

# The modernization of transport and communications in Japan

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Until the mid-19<sup>th</sup> century, the chief means of transportation in Japan were boats and ships for transport over water, palanquins for overland transport, and horses. However, the use of all these means was restricted according to social status, and limited to particular purposes. Most travellers simply walked.

Highways for walking were fairly developed by this time. Engelbert Kaempfer, for example, a German who came to Japan as a doctor for the Dutch East India Company, reported :

Many centuries ago the Empire of Japan had been divided into seven great tracts of land ... to make travelling easy and convenient, every one of these tracts is bound by a highway, and because in success of time they have been again sub-divided into several Provinces so there are particular ways leading to and from every of one of these Provinces, and all ending into the great highway, as small rivers loose themselves into great ones.<sup>1</sup>

In 1692 Kaempfer made a roundtrip journey between Nagasaki, in the western tip of Japan, and the capital Edo (present-day Tokyo). He speaks of the existence of seven highways (though in fact there were five on the main island of Honshû). These main highways were adequately equipped to support travel, with both road maintenance and accommodation facilities.

Communications by courier developed prior to the 19<sup>th</sup> century. There were three different systems of couriers. One was a system for official duties developed by the Tokugawa shogunate. Another was run by each feudal lord, linking Edo, Osaka, and his own domain. The last was a commercial system linking the three main cities of Edo, Osaka, and Kyoto and the cities around them, and could be used by the public. It can be said that a system of communications close to a mail service between the three main cities, was already in place before the Meiji period.

## **New developments in transport and communications: modernization and foreign pressure**

Foreign pressure drove the modernization of technology in Japan, including that of transport and communications. Umetani Noboru identifies three stages in the Japanese response to foreign pressure :<sup>2</sup>

Stage 1 : *Resistance to foreign pressure*

1825 “Order to repel foreign ships” – 1842 abolition of that order

Stage 2 : *Adapting to foreign pressure*

1842–1853 American fleet and Commodore Perry’s visit– 1855 establishment of the shogunate naval institute –1860

Stage 3 : *Constructive use of foreign pressure*

1860 shogunate envoy dispatched to America – Meiji years

Even in the first stage of resistance to foreign pressure, there were people who read foreign books and studied foreign affairs ; they didn’t, however, yet represent a significant social force. In stage two, Japanese industry and technology began slowly to modernize. The study of Western sciences which previously had centered on medicine, natural history, and astronomy, came to focus on the study of Western naval and military technology. At the same time, particularly after Perry’s visit, the prime language of learning changed from Dutch to English.

After 1860, when the Tokugawa shogunate embarked on vigorous negotiations with foreign countries, the process of modernization accelerated in all branches of industry, technology, lifestyle and even scholarship. The Meiji government, formed in 1868 after the overthrow of the Tokugawa shogunate, decided that the most effective way to transfer Western technology to Japan was to learn directly from Westerners and to take them into their employ. The Department of Industry, which was in charge of transport and communications, became the public office which employed the most foreigners ; the largest number of foreigners, furthermore, was employed in sections dealing with transport and communications, such as railways, lighthouses, telegraphs, shipbuilding, and surveying. Meiji leaders understood well the importance of transport and communications for stabilizing and conducting internal politics.

## **Hired foreigners and Japanese technological reform**

The number of foreigners hired by the Meiji government totalled well over five thousand (Table 1). Foreigners hired by regional government offices are included in this number, and we notice that, in the early stages, they were hired

**Table 1** The increase in the total number of foreigners in official employ (according to occupation)  
(UNIT=NO. OF PEOPLE)

