

Rail Delivery Group



Country Profiles – Japan

The Williams Rail Review

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As part of a series of comparative studies of international rail systems, this document profiles railways in Japan. The document outlines how rail services are delivered in Japan and provides an analysis of strengths and weaknesses of the system. This analysis is also contextualised so the reader can make appropriate comparisons with Great Britain (GB).

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Executive summary

Japan is the most notable global railway example of a model with multiple, regional vertically integrated operators when its previously singular Japan National Railways structure was split into six separate geographical vertically integrated railways and a freight operating business following reforms and the start of the process of privatisation initiated in 1987. The reform and privatisation were undertaken to:

- Improve efficiency and reduce subsidy
- Better meet local customer needs
- Attract private sector investment
- Make the railways relatively free of political interference
- Improve on the poor industrial relations

Japan is often cited as a good comparator for rail due to its punctuality and bullet trains, or Shinkansen. These comparisons will be made, but there is important context as to why and how some of Japan's achievements are made.

Geography and demography

The country is surrounded by sea, and a large part of the land is covered by mountains. Accordingly, many cities are located along the coastlines. These geographical characteristics are highly suitable for rail transport. Dense, urban populations in Japan mean that, as in London, driving a car to work in heavily congested areas is so difficult, mass transit is the only viable alternative. Japan has some very large metropolitan areas where this is the case such as Tokyo, Nagoya, Osaka, and Fukuoka. This helps drive Japan's rail usage and the high mode share (33% for passenger km) in the world.¹

It has been suggested that highly dense populations and the extremely strong commuter demand in metropolitan areas are the reasons why vertical integration and geographical separation was the structural option chosen in Japan. The geographical divisions were chosen such that around 95% of trips would be entirely within the regional boundaries of the six vertically integrated railways.

Financing

Japan had very high economic growth in the late 1950s and early 1960s where annual growth was around 10%². During this time there was significant investment in rail, which led to the development of Shinkansen and the diversification of Japanese railway's portfolio (including income generating property) which gave rail a good foundation when it had to reform during the 1980s.

In the late 1980s Japanese railways had to reform to respond to its decline. At this time the Japan National Railway (JNR) had ¥3.7 trillion debt (circa £255bn). The government took on 60% of this debt and the remaining 40% was allocated to the three main-island railways JR East, JR Central and JR West. This gave the railways a firm footing to succeed.

These three companies, along with a number of other private railways, are financially self-sufficient, covering all their debt financing, operating and maintenance (including replacement) costs. They also contribute partly to the cost of new lines through an infrastructure rent fee. This is mainly due to the very high passenger numbers and hence revenue generated. Another reason for this strong financial performance is that of revenues are derived from non-railway activities such as housing development, shopping centres at stations, hotel management, tourism, and the operation of other modes of transport

¹ EP TRAN Committee, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI\(2016\)585900_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI(2016)585900_EN.pdf)

² EJRCF, http://www.ejrcf.or.jp/jrtr/jrtr37/f16_mor.html

such as buses. For example, in JR East, one of Japan's six railway divisions, more than 47% of its revenue came from non-rail related activities such as hotels³.

Infrastructure

The way Japan's infrastructure has developed means that there is competition on parallel lines between the JR companies and private railways in many urban areas and on some long-distance routes (e.g. Osaka to Kyoto). This allows Japan to reap benefits of competition whilst in a vertically integrated structure.

Culture

The importance of punctuality is deeply engrained in Japanese culture⁴. This creates a culture within railway companies for punctuality where staff rarely arrive late for work and are highly conscious of how their job relates to punctuality. Some Japanese colleagues of operators in GB have said that culture is more important than structures in delivering a successful railway.

There are also different approaches to things like crowding. Japanese railways and subways employ "pushers" or "oshiya" to literally cram people onto crowded trains. The practice is fraught with dangers at the platform train interface, such as injury and sexual assault. This is a practice unlikely to sit well with commuters in Britain as a method of increasing capacity!

Conclusions

We would offer the following observations from the Japanese model:

- Geographical vertical integration is enabled by the vast majority of trips being made within the railways' geographical boundaries. Whilst there are some relatively self-contained parts of the network in Great Britain (GB), any geographical separation would still inevitably involve a significant amount of cross-boundary traffic.
- Competition in this structure remains very important, whether that be competition on parallel railway lines or regulatory comparative competition.
- The private sector railways have brought a strong focus on cost control and efficiency as well as innovation.
- The companies have significant commercial freedom particularly in relation to service levels.
- The strong financial position of the three main Island companies is due to very high passenger numbers and revenue (helped by geographical characteristics) but is also helped by significant non-rail related revenues, and also enabled by the three main island railway companies acquiring only 40% of JNR's debt at privatisation.
- High levels of punctuality are helped significantly by having a segregated high-speed network and is deeply engrained in Japanese culture.

³ JR East Annual Report, https://www.jreast.co.jp/E/investor/ar/2018/pdf/ar_2018-04.pdf

⁴ The Telegraph, why is Japan so obsessed with punctuality, <https://www.telegraph.co.uk/travel/destinations/asia/japan/articles/why-japan-so-obsessed-with-punctuality/>

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Introduction to international comparators

There is no templated model for organising railways in an optimally efficient, customer-focussed and safe way. Indeed, all structures are made up of a series of policy choices and trade-offs. Furthermore, the comparative statistics alone only tell us one part of the story; there are lies, damned lies and statistics. Fantastic comparative punctuality tells you nothing of the cost of achieving it. In the same way, it is impossible to say that a particular industry structure is a direct causal factor in achieving efficiency.

As such, these profiles are intended to paint a picture of possibilities and the strengths and weaknesses of the plethora of systems operated internationally. However, they cannot be understood in isolation. The social, geographical, financial and political context are critical to understanding why some systems work well and their limitations when adopted overseas with different counter-variables.

