

Department for Transport
**Carriage of Goods on Passenger
Trains**
Final Report

PRO 4/92/77

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Executive Summary

The Context

Utilising spare space on passenger trains provides an opportunity to achieve value for money and reduce the cost to the fare payer as well as taxpayers. It also results in environmental and societal benefits beyond the immediate logistics supply chain by achieving a modal shift from road to rail.

A number of innovations provide useful reference and learning points for this study such as InterCity RailFreight who are carrying goods on passenger rail with East Midlands Trains and Great Western Trains.

Demand

A service proposition will need to align with what retailers want, address the key factors that are important to the operation of logistics providers as well addressing consumers and Train Operating Companies' (TOCs) needs / requirements. Customers, retailers and supply chains require reliable, time sensitive delivery of goods. Medium to long distances provide the passenger rail network with an opportunity to compete with road based deliveries. It is noted that the service needs to be competitively priced.

An assessment of the key drivers identified a number of opportunities alongside barriers / concerns relating to the carriage of goods on passenger trains. The analysis demonstrated that all the barriers / concerns identified could be addressed.

Supply

There is spare passenger capacity on the passenger train network at certain times of the day, which provides an opportunity to transport goods at these times. This network connects cities to cities, which could be integrated with sustainable first and last mile deliveries and therefore provides an opportunity to be a key delivery partner of sustainable city logistics. Stations will need to ensure that they have appropriate facilities to accommodate goods and any services offered.

Using existing space could include the use of vestibules, luggage space or locking off a carriage. Space allocated to non-passenger movement on rolling stock varies according to rolling stock type, which provides some opportunity to transport goods on passenger trains. Adaption of existing rolling stock to provide additional carriages is a further option to be considered on a route by route basis.

Opportunities to utilise passenger rolling stock flexibly provides an opportunity for the carriage of goods; the emerging 42 Technology Adaptable Carriage concept provides an opportunity to achieve this. There is scope to provide additional carriages, however this requires further work to determine viability. Operating passenger trains at night will require co-ordination with Network Rail due to the current use of this time period for overnight maintenance work.

The Market

Goods that could be transported on passenger trains are time sensitive, valuable, and / or important and can easily be transported on passenger trains in terms of weight, accommodation and movement. These goods are transported by the delivery market, including the Next Day and 2 to 3 Day market and the Same Day market. There is also opportunity for niche services, which provide a very specific or bespoke delivery need as well as for retailers.

10% of the Same Day medium to long distance (best suited to passenger rail) total market would equate to £40 million per annum. If viable, opportunities over shorter distances could realise 5% of the market, equating to £30 million per annum. If 1% of the Next Day and 2 to 3 Day market was viable, this would equate to £68 million per annum.

Operational Models

There is not one predetermined operational model for the passenger network. One or several models may be applicable to a TOC, a route and a market:

- Unutilised capacity in passenger carriages – low to medium volumes;
- Unutilised space in non-passenger compartments – low volumes;
- Adapt existing rolling stock design – low, medium or high volumes;
- Additional carriage(s) – high volumes;
- Additional services – high volumes; and
- Adapt future rolling stock design – low, medium or high volumes.

The Next Day and 2 to 3 Day market is not viable for low to medium volume models and would be expected to have a significant impact on station infrastructure, staff requirements as well as passenger experience.

The Retailer market is also not considered suitable for the operational models that provide space for low and medium volumes, with the exception of the model that locks a carriage.

For the Same Day and Niche markets, with the exception of the two models that require adaption to rolling stock, all impacts are considered to be either beneficial or low risk or provide reasonable benefits or manageable risks.

Potential Business Models

There are several potential business models that could be considered by the industry, namely: TOC led; Market led (logistics provider or retailer contracting with TOCs); TOC with carrier; and Specialist company (liaise between TOC, NR, Doodle, carrier).

The TOC led business model would work well for the Niche market. It is considered that the market led business model would work well for the Same Day

and Retailer markets. The TOC with Logistics provider / courier model and the Specialist Company model would work well for all of the markets.

1 Introduction

1.1 Overview

The Department for Transport (DfT) have commissioned Arup to assess the potential market for goods to be transported by passenger trains. Spare capacity on passenger trains presents an opportunity to undertake other value adding activities and there are examples of this operation being used in the UK and other countries.

1.2 Study Objectives

The key objective of this study is to identify the market potential for the carriage of goods on passenger trains and to determine what role (if any) the DfT could usefully play to help exploit this potential opportunity to the benefit of customers.

It is further expected that there will be societal benefits created by improvements to the environment as a result of a modal shift from road based carriage of goods to passenger rail.

1.3 Study Aims

The key aims of the study are:

- To determine if there is a market to move goods by rail on passenger trains or dedicated services; and
- To identify barriers to implementation and what actions, if any, the DfT could take to overcome these barriers and encourage market growth.

There are a number of questions that the study should answer:

- What are the types of goods that could be carried on passenger trains?
- What is the market for goods on passenger trains?
- What is the size of this market?
- How profitable is the market?
- What are the barriers (real or perceived) to implementation for the different stakeholders?
- How could these barriers be overcome?
- What should the role of the DfT be?

