the Arya Samaj, the Brahmo Samaj and the Singh Sabha's brought out their own publications in various languages such as Urdu, Hindi, Punjabi, and English. Political organizations like the Indian Association, the Indian National Congress, the Khilafat group, Muslim League and the Unionist Party made use of the printing press to propagate their views [29, p.121]. In 1901, there were about 18 printing and lithographic presses and by 1931, the number increased to 30 presses [60]-[65]. The readership of newspapers climbed from 24,000 in 1891 to 1,84,000 in 1911 [29, p.164]. The modernized Punjabis were able to fulfil their appetite for journals, newspapers, fiction and scientific literature through print media. The industrial and agricultural organizations were

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[16]The workers engaged in driving carts and other animal driven vehicles like tongas were 2,00,307 in 1891; 1,89,345 in 1901 and 1,97,209 in 1911. The number declined to 1,51,558 by 1921 and further dropped to 71,914 persons by 1931. The workers engaged in driving carts and other animal driven vehicles like tongas were 2,00,307 in 1891 [37].

[17]Physically, the railway and its workshops changed the land use patterns in the colonial Lahore that grew up around the old walled city. The railway workshops at Naulakha and later the workshops at Moghulpura attracted not only railway workers and their families, but also some small businesses whose customers included the railway company, railway travelers and railway workers [48], [49].

[18]In 1854, there was not even a single letter box in Punjab and in 1891 there were 435 letter boxes [54].

[19]The total length of telegraphic lines up to 1869 was 761 miles (1217 km) but by the end of 1882, the line length was 1,507 miles (2411 km) and at the end of 1891, the line and wire mileage aggregated 4,607 (7371 km) and 12,950 miles (20,720 km) respectively. [55]. The total number of messages sent from telegraph offices in colonial Punjab during 1874-75 was only 45,670, which rose to 6,45,005 during 1900-01 [56].

[20]In 1930s, the Indian Posts and Telegraph Department advertised for telephones with a picture of elegant lady holding a headset and saying, 'Your home is incomplete without a Telephone' [39].

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able to use the print technology to propagate advances in technology. In 1881, 1,090 books were published in different languages which increased to 1,610 in 1931 and further to 2,168 in 1940 [29, p.164].

Radio transmission in colonial Punjab began in 1937 when new medium wave stations (5 kW) were started at Lahore and Peshawar. Educational, religious and commercial programmes as well as news in various languages like English, Hindi, Urdu and Punjabi were broadcasted in 1937 [27, p.19]. The Punjab Government granted Rs. 48,040 towards rural broadcast by Delhi Station. An hour's programme was devised to be on air after sunset when the rural people were at home. Five minutes of talks were broadcast on one subject with intervals of music and announcements. The dialogue method proved very successful in engaging the villager's attention which was later amplified by introducing short dramas which became even more popular. This scheme was then extended to Lahore Radio Station which became very popular. Marconi Company provided radio sets which had higher volume, so that a large number of people were able to listen to the radio in a village [27, p.19].

V. Conclusions

Modern technologies of transportation and communication in colonial Punjab played a big role in gearing the province towards modernization. They started to replace the older modes of transportation and communication as the local population found them convenient and in the process, these technologies were adopted well by various sections of the society.

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