Where possible, this context has been provided, but all comparators should be viewed with an appropriately critical eye. Furthermore, overlaid on this is the issue of an appropriate model for the appropriate market segment.

The rail industry in Great Britain (GB) is made up of many different markets. The intercity market operates between major cities and is typically related to the East Coast, West Coast, Midland and Great Western mainlines (ECML, WCML, MML, GWML respectively). The urban, suburban and regional markets are for commuters or middle-distance railways with a mixture of cost covering and non-cost covering services. A typical route for this category would be Southern, serving commuters into and out of London. Finally, there are relatively self-contained markets, like in Scotland where there is a single dominant operator providing the majority of services.

This mixture of markets exists in other countries. Some have tailored their structures and commercial models accordingly, whereas others have applied a single model to the whole system. Some of the examples presented in this document are not always suited to different market segments, geographies or demographic contexts. For example, the successful open access route run by Nuovo Trasporto Viaggiatori (NTV) in Italy might be unsuited to the London commuter market. Equally, the single operator model running on the highly saturated Dutch market would not be able to reap the benefits of competition on our long-distance commercial mainlines.

In this context, RDG is approaching the Williams Rail Review by examining the markets contained within the industry as well as cross-cutting issues. Where possible these markets and horizontal workstreams and themes will be cross-referenced.

RDG's Approach to the Williams Rail Review

RDG has developed six principles to measure success against for the Williams Rail Review. These will be used to assess the country comparisons. The principles are as follows:

1. **Put customers at the heart:** ensuring that all parts of the railway, including the supply chain, work together to deliver for customers now and for generations to come
2. **Increase accountability:** building on the solid safety record, deliver a structure for the railway that creates confidence in its leadership, improving coordination in the way services are delivered and decisions are taken, and making it clear where the buck stops when things go wrong
3. **Deliver value for money:** managing costs for passengers, freight customers and taxpayers, with a sustainable supply chain

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4. **Unlock economic growth:** boosting innovation with private investment enabling the railway to expand; growing and rebalancing Britain's economy, and be environmentally sustainable
5. **Strengthen communities:** ensuring communities across the country benefit from a vibrant, growing railway
6. **Inspire our people:** ensuring that people working in rail have fulfilling careers and a greater stake in the railway's long-term success

Underpinning all of this is a focus on getting the basics of performance, capacity and fares right.

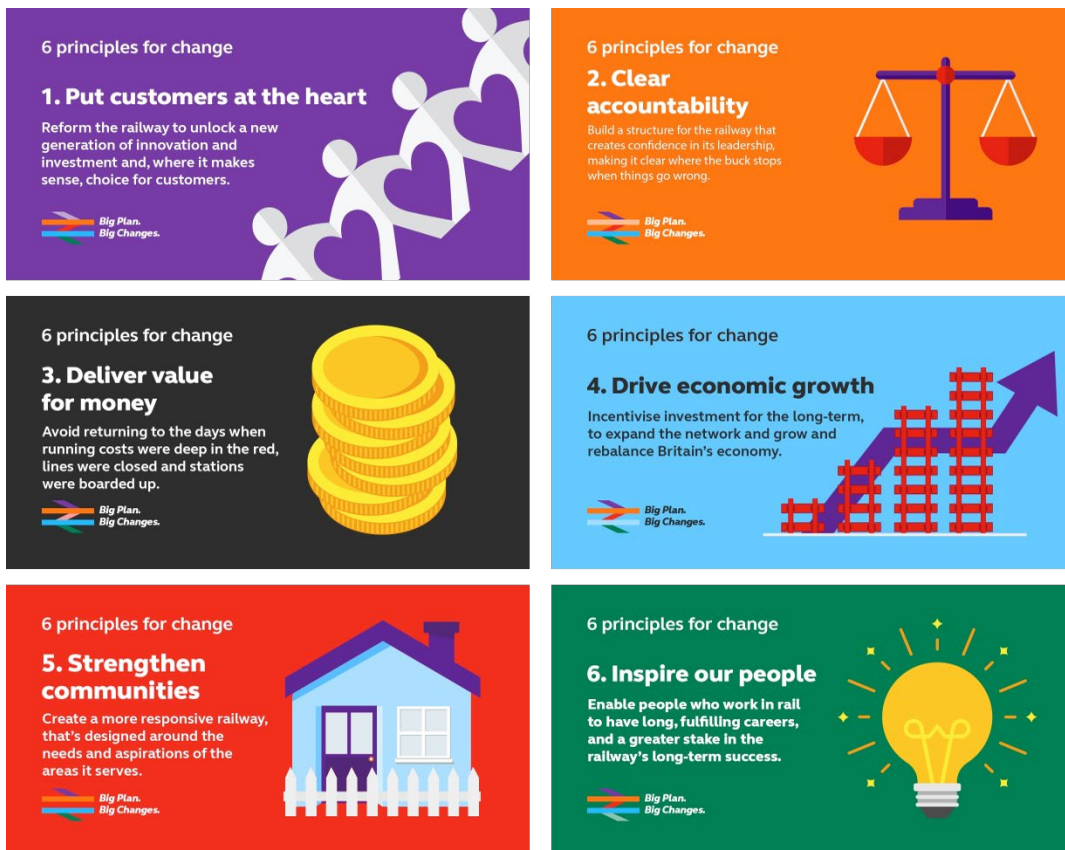
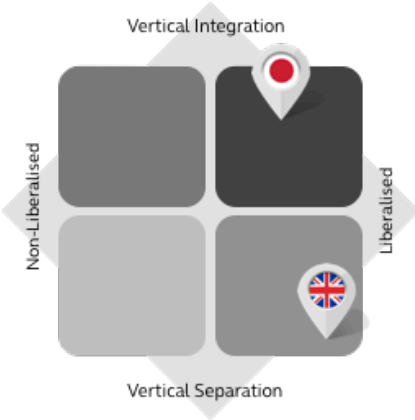