1.4 Drivers

The key drivers for exploring whether goods can / should be moved by passenger trains are as follows:

- The need to maximise the revenue income to Britain's railway industry (particularly the TOCs). Most of the TOCs are still supported by DfT funding and empty capacity on the network is an opportunity to generate additional income and reduce subsidy.
- The environmental pressures on transport to reduce emissions and the benefits that such a network could deliver in terms of removing trucks and vans off the road network onto a more sustainable mode of transport. This is particularly true of urban environments, with most of the large UK cities facing EU fines for missing emission targets such that, facilitating deliveries of goods directly into city transport hubs, which could then be distributed on electric vehicles, could deliver substantial benefits. There are also associated societal benefits such as the reduction of noise and accidents.
- The initiatives that Network Rail already has in place to create the '7 day railway', balancing its need to carry out weekend and overnight engineering works with the offer of a continuously available route infrastructure between key conurbations.
- Innovation within the industry to realise benefits to passengers, including the Innovation in Franchising Fund and the FutureRailway Team's 'Tomorrow's Train Design Today', which is looking at opportunities to use passenger rolling stock flexibly through design that reduce costs and carbon emissions whilst increasing capacity and customer satisfaction and are able to be reconfigured to meet different service requirements.
- The increasing cost of last mile logistics. Delivering into cities is becoming harder for the logistics industry with increasing congestion plus many having introduced low emission zones, congestion charging, timed access restriction and pedestrianized zones, which all result in direct and indirect costs for the logistics industry, which are passed onto customers. Cities like Leeds and York are extending their pedestrianized areas and access restrictions, whilst London will be implementing an Ultra Low Emission Zone in 2020. All these changes will improve the business case for moving goods onto passenger rail as it provides an opportunity to reduce the number of vehicles on the road, operate consolidated last mile deliveries and utilise electric vehicles to realise further environmental benefits.
- E-commerce has transformed retailing in recent years, from solely being shop-based to being multi-channel. Consumers today can expect to purchase and receive virtually anything they want, where and when they want it. There has also been an increase in the number of options for customers to collect or receive their goods, including click and collect, whereby customers order online then collect their goods from the store or a local collection point. Deliveries are being fulfilled in a variety of ways; by combinations of light goods vehicles, electric vehicles and cycle couriers. Although ecommerce brings benefits to the customer, who has more choice than ever before, businesses (retailers, carriers, software providers and local authorities) must fulfil increasingly complex and competitive delivery commitments, whilst controlling costs and the customer's experience. The huge growth in e-commerce means that customers, retailers and supply chains require reliable, time sensitive delivery of goods. Depending on the market segment, the key

requirements may be a mix of faster transit time, specialised goods systems, tracking and tracing systems ability and availability, greater flexibility, lower and competitive prices or premium services.

1.5 Study Methodology

This report assesses potential markets, potential operational models and potential business models.

For the four key stakeholder groups (TOCs, retailers, logistics providers / couriers and consumers) key opportunities as well as barriers / concerns are considered.

This report draws upon work undertaken throughout the study.

2 Context

2.1 The Past

The current environment in the UK is one in which most movements of goods have moved onto road transport. For example, Red Star, set up by British Rail in 1973 to move goods on passenger trains, went through a series of management and private sector buy-outs (the last one by UPS in 2005) to end up with a solely road based network. Similarly, English Welsh and Scottish Railway (EWS), which bought the British Rail parcels business on privatisation, and operated dedicated parcels trains up to the 1990s stopped most of its services when it lost its contract with Royal Mail in 2003. These changes have resulted in a passenger network with limited carrying capacity for goods on trains and within the stations.

The following historical operations provide useful learning for the study.

Royal Mail traditionally utilised the rail network for the transportation of high volume parcels and letter post, utilising scheduled passenger and parcels services. However a shift from rail to road in the 1980's and development of new larger sorting hubs reduced the service to longer haul business and led to the closure of most of the dedicated Royal Mail sorting depots located near to main line stations.

From 1996 a dedicated mail and parcel train network (**Railnet**) was launched using newly created Royal Mail hub terminals at Glasgow, Warrington, Stafford, Watford, Willesden, Bristol, Tonbridge, Newcastle and Doncaster – these terminals had higher than normal platforms in dedicated stations to assist in transfer of wheeled containers onto and off trains. Trains also called at intermediate points where containerised mail was loaded from the platforms of normal passenger stations. This service operated successfully for 3 or 4 years, but increasing unreliability of the overnight rail network due to the conflict of Railtrack's engineering activities led to withdrawal of most of the trains. At present a few services still run using Royal Mail's dedicated EMU rolling stock.

Parcel trains continued to be operated on behalf of Parcelforce until the 1990's, utilising standard scheduled services. However from 1990 onwards the remaining services were converted to road transport by the Post Office.

The Post Office Railway, also known as Mail Rail, was a narrow gauge, driverless underground railway in London, built and operated by the Post Office, to move mail between sorting offices. It operated from December 1927 until May 2003 and then mothballed. There are currently plans to convert this to a tourist attraction.