OCCUPATION YEAR	ART AND SCIENCE TEACHERS	TECHNI- CIANS	CLERICAL WORKERS	FACTORY WORKERS	MISCELLA- NEOUS	TOTAL	TOTAL (YEN)
1872 (M 5)	102	127	43	46	51	369	83,805
1873 ( 6)	127	204	72	35	69	507	109,004
1874 ( 7)	151	213	68	27	65	524	116,211
1875 ( 8)	144	205	69	36	73	527	115,288
1876 ( 9)	129	170	60	26	84	469	97,712
1877 (10)	109	146	55	13	58	381	81,528
1878 (11)	101	118	51	7	44	321	70,497
1879 (12)	84	111	35	9	22	261	61,898
1880 (13)	76	103	40	6	12	237	57,986
1881 (14)*	52	62	29	8	15	166	45,479
1882 (15)	53	51	43	6	4	157	43,421
1883 (16)	44	29	46	8	5	132	38,042
1884 (17)	52	40	44	8	7	151	38,997
1885 (18)	61	38	49	—	7	155	41,720
1886 (19)	59	48	53	—	9	169	47,163
1887 (20)	81	56	52	—	6	195	53,885
1888 (21)	105	44	61	—	5	215	55,451
1889 (22)	109	42	64	—	5	220	55,337
1890 (23)	92	35	68	—	5	200	43,446
1891 (24)	87	33	43	—	7	170	36,283
1892 (25)	66	18	40	—	6	130	29,601
1893 (26)	67	14	23	—	—	104	25,209
1894 (27)	59	10	16	—	—	85	21,295
1895 (28)	55	8	16	—	—	79	21,250
1896 (29)	53	8	16	—	—	77	19,076
1897 (30)	69	7	16	—	—	92	23,878
1898 (31)	78	7	15	—	—	100	27,357
TOTAL	2,265	1,947	1,187	235	559	6,193	

NOTE: Based on the 4th-18th "Japanese Imperial Statistical Yearbook"

in numerous fields related to technology. Moreover, a great portion of these foreigners were employed in the ten years or so following the formation of the Meiji government. Their numbers decreased rapidly with the passing of time.

The number of foreign technical experts privately employed by companies, individuals and such, was small in the early years of the Meiji era. However, in contrast to the pattern in government employment, their number held fairly steady and if anything, increased (Table 2).

This data shows how the government-led program of modernization with foreign assistance was gradually taken over and maintained by nongovernmental enterprises and individuals.

Let us take a look at the number in each ministry in 1872, when statistics of officially hired foreigners was announced (Table 3). Out of 213 foreigners employed in the Department of Industry, 153—over seventy percent—belonged to the technology section. This figure makes clear how the primary role of

**Table 2** The increase in the total number of foreigners in private employ (according to occupation)  
(UNIT=NO. OF PEOPLE)

YEAR \ OCCUPATION	ART AND SCIENCE TEACHERS	TECHNICIANS	CLERICAL WORKERS	FACTORY WORKERS	MISCELLANEOUS	TOTAL	TOTAL (YEN)
1872 (M 5)	—	—	—	—	—	—	—
1873 ( 6)	43	16	2	9	3	73	12,662
1874 ( 7)	44	44	5	9	24	126	19,494
1875 ( 8)	52	75	29	7	162	325	36,272
1876 ( 9)	54	163	37	19	180	453	32,613
1877 (10)	62	169	32	46	148	457	33,602
1878 (11)	54	237	20	8	180	499	42,632
1879 (12)	44	212	15	11	227	509	37,498
1880 (13)	59	199	20	13	197	488	37,203
1881 (14)	43	137	92	10	190	472	34,927
1882 (15)	44	215	29	6	199	493	34,965
1883 (16)	50	215	22	12	188	487	34,501
1884 (17)	64	234	28	5	169	501*	41,520
1885 (18)	69	181	54	14	79	397	40,908
1886 (19)	74	135	39	—	5	253	32,537
1887 (20)	125	231	22	—	16	394	36,802
1888 (21)	234	279	58	—	17	588	57,349
1889 (22)	244	274	52	—	13	583	58,574
1890 (23)	320	229	57	—	17	623	55,657
1891 (24)	313	218	49	—	12	592	51,843
1892 (25)	319	210	33	—	10	572	42,115
1893 (26)	339	165	29	—	5	538	37,914
1894 (27)	335	171	26	—	7	539	39,062
1895 (28)	323	141	30	—	6	500	34,541
1896 (29)	320	237	34	—	4	595	43,365
1897 (30)	315	281	29	—	140	765	54,880
1898 (31)	356	278	26	—	58	718	—
TOTAL	4,299	4,946	869	169	2,256	12,540	—