Figure 1, RDG's six principles

- **Population:** 126.8 million
- **Network:** 27,000km
- **Network electrified:** 74%
- **Freight tonne km per year:** 21bn
- **Freight modal share:** 5%
- **Passenger km:** 414bn
- **Passenger modal share:** 33.8%
- **% Revenue from farebox:** 62%
- **Direct Employees:** 161,000
- **Passengers killed last 5 years:** 1



- Geography**
- Cities on coastal lines
 - Large metropolitan areas
 - Dense population
- Financing**
- Debt written off
 - Low interest loans
 - Loss-making services closed rather than subsidised
- Infrastructure**
- Parallel lines allow benefits of competition to be realised with vertical integration
 - Dedicated high-speed
- Culture**
- Approaches and attitudes to punctuality and crowding

Weaknesses

- Freight
- Intermodal competition
- Rural services

Japan

factors that enable

Strengths

- High-speed services (Shinkansen)
- Punctuality
- Commercial freedom
- Funding



6 principles for change

6. Inspire our people

Enable people who work in rail to bring long, exciting careers and a greater stake in the railway's long-term success.

6 principles for change

4. Drive economic growth

Investment for the long term, to expand the network and grow and rebalance Britain's economy.

6 principles for change

5. Strengthen communities

Create a more resilient railway that's designed around the needs and aspirations of the areas it serves.

6 principles for change

1. Put customers at the heart

Refresh the railway to unlock a new generation of passenger and investment and where it makes sense, choice for customers.

6 principles for change

2. Clear accountability

Make a change to the way that responsibility is exercised, so that it goes from the back into the front of the railway.

6 principles for change

4. Drive economic growth

Investment for the long term, to expand the network and grow and rebalance Britain's economy.

Introduction to Japan's railways

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In the late 1980s Japanese railways had to reform to respond to its decline. At this time the JNR had ¥3.7 trillion debt (circa £255bn). The government took on 60% of this debt and the remaining 40% was allocated to the three main-island railways JR East, JR Central and JR West. This gave the railways a firm footing to succeed.

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There are also different approaches to things like crowding. Japanese railways and subways employ "pushers" or "oshiya" to literally cram people onto crowded trains. The crowding also pushes up the revenue capability of a single train. However, the practice is fraught with dangers at the platform train interface, such as injury and sexual assault. This is a practice unlikely to sit well with commuters in Britain as a method of increasing capacity!

About the Japanese network

Structure

In response to major financial and efficiency pressures, the state agency Japan National Railway (JNR) was divided into six regional, vertically integrated passenger companies (JR Hokkaido, JR East, JR Central, JR West, JR Kyushu, and JR Shikoku – known as the JRs) and one nationwide freight company (JR Freight) in 1987.

Three of the JR companies (JR Central, JR East and JR West) were progressively privatised, between 1993 and 2006, and are now privately owned, joint-stock companies listed on the Tokyo Stock Exchange. Up to one third of the shares are held by foreign bodies. None of the three companies receive state subsidies. The Shinkansen line, being almost insolvent, was privatised and geographically divided. Ownership of each of the lines was distributed to the three private operators according to geographic location; though there is still some cooperation between these companies to provide Shinkansen services. In October 2016, all the shares of JR Kyushu were also listed.



⁷ JR East Annual Report, https://www.jreast.co.jp/E/investor/ar/2018/pdf/ar_2018-04.pdf

⁸ The Telegraph, why is Japan so obsessed with punctuality, <https://www.telegraph.co.uk/travel/destinations/asia/japan/articles/why-japan-so-obsessed-with-punctuality/>

Figure 2, Japan rail regions

The state has retained ownership of JR Hokkaido and JR Shikoku but the remaining government-owned passenger railways represent only a small share of total passenger kilometres. These public enterprises nonetheless act as private operators and seek to earn a profit like private companies. However, neither have been profitable and they receive public subsidies.

The six JR passenger lines own 87% of all Japanese railway track. The remaining 13% is divided among other privately-owned railways, which operate mainly as regional commuter lines. Freight services are a secondary user and are provided by a company which does not own track infrastructure of its own. Tracks run in parallel, but in only in very few cases do tracks of different passenger lines overlap. Intra-modal competition is therefore very low. Only in urban regions, such as the suburbs of Tokyo, does intra-modal competition arise from other privately operating railways that focus on regional transport. The main competition thus stems from inter-modal competition (i.e. road-based transport).

The government has a role in jointly planning rail infrastructure with private operators and approving the fares set by the JRs. The safety regulator is the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

JNR reform

As introduced earlier, the JNR was reformed in April 1987. Through this process, the railway network was divided according to regions, and six independent passenger companies were established. Although the Shinkansen Holding Corporation (SHC) (a government agency) owned the infrastructure of the Shinkansen lines at the time of reform, the passenger companies owned the assets of conventional lines. In 1991, the three passenger companies bought the Shinkansen lines infrastructure from the SHC. Thus, regarding the assets built during the JNR era, each passenger company subsequently owned the infrastructure of both the Shinkansen and conventional lines.

The JNR reform predicted that the railway operation of the three passenger companies on Japan's main island (Honshu) would be profitable. Thus, JR East, JR Central, JR West along with JR Freight started their management succeeding the JNR's liabilities. Then, as mentioned above, the three companies in Honshu purchased the infrastructure of the Shinkansen lines. As a result, these four companies held 14.5 trillion yen in total liabilities and have been, since then, carrying out their management repaying the allocated liabilities.