Red Star Parcels was set up by British Rail in 1973. It therefore carried 'special' time sensitive high value goods for a premium rate, as an alternative to the normal main British Rail parcels business, using existing space on passenger trains. Red Star was set up to move parcels in the guard's compartment of passenger trains. Senders could drop off their consignments at selected stations where they were moved on passenger trains to destination station where the parcels were collected by the recipient. The service used express passenger trains and had the slogan 'Send your parcels Red Star and pull out all the stops'.

Utilising scheduled express passenger services, it provided an efficient and reliable service. It was one of the fastest methods of transporting a package long distances across the country. Red Star Parcels also offered an international service, integrating with European connections, which operated from Victoria station in London. It therefore provided a successful service at this time.

City Link, a private company, was established in 1969, to offer a transfer service between London termini. It also introduced the concept of same and next day delivery throughout the UK, utilising Red Star Parcels to transport its parcels between stations from which a City Link would collect and deliver the last mile (rather than the classic Red Star model where customers collected and delivered the consignments themselves). It was highly successful.

British Rail also introduced a door-to-door parcels service (**Night Star**), which eventually led to the downfall of the relationship with City Link. City Link consequently transitioned from rail to road to transport its parcels.

Red Star was niche marketed as part of the wider BR parcels business, which carried goods on dedicated parcels trains round the country, but also on normal passenger services – this contributed to its failure.

2.2 The Present

There are a number of innovations that have been studied, trialled or are operational that provide useful learning for this study.

Since 1890, passenger trains have been used for the delivery of goods in India. **Dabbawala** (see Figure 1) is a lunch box delivery system whereby Dabbawalas (service providers) use a combination of walking, bicycles and trains to collect and deliver lunch boxes to clients. Mumbai's topography (linear) and an extensive rail network facilitated the development of this service. Currently 5,000 Mumbai Dabbawalas deliver 200,000 tiffin tin boxes to offices in Mumbai on a daily basis. This integrates bicycle and on foot first and last mile deliveries and is culturally integrated.

Figure 1 Dabbawala



InterCity RailFreight (formerly 5PL) currently use passenger trains for the movement of a wide range of consignments on East Midlands Trains passenger

services as well as fresh fish from Cornwall on Great Western Railway trains. Security, safety and train performance are key issues that have been tested; there is no impact on East Midlands Trains in terms of delays to trains, impact upon passengers, or damage to property or trains. Trains are fast and frequent on the key routes used and since they are running anyway the cost and emission savings can be significant. It is noted that these are small consignments in totes that fit within dedicated lockers and so can easily be moved by one individual to and from the train.

Xen Couriers, a delivery company based in Manchester, provides dedicated services to legal customers wishing to deliver important deeds, contracts and other legal documents (see Figure 2). Packages that are small enough to be carried, for example up to A2 envelope or 1 A4 box up to 5kg, are taken via train and then bike to their destination, always by the same person. London City Express is used as the fastest route to Central London. Collection from central Manchester to delivery in central London takes around three hours; and the (signed) documents can then be returned to Manchester the same day if required. For larger packages within Manchester the company uses cycletrailers.

Figure 2 Xen Couriers



Colas Rail and TNT (see Figure 3) have trialled a freight train carrying express parcels and perishable products for distribution in central London. Converted passenger rolling stock was used, however the train ran as a dedicated service, not as part of a regular passenger train. The goods were then transhipped into a fleet of TNT electric and low-emission vehicles, which was achieved in less than an hour. The trial was a success it was reliable, was faster than by road as well as resulting in reduced emissions.

Figure 3 Colas and TNT Trial



Amazon are looking into the use of public transport to deliver packages and have submitted a patent application for it. The idea is to use buses, trains and metros and other vehicles as roaming / mobile pick up locations. A customer could choose to have items delivered to the pickup location on the vehicle which the user takes every day travelling from the office to home, or which stops at a bus stop, station or other location that is convenient for the user. The application includes the potential for tracking using GPS and receive real-time text message communications.

Sustainable last mile logistics are an important part of the supply chain, with established operations such as **Gnewt Cargo** (see Figure 4) providing final mile delivery with zero-emission fleet that includes all-electric cargo-cycles and minivans. Other innovations relate to options for customers to collect or receive their goods, such as Lockers (**BentoBox**), click and collect (**Collect+**) and local collections points such as **Doddle** in some Network Rail stations (see Figure 4). These initiatives could readily be integrated with the use of passenger trains for the carriage of goods.

Figure 4 Gnewt Cargo and Doddle



These innovations demonstrate that there are a number of successful trials and operational schemes utilising passenger trains space or rail passenger infrastructure, which achieve:

- Environmental benefits;
- The safety and security of passengers and goods;
- Journey times that are faster than road (and more repeatable as are subject to less variance than road journeys, which are impacted by traffic congestion);
- Loading / unloading without impacting upon reliability of passenger services at terminals and intermediate stations; and
- Integration with emission free or low emission last mile delivery.