NOTE : Source same as for Table 1

**Table 3** 1872 (Meiji 5)

(UNIT=NO. OF PEOPLE)

GOVERNMENT OFFICE \ NATIONALITY	AMERICAN	BRITISH	FRENCH	GERMAN	OTHER	TOTAL ACCORDING TO GOVERNMENT
THE CABINET	—	—	1	—	—	1
MINISTRY OF FOREIGN AFFAIRS	2	—	—	—	—	2
MINISTRY OF FINANCE	3	7	7	—	2	19
WAR DEPARTMENT	—	3	4	—	2	9
MINISTRY OF EDUCATION	6	5	4	8	1	24
DEPARTMENT OF INDUSTRY	—	104	33	—	16	153
DEPARTMENT OF LAND RECLAMATION	5	—	—	—	—	5
TOTAL ACCORDING TO NATIONALITY	16	119	49	8	21	213

**Table 4** The number of British and French in the Department of Industry

	BRITISH	FRENCH
GOVERNMENT OFFICE OF ENGINEERING	2	—
GOVERNMENT OFFICE OF MINING	3	1
GOVERNMENT OFFICE OF RAILWAYS	52	—
GOVERNMENT OFFICE OF LIGHTHOUSE	33	—
GOVERNMENT OFFICE OF TELEGRAPHS	10	—
GOVERNMENT OFFICE OF SHIPBUILDING	—	24
GOVERNMENT OFFICE OF IRON MANUFACTURE	—	2
GOVERNMENT OFFICE OF MANUFACTURE	—	6
GOVERNMENT OFFICE OF SURVEYING	4	—
TOTAL	104	33

foreign employees was to introduce modern technology into Japan. If we further parse at the figures according to nationality, the number of British advisors is overwhelmingly large—more than fifty percent of the total. It is also instructive to consider the fields in which the foreigners were placed (Table 4). For we find that most of them, more than eighty percent, were in fields directly related to transport and communications, such as railways, lighthouses and telegraphs. Moreover, if we include fields indirectly related to transport and communications, such as shipbuilding and surveying, the percentage exceeds ninety-five percent—the majority, again being British. The modernization of transport and communications in Japan, in short, relied heavily on British assistance. The reason is simple: Britain boasted the most advanced transport and communication technology of that time. The fact that Japan imported the newest technology and assimilated it rapidly is a key point when considering its strategy of modernization.

After that, the organization of Japanese government offices was repeatedly reformed. Statistically, the number of foreigners hired by ministries outside the Department of Industry increased, and the number of foreigners hired by the Department of Industry steadily declined; even so, the majority of government-employed foreigners worked for the Department of Industry. Statistics for 1879 show the number of foreigners in the Department of Industry still making up about fifty percent of the total, with the British presence still prominent. However, we also note a small increase in the numbers of American and German employees (Table 5).

In short, Japanese modernization relied heavily on foreign experts and particularly, on British technology. In addition, the fact that the number of foreigners in official employ later quickly dropped indicates how the technological foundations of this modernization were acquired in a relatively short period.

I would now like to examine in greater detail how modernization was

Table 5 1879 (Meiji 12)

(UNIT=NO. OF PEOPLE)

NATIONALITY GOVERNMENT OFFICE	AMERICAN	BRITISH	FRENCH	GERMAN	OTHER	TOTAL ACCORDING TO GOVERNMENT OFFICE
THE CABINET*	1	—	—	—	—	1
MINISTRY OF FOREIGN AFFAIRS	1	—	1	1	—	3
MINISTRY OF HOME AFFAIRS	7	7	1	8	11	34 ( 37)
MINISTRY OF FINANCE	4	5	—	2	2	13 ( 14)
WAR DEPARTMENT	—	—	11	—	1	12
ADMIRALTY	—	15	1	2	1	19 ( 27)
MINISTRY OF EDUCATION	14	7	5	12	5	43 ( 49)
DEPARTMENT OF INDUSTRY	2	104	11	5	12	134 (144)
MINISTRY OF JUSTICE	2	1	4	—	—	7 ( 9)
DEPARTMENT OF LAND RECLAMATION	9	1	—	—	2	12
TOTAL ACCORDING TO NATIONALITY	40	140	34	30	34	278

accomplished in transport and communications, looking especially at roads, railways, and telegraphs.