In contrast, it was predicted that the operation of the other three passenger railway companies on Japan's smaller island would become unprofitable. Thus, to incentivise management and avoid paying annual subsidies, the government allocated Management Stabilization Funds to these companies. At the time of the JNR reform, JR Hokkaido, JR Shikoku and JR Kyushu received 682.2, 208.2, 387.7 billion yen respectively.

In the freight sector, a single nationwide company (JR Freight) was established since, different from the passenger sector, the general distance travelled by freight transport is much greater and freight trains usually cross the borders which demarcate the networks of divided passenger companies. Another distinct characteristic of the JNR reform was that it was designed so that JR Freight could access the trunk lines owned by the passenger companies. The background to this design of the railway reform was that freight rail transport had been unprofitable during the JNR's history. Although it was essential to cut excess cross-subsidies between the passenger and freight sectors and terminate irrational reliance between the two, it was also important to achieve sustainable management of JR Freight. Thus, JR Freight was released from infrastructure maintenance responsibilities for the purpose of reducing its operational costs. Also, track

access charges were set at relatively low levels, namely ‘avoidable costs,’ aiming to shoulder only those inherent to freight rail transport.

The JNR reform was one of the most serious items on the political agenda in Japan in the 1980s. To implement the reform, several issues needed to be solved. For example, by the 1990s, 83 unprofitable local lines had been separated from the JNR/JRs’ network to make the management of JRs sustainable. However, the most serious issue had to do with long-term liabilities and surplus personnel.

As noted above, the JNR’s long-term liabilities had accumulated to 37.1 trillion yen. To settle these liabilities, the government agency called the JNR Settlement Corporation (JNRSC) was established and succeeded 25.5 trillion yen⁹. JNRSC made efforts to refund the succeeded liabilities by means such as selling shares of JRs and selling surplus land not required for railway operation. Despite its efforts, the JNRSC could not refund all the liabilities, and it dissolved in 1998. As a result, 13.8 trillion yen was transferred from JNR’s long-term liability to a national debt.

Regarding the issue of surplus personnel, the JNR employed 277,020 workers as of April 1986. It was estimated that there would be approximately 93,000 excess personnel after the JNR reform¹⁰. The government approached this issue by establishing a Surplus Personnel Reemployment Measures Headquarters and enacting a special law which requested active cooperation from various national sectors to employ them. As a result, the new railway companies reemployed 203,000 workers while the others changed jobs or retired.

Newly established JRs could focus their market and started to provide transport services appropriate for each region. The freight sector had previously been loss-making in the JNR era, the serious downturn trend since the 1970s has been reversed and the traffic volume (tonne-km) has become stable. Since termination of the cross-subsidy to the freight sector it has been possible to re-invest profit to improve passenger services. While the transport volume (passenger-km) decreased 6% in the decade prior to JNR reform, the trend changed significantly, increasing to 27%, in the decade after the reform. Following the business model of other Japanese private railways, JR passenger companies also commenced affiliated business, actively utilising and developing the space in and around the stations. It is common now, especially around large stations, for group firms of JR passenger companies to promote various kinds of affiliated businesses utilising the external economy associated with railway operations, revenue of these business activities has been increasing.

The three JR companies in Honshu have been in the black and bear the cost of infrastructure and the burden of the allocated JNR liabilities. As planned, all shares of JR East, JR West, and JR Central were listed in 2002, 2004 and 2006 respectively. By contrast, JR Kyushu’s railway operation segment has been making losses. However, the company increased their revenue through affiliated businesses and, as a whole, has been in the black. In October 2016, all shares of JR Kyushu were also listed, and its Management Stabilization Funds were liquidated by paying railway-related expenses such as the advance payment of lease fee for the Shinkansen infrastructure, which was constructed after the JNR reform. As shown by these cases, the JR companies improved rail services and developed affiliated businesses as well. Additionally, they have promoted their businesses based on the schemes planned in the JNR reform without receiving annual subsidies from the government.

The results of the JNR reform have, according to Kurosaki, been “outstanding” because of increasing transport volume, productivity, and sustainable management of the JRs, who have focused on their markets and specific regional needs¹¹. Although the transport volume (passenger-km) decreased 6% in the

⁹ Network Industries newsletter, 18(4), 8-11

¹⁰ Ibid

¹¹ Kurosaki, F. (2016) Reform of the Japanese National Railways, Network Industries newsletter, 18(4), 8-11

decade prior to JNR reform, the trend changed significantly, increasing by 27%, in the decade after the reform. According to Kurosaki “this success can mainly be attributed to privatisation and regional division, both of which solved the problems underlying JNR’s failure”¹².

Interaction of JRs

Passenger through-trains are operated with a clear separation of operational responsibilities at the border station between the companies. Through-train passenger services were common among Japanese railways and were also introduced among JRs. However, different from open access in EU countries, each company takes responsibility for both train operation and infrastructure management, as noted above. In general, drivers change at the border station and drive trains on their company’s track only. However, there are some exceptional operations in cases where changing crews is practically difficult at the border or where one railway is too small to hire and provide the necessary training for the drivers¹³.

As this example shows, a fundamental policy in Japanese passenger railway operation is the clear separation of operational responsibilities at the border station. Some argue this has contributed to smooth, efficient and safe passenger train operation in Japan, but it is difficult to see how this could be transposed to the GB situation.

Rolling Stock

The JRs own their own rolling stock. Some go further and have a direct interest in the manufacturers. JR Central have a majority shareholding of Nippon Sharyou, a subsidiary that builds their trains, giving greater control over design, upgrades and maintenance, as well as large financial benefits in comparison to the UK’s lease-based structure.