During the stakeholder engagement phase of the study, key stakeholders were asked to indicate their awareness of any past or present examples of the carriage of goods on passenger trains. There was broad awareness across the stakeholder groups of InterCity RailFreight and the TNT / Colas Rail trial as well as the historic Red Star Parcels. Anecdotal evidence also identified a number of initiatives that have taken place including the transportation of flowers from Cornwall and seafood from Scotland to London, indicating niche market requirements being provided on an adhoc basis.

2.3 Current Trends and Drivers

2.3.1 Putting the Customer First – Value for Money

Utilising spare train space on passenger trains provides an opportunity to achieve value for money and reduce the cost to the fare payer as well as taxpayers. These ambitions were set out in both the McNulty report as well as the Government's strategy (March 2012 Command Paper - Reforming our Railways: Putting the Customer First) for the railway.

2.3.2 Environmental Legislation

The Climate Change Act (2008) and the associated Carbon Plan (2011) set out to achieve a reduction in greenhouse gas emissions. The Carbon Plan includes an array of measures implemented in private and public transport including investment for low emission vehicles, green buses, railway route electrification, fuel efficiency, which includes the reduction of emissions from delivery vehicles.

The DfT is a key player in delivering the requirements of the Climate Change Act 2008 and the 2011 Carbon Plan. Consequently any environmental benefits that can be achieved by a modal shift from road to rail by utilising passenger trains to transport goods will be positive and provide benefits beyond the immediate logistics supply chain. Utilising spare train space on passenger trains provides an opportunity to achieve these commitments.

2.3.2.1 Transport Policy and Strategy

Two key objectives of transport policy are to:

- Reduce road congestion; and

- Reduce CO₂ emissions.

The 2011 European Commission White Paper, includes a goal to achieve a 50% modal shift of medium-distance inter-city passenger and freight journeys from road to rail and waterborne transport. Considering the aggregated effect of road transport on carbon emissions and environmental degradation, these developments, if materialised, are expected to contribute towards meeting the EU's 2030 interim climate change objective to achieve a 40% cut in greenhouse gas emissions, compared to 1990.

The DfT awards freight grants to encourage modal shift away from road to rail and water transport through the Mode Shift Revenue Support (MSRS) and Waterborne Freight Grant schemes (WFG).

Other government initiatives include:

- The introduction of a road user levy for heavy goods vehicles; and
- Incentivisation of the use of ultra-low emission vehicles, such as electric, plug-in hybrid and hydrogen powered cars and vans, in order to help cut down greenhouse gas emissions and air pollution on the roads, done through the provision of grants to purchasers of ultra-low emission vehicles.

The government has also endorsed the Logistics Carbon Reduction Scheme (LCRS) set up by the FTA (Freight Transport Association), which is a voluntary, industry-led approach to recording, reporting and reducing carbon emissions from freight transport.

Cities have introduced low emission zones, congestion charging, timed access restrictions and pedestrianised zones to reduce congestion and achieve a reduction in emissions.

The modal shift from road to rail is more pertinent, as deliveries into cities become more difficult and costs rise for road based transport.

Shifting from road to rail transportation, including the carriage of goods on passenger trains, can also generate widespread benefits for businesses and passengers alike. These benefits include:

- Reducing the financial burden on passengers;
- Fast delivery in the heart of busy city centres, alleviating increasing congestion on the road network;
- Regular services across most destinations in the UK;
- Competitive prices;
- Avoiding the rising volatile fuel prices that affect road journeys;
- No need to consider the restriction on drivers' working hours;
- Lower fatality risk associated with traffic flows;
- Relatively lower energy consumption; and
- The formation of new innovative businesses followed by job creation.

The environmental pressures on transport to reduce emissions and the benefits that utilising the passenger rail network could deliver in terms of removing trucks and vans off the road network onto a more sustainable mode of transport is a key driver. There are also associated societal benefits such as the reduction of noise and accidents as well as the visual impact of large vehicles that this modal shift will achieve.

2.3.3 E-commerce

Retailing has transformed in recent years, from solely being shop-based to being omni-channel, via computers and laptops and now increasingly through smart phones and tablets. Consumers today can expect to purchase and receive virtually anything they want, where and when they want it. Goods can be purchased and delivered almost anywhere without a single physical transaction taking place.

There has also been an increase in the number of options for customers to collect or receive their goods, including click and collect, whereby customers order online then collect their goods from the store or a local collection point.

Having a range of delivery options and the convenience of Click and Collect are important influences on consumer choice.

The expansion of the e-commerce market has resulted in deliveries being fulfilled in a variety of ways; by combinations of light goods vehicles, electric vehicles and cycle couriers. E-commerce brings benefits to the customer, who has more choice than ever before, however businesses (retailers, carriers, software providers and local authorities) must fulfil increasingly complex and competitive delivery commitments, whilst controlling costs and the customer's experience.

The impact of increased Business to Customer (B2C) delivery activity has resulted in an increase in van activity. For example, London has seen a significant increase in van activity whereas larger vehicle movements have remained broadly static over the same period. Indeed, the DfT predicts a 103% increase in van traffic nationally by 2035 (based on 2003 traffic levels). This trend puts increased pressure on the road network.