### The modernization of transport and communications

#### Roads

As in any country, the modernization of transportation required large-scale road construction and the reorganization of the road traffic system. Nonpaved roads posed serious obstacles to the development of transportation by carts and horsedrawn carriages. It became necessary to construct roads that could withstand the load concentrated on narrow wheels.

Traditionally, carts were prohibited from going on the highways. This ban was lifted in 1863. Furthermore, the rickshaw, a vehicle combining a cart and a palanquin, was invented and the use of rickshaws was approved in 1870. Horsedrawn carriages also began to appear in the treaty ports in the early 1860s as a private means of transportation for the foreign diplomatic and consular offices. After the Meiji Restoration, their popularity grew rapidly and Japanese too came to use them for both private and business purposes.

According to the 1875 statistics, the number of vehicles in Japan counted 360 horsedrawn carriages, 1700 ox carts, 15,600 carts and 113,900 rickshaws. Heavy vehicles, such as horsedrawn carriages and carts, and the sheer increase

in vehicular traffic destroyed the nonpaved roads. Harry Parks, the British Minister to Japan, in a report dated October 5, 1877, described the condition of the Japanese roads at that time as follows :

Up until now the Japanese have been unaware of macadamizing and since they have constructed their roads using soft materials, it is practically impossible for vehicles to run on them after torrential rain.

Macadamizing was invented by the Scotsman, John Loudon McAdam, in the beginning of the 19<sup>th</sup> century. The method involves rubble of four centimeters in diameter being laid on the road surface and compacted using a roller. Subsequently, small pieces of rubble are put into the crevices. The mutual grinding of the rubble creates a pavement that can withstand vehicular weight. The development of this invention was stimulated by the rapid increase in horsedrawn vehicle traffic not only in Britain but throughout Europe.

McAdam was appointed a general road manager in the outskirts of Bristol in 1815 and built more than seven hundred miles of turnpikes (toll roads) using his method of construction. These roads gained the reputation of being extremely durable and low in cost. From 1817 onward, macadamizing was used in road construction in London and other cities.

Minister Parks' comments indicate the vast difference in British and Japanese technology of that time. The Meiji government was also aware of the inferiority of Japanese roads, and undertook both to repair the existing roads, and to develop new ones : it also developed a strategy for distributing the costs of these projects. In August 1873, the Meiji government classified roads into three types in conformance with the "Rivers, Ports, and Roads Repair Regulations", and stipulated the distribution of road construction and management costs. In June 1876, in compliance with Cabinet Notice No. 60, all roads were divided into national, prefectural, and country roads and classified as first, second, or third class. A modern road management system was thus attained just nine years after the Meiji Restoration.

### *Railways*

The history of Japanese railways begins in the last days of the Tokugawa shogunate. Foreigners petitioned for railway construction projects, asking specifically for lines connecting Yokohama, a settlement for foreigners, with the capital Edo, and connecting Kobe, another settlement for foreigners, with Osaka, a large commercial city. Their objective was to enable foreigners in Japan to carry out diplomatic and commercial activities as smoothly as possible. One of

these construction projects, the Yokohama–Edo line (Tokyo was called Edo in the days of the shogunate), had been approved by the Tokugawa shogunate. The Meiji government first cancelled it, but reversed itself in 1869.

British Minister Harry Parks advised the Meiji government to undertake the construction independently. He told the head of the government that railways were instrumental to the centralization of power, and that consequently, it would be expedient for the government to build them by itself. The main aspects of technology, of course, still relied on foreign expertise.

In 1870, with the arrival of technical experts and construction materials from Britain, construction on the line between Tokyo (Shimbashi) and Yokohama commenced. The line was completed in 1872. It was twenty–nine kilometers in length, the journey time was fifty–three minutes, and a train ran both ways nine times a day.

The first Japanese railway relied wholly on British assistance. Construction costs were covered with loans from Britain, and design, surveying and construction also relied heavily on the British technical expertise. Parks recommended his countryman Edmund Morel to the Japanese government as a suitable person to oversee the project. He had been engaged in railway construction in Ceylon. After it was completed, he took on the task of building the railway in Japan, along with another Englishman, John Diack. The two scouted suitable sites for railway construction and directed the Japanese in every aspect of the project including surveying, construction work, and railway service.