This type of integration, not only of track and train, but of the supply chain is common in Japan. This is largely possible because of the long-term interest the JRs have as they do not have contracts that may be terminated.

Fares

Before a service starts a fare must be approved by the Japanese Transport Ministry (MILT). The operator chooses an upper limit and MILT approves it. The criteria for the approval are, fare does not exceed the appropriate cost, plus appropriate profit under efficient operation. The railway operator can then set fares up to that limit¹⁴.

By distance fares are comparable to Britain, a 450km journey costs about £95 in Japan and £100 in Britain. That said, the service is considerably faster in Japan at 2 hours 8 minutes compared with 3 hours 41 minutes.

Long-distance services in Japan such as bullet trains have a unique fares system which require customers to hold two fares. In addition to the basic fare (which covers the distance to be travelled), customers must purchase either a reserved or unreserved seat supplement. Similar to GB rail, if travellers on a more flexible unreserved seat supplement outnumber the available seats in the unreserved coaches, it means that passengers must stand.

However, in a number of Japan’s long-distance services, coaches with reserved seating offer a higher quality travel experience and as such, customers are incentivised to book a reserved seat.

¹² Ibid

¹³ A study of vertical separation in Japanese passenger railways, <https://reader.elsevier.com/reader/sd/pii/S2213624X17302845?token=390821B340044C8F03B61E8AEED3F6142F555EAD9914C3E51C2AAAB2AEB84E0152C01319F8E55992BD9EC6C681603253>

¹⁴ EJRCF, http://www.ejrcf.or.jp/jrtr/jrtr37/f16_mor.html

Despite the Japanese rail system being notorious for overcrowding in dense metropolitan areas, fares do not typically differ between peak and off-peak. As rail transportation is so widespread in metropolitan areas, firms are encouraged to allow flexible working hours to spread peak traffic as much as possible.

The network in numbers

Comparator	Japan	UK* ¹⁵ unless noted otherwise
Population (million) 2017	126.8 ¹⁶	65.809
GDP (Nominal) trillion € 2016	4.34 ¹⁷ (ER used 22/11)	2.3958
Network Employees (UK includes direct supply chain)	161,000 direct employees approx	240,000
Network KM (electrified %) 2016	27,000 (74%) ¹⁸	16,253km (33.7%)
Passenger km per year 2016 (modal share)	414bn (33.8%) 2014 ¹⁹	68bn (8.7%)
Number of passenger operators	211 ²⁰	20
Number of stations	8579	2317 ²¹
Regional and local punctuality % on time	See below**	89.7% (5 minutes) ²²
Long distance punctuality % on time		91% (10 minutes) ²³
High and Good Satisfaction %	-	75% ²⁴
Freight tonne km per year 2016 (modal share)	21bn (5%) ²⁵	17.1bn (4.7%)
All train km (% passenger/freight)	-	565.6 (94/6) ²⁶
Infrastructure investment €bn (enhancements)	-	9018 (41%) ²⁷
Maintenance and enhancement spend thousand € per km	-	327
% Farebox revenue	62% ^{28***}	92% ²⁹
Passengers killed in railway accidents 2013, 2014, 2015, 2016, 2017	0, 0, 0, 0, 1 ³⁰	0, 0, 0, 0, 0

* European Union (EU) Commission stats include Northern Ireland (NI) but exclude the Channel Tunnel

** It is very challenging to find publicly available punctuality statistics. Statistics released in January 2018 found that punctuality around Tokyo was declining and some further punctuality statistics were released (in Japanese). These were incorporated into a 2018 UCL comparison of UK and Japanese railways³¹.

*** By distance fares are comparable to Britain, a 450km journey costs about £95 in Japan and £100 in Britain. That said, the service is considerably faster in Japan at 2 hours 8 minutes compared with 3 hours 41 minutes³².

¹⁵ EU Transport Statistical Pocketbook, <https://ec.europa.eu/transport/sites/transport/files/pocketbook2018.pdf>

¹⁶ World Bank, <https://data.worldbank.org/country/japan?view=chart>

¹⁷ World Bank, <https://data.worldbank.org/country/japan?view=chart>

¹⁸ EP TRAN, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI\(2016\)585900_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI(2016)585900_EN.pdf)

¹⁹ EP TRAN, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI\(2016\)585900_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI(2016)585900_EN.pdf)

²⁰ EU-Japan Centre for Industrial Competition, https://www.eubusinessinJapan.eu/sites/default/files/railway_market_in_japan.pdf

²¹ RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

²² RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

²³ RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

²⁴ RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

²⁵ EP TRAN, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI\(2016\)585900_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI(2016)585900_EN.pdf)

²⁶ Train km in themselves do not always denote success. British freight operators have reduced train km by increasing length and payload, making more efficient use of scarce capacity. https://www.raildeliverygroup.com/files/Publications/2018-06_rail_freight_working_for_britain.pdf

²⁷ RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

²⁸ Calculated as an example from JR East operational and ticket revenues, 2018 Annual Report,

<https://www.jreast.co.jp/E/investor/ar/2018/index.html>

²⁹ RMMS 2016, https://ec.europa.eu/transport/modes/rail/market/market_monitoring_en

³⁰ <https://abcnews.go.com/International/story?id=81911&page=1>

³¹ Comparing railway systems in the UK and Japan from the view of their punctuality, <http://dajf.org.uk/wp-content/uploads/Daiwa-Seminar.pdf>

³² Tokyo to Kyoto compared with London to Newcastle.

Strengths

Shinkansen 新幹線

Japan's high-speed Shinkansen trains are an undoubted success. Trains run at up to 320kmph on 2,764km of dedicated network serving Japan's largest metropolitan areas. In addition to being quick, these trains are safe and punctual. The average delay in 2016 in the Central region was 24 seconds, including incidents beyond the control of the operator³³. There have been no fatalities on the bullet trains due to train or track failure, although a boy was killed in 1995 when the doors were closed on the passenger crushing him³⁴.