The impact of increased van activity has had a detrimental impact on the air quality, traffic safety and congestion in cities.

2.3.4 Sustainable City Logistics

Sustainability has evolved from a buzz word to a necessary and integral part of the logistics business and their customers' business operations. Increasing numbers of customers are now demanding energy-efficient supply chains from their logistics providers.

Technology advancement has resulted in the use of more environmentally friendly transport methods such as electric and other low emission vehicles as well as cycles to make deliveries or last mile deliveries. This has significantly increased in the last decade.

The LaMiLo (last mile logistics) project, which is part-funded by the European Regional Development Fund (ERDF) aims to ‘create a step change in freight deliveries by fully considering the ‘last mile’ of a supply chain when planning a freight logistics journey’. Through the use of environmentally friendly transport methods as well as encouraging a modal shift from road to rail/water it aims to reduce CO₂ levels in city centres and freight hubs.

Similarly, the EU funded FREVUE (Freight Electric Vehicles in Urban Europe) is piloting electric trucks across 8 cities to evaluate their use in logistics operations and commercial application. The scheme started in 2013 and electric vehicles are in the process of being implemented.

Gnewt Cargo Ltd (see Section 2.2) is an award winning logistic company offering final mile delivery in London. It utilises an all zero-emission fleet for other third party logistics companies, large retailers and other users. The fleet includes all-electric cargo-cycles and minivans. This combination allows the delivery of consignments of various sizes while reducing emissions and congestion. The impact evaluation in May 2010 demonstrated that the use of the consolidation centre together with the replacement of the diesel van fleet by electric vans and tricycles led to a reduction of 20% in the total distance driven by all vehicles per parcel delivered to customers.

Such schemes and projects help deliver economic, social and environmental benefits to communities and businesses.

The passenger rail network connects cities to cities, which could be integrated with sustainable first and last mile deliveries and therefore provides an opportunity to be a key delivery partner of sustainable city logistics.

2.4 Summary

Red Star is a historic precedent of the successful movement of goods by utilising spare space on passenger trains. Red Star provided a reliable and integrated service, including some international connectivity. Utilising scheduled express passenger services it was fast and efficient. City Link introduced a same and next day delivery in the UK, utilising Red Star to transport its parcels between stations from which City Link delivered the last mile. The privatisation of the rail industry signalled Red Star’s demise.

There are a number of innovations that have been studied, trialled or are operational that provide useful reference and learning points for this study such as InterCity RailFreight who are carrying goods on passenger rail with East Midlands Trains and Great Western Trains, Gnewt Cargo, Xen Couriers and the Colas and TNT trial.

The current legislative framework requires a significant change to achieve environmental, societal and road capacity objectives. This provides an opportunity for a modal shift to rail for freight in general as well as goods on passenger rail services.

Transporting goods on passenger rail, in general will have to compete head on with road transport and match bottom line requirements. All of which must be considered when pricing the service.

Delivering into cities is becoming harder for the logistics industry with increasing congestion and restrictions; many cities have introduced low emission zones, congestion charging, timed access restriction and pedestrianized zones, which all result in direct and indirect costs for the logistics industry, which are passed onto customers. The existing passenger rail network due to the nature of its operation already connects these urban areas. Moreover it provides direct connectivity to city centre locations with stations providing an opportunity for logistics hubs, something that road based logistics providers struggle to achieve. This is a key opportunity where space is available at or near stations e.g. arches or car parks close by.

Customers, retailers and supply chains require reliable, time sensitive delivery of goods. Medium to long distances provide the passenger rail network with an opportunity to compete with road based deliveries. Where these journeys can be unaccompanied by passenger rail it will reduce staff costs.

The impact of increased van activity due to this growth in e-commerce has had a detrimental impact on the air quality, traffic safety and congestion in cities. Achieving a modal shift from road would therefore realise environmental and societal benefits beyond the immediate supply chain and the customer.

There has also been an increase in the number of options for customers to collect or receive their goods. The use of collection points in stores, lockers or local collection points has seen a rise in use. Network Rail's Doodle scheme utilises space at stations for stores that act as delivery and collection points for customers. These initiatives could easily be integrated with the use of passenger trains for the carriage of goods.

There is an increased emphasis on safety and security, which any proposal will need to adequately address. The existing protocol established for InterCity RailFreight demonstrates that this is already achievable on passenger trains.

3 The Market

This chapter defines the types of goods that could be carried on passenger trains, what the markets are as well as an estimated value of the markets to understand the potential value of the opportunity.

3.1 Type of Goods

Goods that could be transported on passenger trains are those that:

- Are time sensitive e.g. require guaranteed delivery or urgent transportation;
- Are valuable e.g. have a high retail value or profit margin (and require secure carriage);
- Are important e.g. need to be transported securely; and
- Can easily be transported on passenger trains i.e. easily accommodated into cages that can be efficiently and safely moved on and off passenger trains and that do not require special handling. In addition the items will have a weight cap. Passenger rolling stock can carry a lower maximum weight because of the suspension requirements necessary to run at over 60 mph.