Japan subsequently proceeded with railway construction as independently as possible. In 1874, the line between Osaka and Kobe, and in 1877, the line between Osaka and Kyoto went into operation. However, since the costs of railway construction were exorbitant, securing capital proved difficult, and it was not until 1889 that the main Japanese trunk line between Tokyo and Kobe, the Tōkaidō Trunk Line, opened.

The government sanctioned private railway companies from an early stage, and from the 1880s onward, it was these companies that built the regional railways. Both the government and the private companies shared responsibility for the railways. The government took complete charge of the main trunk lines in the center of the Honshū (Tōkaidō, Chūō, Shin'etsu, and Hokuriku Lines), and the private railways administered the rest. Nevertheless, the main railways were nationalized with the growth of capitalism, the Sino–Japanese and Russo–Japanese wars, and the rapid distribution of people and merchandise throughout Japan.



*Telegraphs, telephones, and mail*

Telegraphic instruments were introduced into Japan in 1854, when Commander Perry brought them before the shogunate.

Meiji leaders decided to put the telegraph under government management in 1868. The first telegraph cable was laid between the lighthouse government office and the courthouse in Yokohama in the following year, 1869. The reason why the lighthouse government office was chosen as one of the dispatching places was because the government entrusted Henry Brunton to recommend an expert on telegraphic technology, and Brunton himself had been employed to construct lighthouses. Brunton travelled all over Japan making a survey of sites suitable for lighthouses, and advised the government on their actual construction. He was a Scotsman, and he introduced a fellow countryman, George Miles Gilbert, as a telegraphic technician. Under Gilbert's direction, a public telegram service began between Tokyo and Yokohama in the same year, 1867.

At first, the administration of telegraphs was controlled by three ministries: the Ministry of Foreign Affairs, the Ministry of Finance, and the Ministry of Civil Affairs. In 1870, management was centralized under the jurisdiction of the Department of Industry. The Meiji government came into existence in an age when transportation and communications were developing on a worldwide scale. One of its most urgent tasks, therefore, was to establish a communication system on a par with the Western powers. An international submarine cable was completed in 1871 between Shanghai and Nagasaki; the telegraph cable between the capital Tokyo and Nagasaki went into operation in 1873.

In 1875 the main trunk line was completed connecting Sapporo, the main city in Hokkaido, with Nagasaki. Subsequently, a regional telegraphic network was built up, and by 1882 a telegraphic network connecting all the major Japanese cities was complete. In the early stages telegraphs were chiefly used to dispatch official telegrams, and functioned to unify the nation as instructions from the central government swiftly reached every district. Since the telegraph was a means of communications transplanted from the West, there was no alternative but to rely on the technological expertise of foreign technicians. At first, it was these technicians—George Miles Gilbert, Edger George and about ten other experts from Britain—who took charge of telegraphic construction. But, as with other modern technologies, Japan, in this field also, soon built up its own technology and was able to complete a telegraphic cable independently.

Telephones were first introduced in 1877. After a long discussion as to whether telephones should be privatized or put under government management, in 1889 it was finally decided to put them into operation under government

control. In the case of the telegraph, the choice of national management was quickly decided. The telephone, by contrast, was perceived as supplemental to the telegraph. In 1889, twenty years after the telegraph, a public telephone switchboard service connected Tokyo and Yokohama. In 1893, a telephone switchboard service commenced between Tokyo and Kobe, and long-distance telephone calls could be placed between Tokyo and Osaka by 1899.

For the time being, however, long-distance communication was almost always carried out by telegraph, and the telephone developed chiefly as a means of short-distance communication, with local calls making up its core.

As for mail, the American mail system was helpful at the outset. Since, however, it was a system which didn't necessarily require advanced technology, it was possible to establish a mail system independently, to supplement the courier system already in existence. Moreover, implementation of the new mail system was bolstered by the creation of new roads and railways. It can be said that mail delivery was one of the prime beneficiaries of the overall development of transportation and communication.