As with the French TGV, it should be noted that part of the success of the high-speed network is access to a dedicated network. There are no conventional or freight services on the lines.

Punctuality

Although statistics are not widely available to the public, it is widely accepted that Japanese railways are highly punctual, with trains measured to the second. The Tokaido Shinkansen in 2012 achieved an average delay of just 0.6 minutes³⁵. Some trains even leave early, and certificates are issued for delayed trains of more than five minutes as employers do not usually accept late trains as a valid excuse.

There are some reports of declining punctuality, but evidence suggest performance is still very high³⁶.

However, this focus on punctuality can reduce flexibility. In an in-depth study comparing the Dutch and Japanese networks the researcher found: "*Although the Japanese are focused on allowing more trains to stop at stations in higher frequency, the Dutch are all about flexibility and higher speed in the proximity of stations (that can ultimately end up disrupting the punctuality of other trains.)*"³⁷.

Furthermore, the culture associated with this punctuality- it is believed- contributed to one of Japan's worst rail disasters. The Amagasaki derailment in 2005 resulted in the death of more than 100 passengers. Rail unions blamed the culture of fear in which employees were "subjected to humiliating punishments for committing minor errors such as arriving seconds late or slightly overrunning platforms."³⁸

Commercial freedom and competition

There is price cap (fares) regulation and the regulator adopts a comparative or yardstick competition approach. Under this scheme, rail operators compete with each other to improve performance, and the regulator assesses the operators' performance by using common measures. The results of this assessment are to be used when fare revision is being considered.

There is no regulatory or legal obligation to maintain a certain level of services, including local services, but communities often negotiate with JR companies regarding the maintenance of local lines and services.

³³ JR Central Annual Report, <https://global.jr-central.co.jp/en/>

³⁴ Japanese times, https://www.japantimes.co.jp/news/2001/03/08/national/railway-to-pay-for-1995-fatality/#.W_cMY6ecY1g

³⁵ JR Central Annual Report, <https://global.jr-central.co.jp/en/>

³⁶ Japan Times, https://www.japantimes.co.jp/news/2018/01/16/national/japans-trains-always-time-report-highlights-frequency-rush-hour-delays-tokyo/#.W_a7IKecYnU

³⁷ Reported in The Washington Post, https://www.washingtonpost.com/news/world/wp/2018/05/17/once-again-a-japanese-train-leaves-inexcusable-25-seconds-early-why-cant-we-have-the-same-problems/?noredirect=on&utm_term=.38e3e5dc5918

³⁸ The Guardian, <https://www.theguardian.com/world/2017/nov/17/japanese-rail-company-apologises-train-20-seconds-early>

Funding

Japan's railways are low subsidy³⁹. However, this does mean that some non-profitable lines are at threat of closure (see weaknesses). The low subsidy is, in part achieved through low interest construction loans offered to the railways⁴⁰.

The Japanese railway has also been highly effective at generating non-rail revenue streams to cross-subsidise services⁴¹. As highlighted in the introduction, this kind of revenue can make up 47% of income. It may be difficult to replicate this in Britain under current conditions according to the Economist:

“But the railway also thrives because of a planning system that encourages the building of commercial developments and housing alongside the railway route. JR East owns the land around the railways and lets it out; nearly a third of its revenue comes from shopping malls, blocks of offices, flats and the like. This money is reinvested in the network. In Britain, where planning and transport are rarely aligned, it is hard to create similarly successful commercial developments. Indeed, most of the plans for the areas around the stations of HS2 are vague, and some of the stops along an earlier line, HS1, are still underdeveloped, years after the line was built.”⁴²

It should also be remembered that the historical writing off of debt has also been highly effective in providing the right financial conditions for a low subsidy network. Furthermore, Japan had very high economic growth in the late 1950s and early 1960s where annual growth was around 10%⁴³. During this time there was significant investment in rail, which led to the development of Shinkansen and the diversification of Japanese railway's portfolio (including income generating property) which gave rail a good foundation when it had to reform during the 1980s decline.

Weaknesses

Freight

Japanese rail freight business is not successful and freight trains struggle to gain reasonable access rights. In 1965 rail freight had 31% modal share, but this has now declined to around 5%⁴⁴. This is, in no small part, due to the lack of focus on rail freight by government and the lack of a mixed-use railway.

Intermodal competition

Japan's railways have failed to grow in recent years in part due to demographic changes but also its failure to respond to intermodal competition, particularly from air. The emergence of cheap overnight buses and low-cost airlines has resulted in the disappearance of the once popular night trains. Mid-2016, the *Sunrise Seto/Izumo* is the country's last surviving regular night service⁴⁵. The graphs below show the range of prices from highest to lowest for certain routes. High-speed railway sits in the middle of the range, but cheaper fares are available on other carriers and low-cost airlines.