Goods that are time sensitive and can therefore require urgent transportation or guaranteed delivery times may include:

- Spare parts - spare parts that fit in a carton;
- Documents, legal or commercial required for catching a deadline;
- Mobile phones, tablets and accessories for a new product launch or fulfilling seasonal demand;
- Pharmaceuticals, organs or blood across the country for transplants or after a disaster;
- Promotional material for a new campaign; or
- Perishable goods like groceries, meat or fish or flowers

Products that are valuable and have higher profit margins include:

- Electronics – laptops, mobile phones, tablets, video games consoles and their peripherals, accessories and spare parts;
- High technology equipment with reasonable size;
- Spare parts – spare parts that fit in a carton;
- Documents;
- Pharmaceuticals and blood;
- Perishable goods – fruits, groceries, meat and fish;
- Clothing, footwear and accessories;
- Folding bikes; or

- Tobacco.

Goods that are considered valuable and need to be transported securely include:

- Documents;
- Electronics - laptops, mobile phones, tablets, video games consoles and their peripherals, accessories and spare parts;
- High technology equipment with reasonable size; or
- Pharmaceuticals and blood.

Goods that could be transported on passenger trains are therefore goods that are time sensitive, valuable, and / or important and can easily be transported on passenger trains in terms of weight, accommodation and movement. Figure 5 summarises the key categories of these goods.

Figure 5 Carriage of Goods on Passenger Trains: Categories and Type of Goods

Medical  Pharmaceuticals Blood Organs Samples Medical Research	Documents  Gift vouchers Legal Envelopes Promotional material	Fashion  Clothing Footwear Accessories Jewellery
Electronics  Mobile phones Computer equipment Games consoles	E-commerce  DVDs Music Video games Health and beauty	Food & Drink  Drink and alcohol Groceries Fish Niche food products
Horticultural  Flowers Plants Seeds Equipment	Transport  Car spare parts Airplane spare parts Bicycles	Other  Money Tobacco

3.2 The Logistics Provider / Courier Market

All of the above products can be transported by the logistics provider /courier market; the Next Day and 2 to 3 Day and Same Day delivery market. Third party logistics carriers collect, sort, transfer and deliver the goods identified in Figure 5 and other items that are time sensitive, valuable or too heavy to be delivered by post. The market typically provides door-to-door collection and delivery. Deliveries can be international, national and local and are typically undertaken by air and road (van or motorbike).

3.2.1 Market Segments

As noted above, the delivery market is segmented. Demand for services is determined by cost, time factor and the size / weight of goods. Services offered to the market can be broadly classified as follows:

- Premium Same Day;
- Same Day;
- Next Day; and
- 2 to 3 Day (Standard).

Premium Same Day: This provides a service that fulfils demand for immediate delivery. It is defined as direct vehicle, point to point. Transportation is carried out by companies on a range of vehicles; from bicycles to large trucks. Delivery is door to door or desk to desk. This is usually the most expensive level of service offered by service providers.

Same Day: This provides a service that fulfils a demand for delivery on the same day. It is defined as delivery on the same day by close of business, not a direct vehicle and not point to point. Transportation is carried out by companies on a range of vehicles; from bicycles to large trucks. Delivery is door to door or desk to desk. This level of service may be slightly cheaper (but not always) than a direct vehicle carrying out immediate delivery. Prices for this level of service can be a little lower than the premium service as courier companies are able to consolidate a number of deliveries on the same vehicle.

Next Day: This provides a service that fulfils a demand for delivery tomorrow. It is defined as a guaranteed delivery the following working day, by close of business. This is the standard service offered by most express parcel carriers. Delivery is door to door and most express parcel carriers offer additional premium services (e.g. delivery before 0900) for an extra fee.

2 to 3 Day (Standard): This provides a service that fulfils a demand for 2 to 3 day delivery. It is defined as a non-guaranteed delivery within two or three days. This type of service tends to be offered by standard parcel carriers rather than express parcel carriers as it invariably incurs additional costs to carriers whose standard service offering is next day. This is due to additional handling and processing expenses. Delivery is door to door.

Same Day carriers include CitySprint, TNT, DHL, Rico as well as a large number of owner driver unbranded van couriers.

Next Day and 2 to 3 Day carriers include DHL, FedEx, DPD, Hermes and Yodel.

Several carriers operate across the market segments and cater for a variety of customers, including business-to-business (B2B), business-to-consumer (B2C) and consumer-to-consumer (C2C) customers. The typical differentiation of carriers between the segments has reduced due to factors such as the recent economic downturn, the rise of online retailing and the emergence of new forms of competition. Other carriers exclusively provide Same Day services to B2B customers, or Next Day and 2 to 3 Day services to C2C customers.

Carriers such as FedEx, UPS, TNT and DHL operate integrated offerings providing a door-to-door service using their own intermodal fleet as well as undertaking all the handling services.

Entry to the market is described by IBISWorld as 'moderate'. At the most basic level, a courier service can be set up with nothing more than a bicycle and a mobile phone.