### **Conclusion**

How did communications in Japan change as a result of modernization? Since there is insufficient time to explore this subject at length, I should briefly to consider just the case of correspondence by letter (official, commercial, private).

The improvement in the time it took mail to travel throughout Japan can be easily read from Table 6. This lists the number of days it took letters to get from Tokyo, located nearly in the center of Japan, to the other main cities. We see from the table, that in 1873 it took seventeen days for mail to reach Kagoshima in the southern tip of the Japanese archipelago; by 1883, this was cut to twelve days, and by 1885 to nine days. In 1873 it took ten days for a letter to arrive in Akita, in the north of the Japanese archipelago; by 1885, only four. It is of course one-sided to judge the development of transport and communications in terms of time reduction alone, but such numbers give us a general idea of how much was achieved in transport and communications in just the first decades of the Meiji government.

Nevertheless, it wasn't simply the introduction of Western technology and its speedy assimilation, which accounts for the modernization of transport and communications. When we consider how Japan changed from the mid-19<sup>th</sup> century onwards, we cannot forget that the new developments drew upon earlier structures and traditions. Here is another quote from Kaempfer :

**Table 6** The number of days it took for mail to arrive at the main cities (from Tokyo)

PREFECTURES	1873 (M 6)	1883 (M 16)	1885 (M 18)
A O M O R I	12	10	—
I W A T E	10	7	4
A K I T A	10	8	4
FUKUSHIMA	6	4	2
T O K Y O	2	—	—
KANAGAWA	3	1	1
A I K A W A	10	—	6
I S H I K A W A	10	7	3
K Y O T O	8	4	3
O S A K A	8	4	3
WAKAYAMA	9	6	3
H Y O G O	8	4	3
T O T T O R I	11	7	4
HIROSHIMA	11	7	5
F U K U O K A	14	9	7
N A G A S A K I	14	11	7
KAGOSHIMA	17	12	9

It is scarce credible, what numbers of people daily travel on the roads in this country, and I can assure the reader from my own experience, having pass'd it four time, that *Tokaido*, which is one of the chief, and indeed the most frequented of the seven great roads in Japan, is upon some days more crowded, than the publick streets in any the most populous town in Europe. This is owing partly to the Country's being extremely populous, partly to the frequent journies, which the natives undertake oftner than perhaps any other nation either willingly and out of their own free choice, or because they are necessitated to it.<sup>3</sup>

Kaempfer reminds us of how frequently people travelled within the Japanese archipelago already by the end of the 17<sup>th</sup> century. These travelers were not limited to the privileged classes and the wealthy, but included the common people as well. Most travels took the form of religious and economic pilgrimages, but the fact that even commoners travelled seemed remarkable to Kaempfer. He writes about an incident on the outskirts of Kyoto :

We met here a great multitude of people, men and women, most on foot, some few on horseback and sometimes two or three mounted on one beast. There were not a few beggars among them. They are all pilgrims, some going to, some returning from *Isje* (Ise), a famous place situated at the south

end of Province of that name.<sup>4</sup>

Men and women, and even beggars circulated throughout Japan in large numbers. Their peregrinations moreover were not necessarily confined to religious activities, and typically had significant recreational and educational dimensions to them as well. Why did the Japanese move around so? Economic activity is one reason. But I believe that curiosity was also an important factor. People moved about not only in search of better food, better employment, or better housing. They were driven by curiosity as well.

People have a desire to travel; that is to say, people travel out of curiosity. Travel has been described as “the satisfaction of one’s curiosity accompanied by physical movement.” With this in mind, it can be considered that the modernization of transportation and communications in Japan was built upon the Japanese zest for travel, that is, their curiosity. This curiosity, moreover, also shaped the reception of Western technology, enabling the Japanese rapidly to master Western techniques and pass beyond reliance on foreign experts. In sum, the modernization of transport and communications was achieved by the assimilation of new technology into a culture already primed for novelty and change.

#### Notes

1. E. Kaempfer, *The history of Japan*, (London, 1727), 403.
2. “Hired foreigners – an outline” (Kashima Research Institute Publishing, 1968).
3. E. Kaempfer, 429.
4. *Ibid.*, 494–5.