³⁹ Railway Technology, <https://www.railway-technology.com/features/featurelevel-playing-field-eu-efforts-to-break-into-japans-rail-industry-4379553/>

⁴⁰ City Lab, <https://www.citylab.com/transportation/2011/10/why-tokyos-privately-owned-rail-systems-work-so-well/389/>

⁴¹ The Economist, <https://www.economist.com/the-economist-explains/2014/06/09/why-japan-leads-the-world-in-high-speed-trains>

⁴² The Economist, <https://www.economist.com/the-economist-explains/2014/06/09/why-japan-leads-the-world-in-high-speed-trains>

⁴³ EJRCF, http://www.ejrcf.or.jp/jrtr/jrtr37/f16_mor.html

⁴⁴ Sweden and Japan comparative study, https://www.trafa.se/globalassets/rapporter/2010-2015/2014/report_2014_12_railway_in_sweden_and_japan_-_a_comparative_study.pdf

⁴⁵ EP TRAN, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI\(2016\)585900_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/585900/IPOL_BRI(2016)585900_EN.pdf)

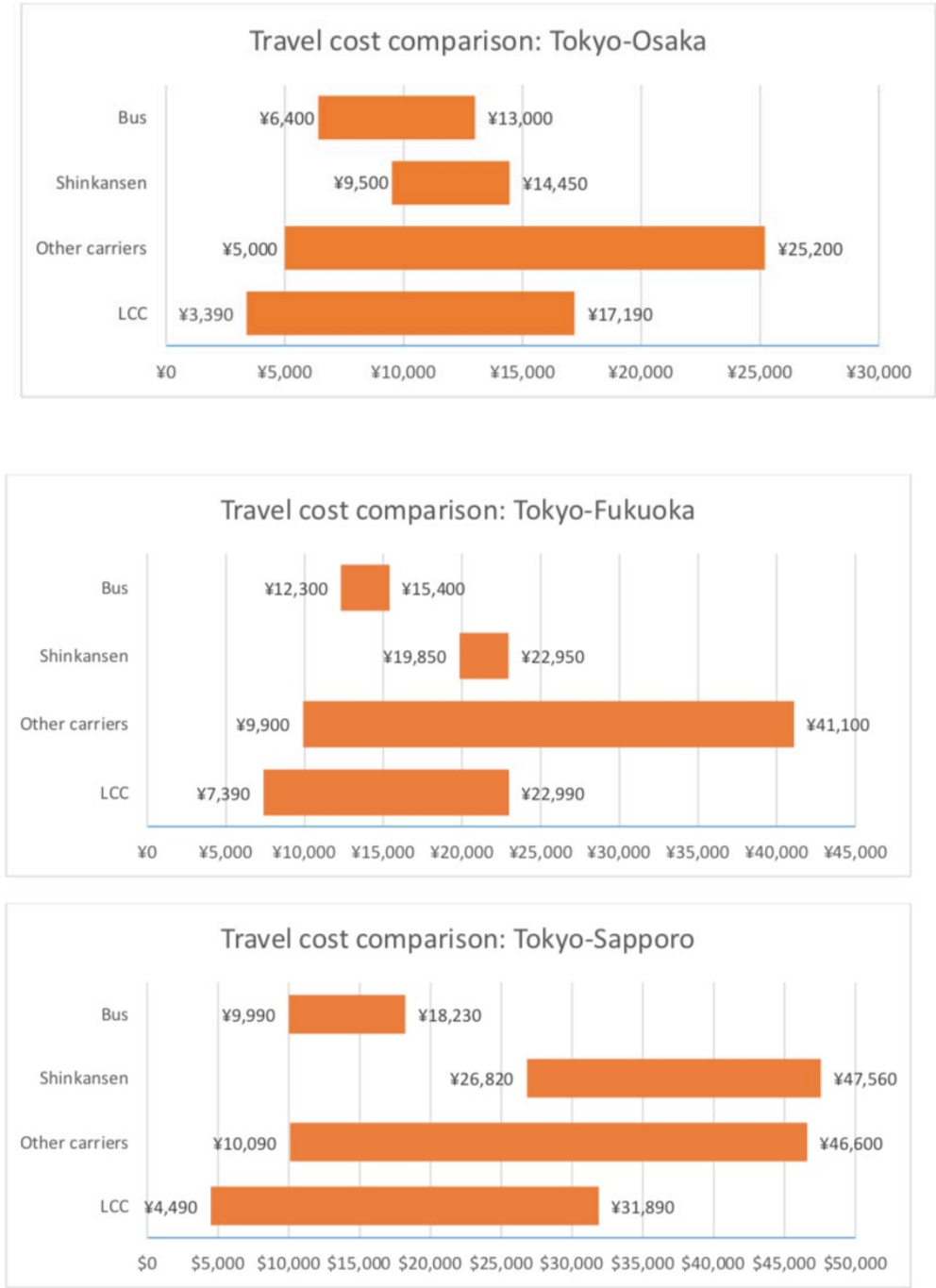


Figure 3, Travel cost comparison⁴⁶

Non-urban services

There is an increasing gap between the rail services offered in urban and rural areas. The large, private or fully privatised, railway operators are concentrated in these areas, where the market is propped up by the shift of the population to larger cities. In the periphery, mostly smaller railway operators, often third sector

⁴⁶ EU-Japan Centre for Industrial Cooperation, https://www.eubusinessinjapan.eu/sites/default/files/railway_market_in_japan.pdf

entities, partly owned by regional or local governments, operate with small profit margins and in many cases losses. Around 70% were loss-making in 2013⁴⁷.

With little tradition in offering railway services in concessions and allowing the larger railways to shift loss-making lines to the government, Japan will most likely see increased consolidation and closing of train-lines in the coming years and a smaller market⁴⁸.

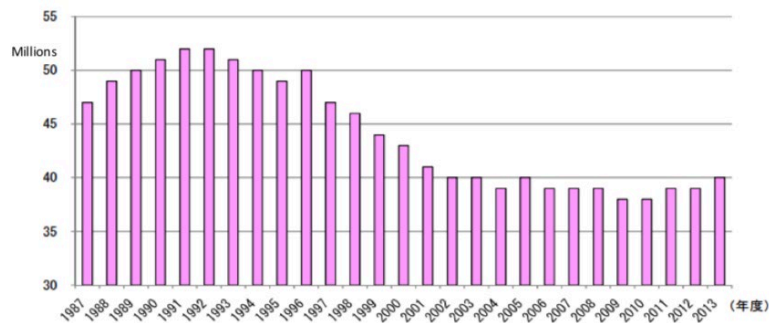


Figure 4, Passenger volumes on local railways⁴⁹

Additional information

Japanese railways have seen many successes and achievements. This is often attributed to vertical integration. However, in a twenty-year study of Dutch and Japanese cooperation on rail participants from the Netherlands did not see their vertical separation to be a barrier to implementing changes to emulate success.