3.2.1.1 Next Day and 2 to 3 Day Market

The Next Day and 2 to 3 Day carrier and parcel industry move between 20,000 and 25,000 articulated vehicles around the UK at night. This is the equivalent of up to 17,000 train carriages.

The key attributes of this market segment are:

- The market is saturated with providers and highly competitive;
- The services offered by the carriers are either door to door or operated via an established network of drop-off / collection outlets;
- It is priced on weight not distance thereby requiring very high volumes;
- Very high volumes require dedicated facilities and infrastructure as well as significant investment in labour resources; and
- Low revenue / low margin per consignment compared to the Same Day market (0% to 10% net profit). It is noted that 0% net profit is when it is part of package of service offerings by a carrier.

To achieve entry into this market requires:

- Very high volumes to be worthwhile;
- Direct access for articulated vehicles to a dedicated carriage (first and last mile);
- The ability to handle high volumes of goods requires access at stations for articulated vehicles as well as a conveyor or similar equipment connecting the articulated vehicle to the carriage to transfer the goods effectively for onward transportation by rail i.e. replicating the warehouse infrastructure required to handle large volume;

- Significant infrastructure investment; and
- Requires dedicated stripped carriages or new rolling stock.

It is noted that the engagement with logistics carriers identified that there is large potential volume / market available for Next Day and 2 to 3 Day carriage by passenger rail, if it is to the right destination (end to end) and at the right price. For example a carrier would consider the use of passenger rail between London and Manchester for the 2 to 3 Day delivery, requiring two carriages.

Indicative costs, revenues and gross profit have been derived for two key routes, namely London to Edinburgh and London to Manchester:

- London to Edinburgh:
 - Indicative cost by road: £1,800 per carriage (including first and last mile), which equates to £50 per pallet
 - Indicative revenue by road: £2,880 per carriage, which equates to £80 per pallet
- London to Manchester:
 - Indicative cost by road: £750 per carriage (including first and last mile), which equates to £21 per pallet
 - Indicative revenue by road: £2,880 per carriage, which equates to £80 per pallet

Thus the Next Day or 2 to 3 Day markets, in general, do not appear to be very attractive for the carriage of goods on passenger rail.

3.2.1.2 Same Day Market

The key attributes of the Same Day parcel delivery market are that:

- The market is saturated with providers and highly competitive;
- The market is time sensitive so can charge more, particularly over distance;
- Achieves higher revenue / margin per consignment (particularly over medium to long distances) compared to Next Day or 2 to 3 Day (15% + net profit);
- Reasonably low volumes are required in order to generate meaningful revenues compared to Next Day or 2 to 3 Day as it is priced on distance not weight, therefore does not require high volumes;
- It is small volume – goods are caged, bagged or loose so does not require dedicated infrastructure; and
- Barriers to entry are limited as lower volumes do not require high levels of investment in labour, facilities and infrastructure.

To achieve entry into this market requires:

- Direct access to stations required for vans and bikes (first and last mile); but
- Does not require high levels of investment in labour, facilities and infrastructure.

Medium (over 100 miles) to long (over 200 miles) distances would therefore be suited to rail as the passenger rail network can achieve faster journey times compared to road. For example London to Manchester / Birmingham or London to Edinburgh or Inverness.

Indicative costs, revenues and gross profit have been derived for two key routes, namely London to Edinburgh and London to Manchester:

- London to Edinburgh:
 - Indicative cost by road: £400 per pallet (includes first and last mile)
 - Indicative revenue by road: £700 per pallet
- London to Manchester:
 - Indicative cost by road: £200 per pallet (includes first and last mile)
 - Indicative revenue by road: £350 per pallet

The revenue per pallet is significantly higher for the Same Day market compared to the Next Day and 2 to 3 Day markets.

A service offering the fast movement of parcels over longer distances within the Same Day segment of the parcel delivery market is considered more attractive for passenger rail than the Next Day and 2 to 3 Day market. This is because it could generate meaningful levels of revenue whilst minimising the need for capital investment and obviate the need for significant modifications to existing rolling stock.

3.2.2 Recommendation

It is noted that there is market demand for Next Day and 2 to 3 Day service by passenger rail, but it is likely that the infrastructure and handling requirements will make this prohibitive.

It is therefore recommended that the Same Day market providing an offering for the fast movement of parcels over medium to longer distances is the focus for movement by passenger rail. This is because it could generate meaningful levels of revenue whilst minimising the need for capital investment or significant modifications to existing rolling stock. Also goods are caged, bagged or loose so easily handled.

3.2.3 Market Size and Value

Research undertaken by Mintel estimates the courier and parcel market to have a value of £7.8 billion in 2014. This equates to the delivery of 2.2 billion packages. Market growth is expected to continue; Mintel predicts that a cumulative growth of 39% will be achieved taking the market value to £10.8 billion in 2019. Cumulative volume growth of 40% is projected between 2014 and 2019 with the total volume of parcels reaching three billion by 2019.

From information provided confidentially during the stakeholder engagement stage (the market share and value of Same Day carriers) it is possible to estimate

the proportion of the market that is Same Day and the proportion that is Next Day and 2 to 3 Day.