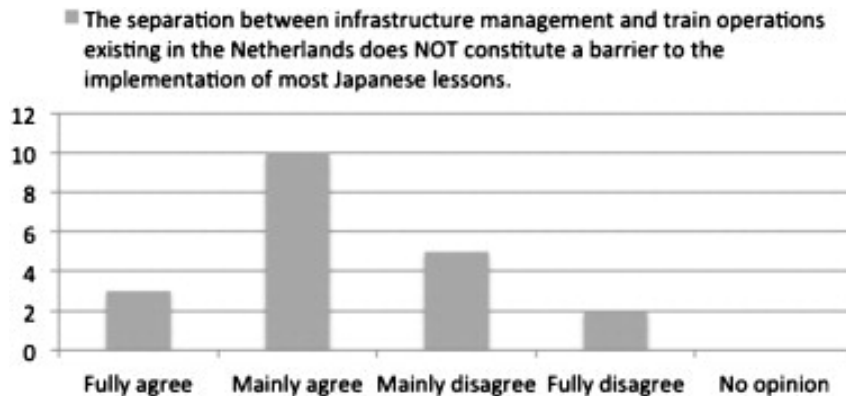


Figure 5, Vertical separation as a barrier to implementing Japanese-style improvements⁵⁰

This is particularly good news for freight who have been one of the main victims of close passenger/infrastructure alignment in Japan.

Nonetheless, it should be noted that this is just one perception from the standpoint of employees of a vertically separated company. GB colleagues who have spoken to Japanese rail employees report that JR employees see integration as integral to their success.

⁴⁷ EU-Japan Centre for Industrial Cooperation, https://www.eubusinessinjapan.eu/sites/default/files/railway_market_in_japan.pdf

⁴⁸ EU-Japan Centre for Industrial Cooperation, https://www.eubusinessinjapan.eu/sites/default/files/railway_market_in_japan.pdf

⁴⁹ EU-Japan Centre for Industrial Cooperation, https://www.eubusinessinjapan.eu/sites/default/files/railway_market_in_japan.pdf

⁵⁰ Learning from the Japanese railways: Experience in the Netherlands, <https://www.tandfonline.com/doi/figure/10.1016/j.polsoc.2013.05.003?scroll=top&needAccess=true>

Conclusions

Japan's reputation for an efficient and punctual railway is well deserved. There is a lot for other railways to aspire to, but the catalysts for this performance are not always those commonly attributed, i.e. vertical integration.

Success against the RDG principles

Principle	Commentary
Put customers at the heart ensuring that all parts of the railway, including the supply chain, work together to deliver for customers now and for generations to come	<p>There is relatively little evidence on passenger satisfaction although strong punctuality and safety will be a positive contributor.</p> <p>It is unclear how much crowding and loss of rural services plays a part in satisfaction.</p>
Increase accountability building on the solid safety record, deliver a structure for the railway that creates confidence in its leadership, improving coordination in the way services are delivered and decisions are taken, and making it clear where the buck stops when things go wrong	<p>There is clear accountability with vertical integration and strong single branding even with different ownership structures.</p>
Deliver value for money managing costs for passengers, freight customers and taxpayers, with a sustainable supply chain	<p>There is insufficient evidence to draw a conclusion.</p>
Unlock economic growth boosting innovation with private investment enabling the railway to expand; growing and rebalancing Britain's economy, and be environmentally sustainable	<p>Japanese railways clearly support its major cities but fails to 'rebalance' the economy with the decline of rural lines.</p>
Strengthen communities ensuring communities across the country benefit from a vibrant, growing railway	<p>Japanese railways clearly support its major cities but fails to 'rebalance' the economy with the decline of rural lines.</p>
Inspire our people ensuring that people working in rail have fulfilling careers and a greater stake in the railway's long-term success	<p>There is insufficient evidence to make a comprehensive assessment. Some informal feedback says that the JRs do a lot to develop the workforce including rotating staff between roles and creating development opportunities to encourage loyalty.</p> <p>However, there are indications that stress and bullying which can drive high-performance leads to illness and in one example multiple fatalities in an accident.</p>
Performance	<p>Excellent.</p>
Capacity	<p>Capacity provision is very good – high capacity trains at high frequencies. However, trains are heavily overcrowded around urban areas with people being pushed onto trains.</p>
Fares	<p>Comparable to the UK (although there is service differentiation)</p>

Glossary

Abbreviation	Definition
BN	Billion
CEO	Chief Executive Officer
ECML	East Coast Mainline
EU	European Union
GB	Great Britain
GWML	Great Western Mainline
JNR	Japan National Railways
JR	Japan Railways
JNRSC	JNR Settlement Corporation
KM	Kilometres
KPH	Kilometres per hour
MML	Midland Mainline
MPH	Miles per hour
MILT	Ministry of Land, Infrastructure, Transport and Tourism
NI	Northern Ireland
NTV	Nuovo Trasporto Viaggiatori (Italian passenger operator)
PSC	Public Service Contract
PSO	Public Service Obligations
RDG	Rail Delivery Group
SHC	Shinkansen Holding Corporation
TGV	Train à Grande Vitesse (French high-speed trains)
UK	United Kingdom
UCL	University College London
WCML	West Coast Mainline