It is estimated that the Same Day market segment generated in the region of £1 billion per annum in 2014, which infers that the Next Day and 2 to 3 Day market segment generated approximately £6.8 billion.

Distances that are either medium (over 100 miles) or long (over 200 miles) are best suited to rail. This is where the rail networks can achieve quicker journey times than by road.

Based on confidential market knowledge provided by a carrier during the stakeholder engagement, it is estimated that the proportion of the annual Same Day market revenue that relates to short-distance (i.e. local) work is 60% and the remaining 40% is attributable to medium / long distance jobs (and therefore suitable for movement by rail). This equates to an estimated market value for medium to long distance Same Day sector of £400 million per annum, a proportion of which could be carried by passenger rail. For example 10% of the total market would equate to £40 million per annum, which is a reasonable estimate based on engagement. It is noted that there could be opportunities for the movement of goods by passenger rail over shorter distances; 5% of this market would equate to £30 million per annum.

If 1% of the Next Day and 2 to 3 Day market was viable for movement by passenger rail, this would equate to £68 million per annum.

3.3 Niche Services

In addition to the Same Day, Next Day and 2 to 3 Day parcels market, there is also scope for niche services by rail, such as bespoke requirements for the transportation of time sensitive or high value food items. Examples of these niche services include fish transported by passenger rail from Scotland to London as well as flowers travelling by passenger rail from Cornwall. These services may have bespoke requirements for transportation such as temperature control / monitoring.

Opportunities for niche services should therefore be considered on a case by case basis.

3.4 Retailers

A further market opportunity is for retailers, particularly those that operate their own supply chain. These retailers could utilise passenger rail to provide an operational advantage, including improved journey times over medium to long distances and increased reliability when compared to road, combined with city to city connectivity and environmental benefits that would be considered attractive to their customers. This could be attractive to retailers.

3.5 Summary

The Next Day and 2 to 3 Day market and the Same Day markets typically provide door-to-door collection and delivery, therefore the passenger rail offering will need to integrate with first and last mile logistics or click and collect. In addition there is opportunity for niche services, which provide a very specific or bespoke delivery requirement.

Therefore the following markets that could be considered for transportation by passenger rail are:

- Next Day and 2 to 3 Day;
- Same Day;
- Niche; and
- Retailers.

The Same Day market over medium to longer distances is considered the most appropriate focus for movement by passenger rail because it could generate better levels of revenue without requiring significant capital investment or modifications to existing rolling stock compared to the Next Day and 2 to 3 Day market.

This chapter has looked at the types of goods and the potential markets that these goods relate to. Chapter 7 looks at the potential operational models for the carriage of goods by passenger trains and will assess the markets set out against the potential operational models.

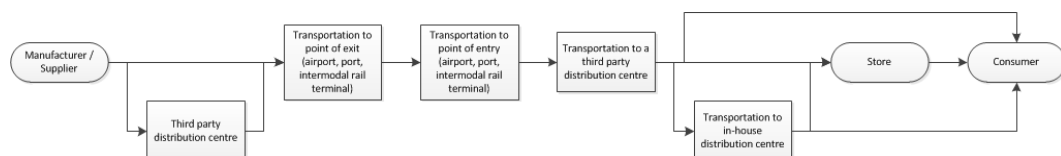
4 Demand

4.1 Supply Chain Overview

Within the UK, the origin of freight includes ports, factories, airports, retail, markets, wholesalers, distribution warehouses, regional and local distribution centres and e-commerce fulfilment centres which illustrate that the supply chains are served by diverse freight and logistics and the services required are not homogeneous.

A typical high level supply chain consists of four to six legs as illustrated in Figure 6. This shows that typically goods are sourced by manufacturing locations or from suppliers and moved directly to the point of exit or through a third party distribution centre, depending on the transportation availability or the requirement of further process and handling. Depending on the geography, the value of the goods, the product life cycle length, the risk of goods becoming obsolete, the nature, size, density and other factors, the transportation mode is defined. Goods can be air, sea, inland waterways, road or rail freighted. In many cases and in order to achieve lower costs or reach a remote geographical location, a combination of the different freight forwarding methods is used, known as intermodal. After the arrival of the goods in the point of entry, the freight forwarder receives the cargo and performs the customs clearance (if required) and completes the paperwork. Typically, the goods are moved to the third party distribution centre a short time before transported again to the clients' in-house facilities or even directly to stores and consumers.

Figure 6 Example Supply Chain (High Level)



Many companies utilise freight forwarding specialists known as third party logistics (3PL) providers, such as DHL, Kuehne+Nagel, DB Schenker and UPS and many others, to transport their goods rather than moving it themselves. The 3PLs reserve space in air, sea, inland waterways, road and rail carriers or use their own means, offering better prices, shorter lead times, larger geographical coverage and lower end to end supply chain costs compared when companies are individually moving their goods.

Some examples of the supply chain for goods identified in Chapter 3 that could be transported by passenger rail are discussed below. Many of these products are manufactured and sourced outside the UK.

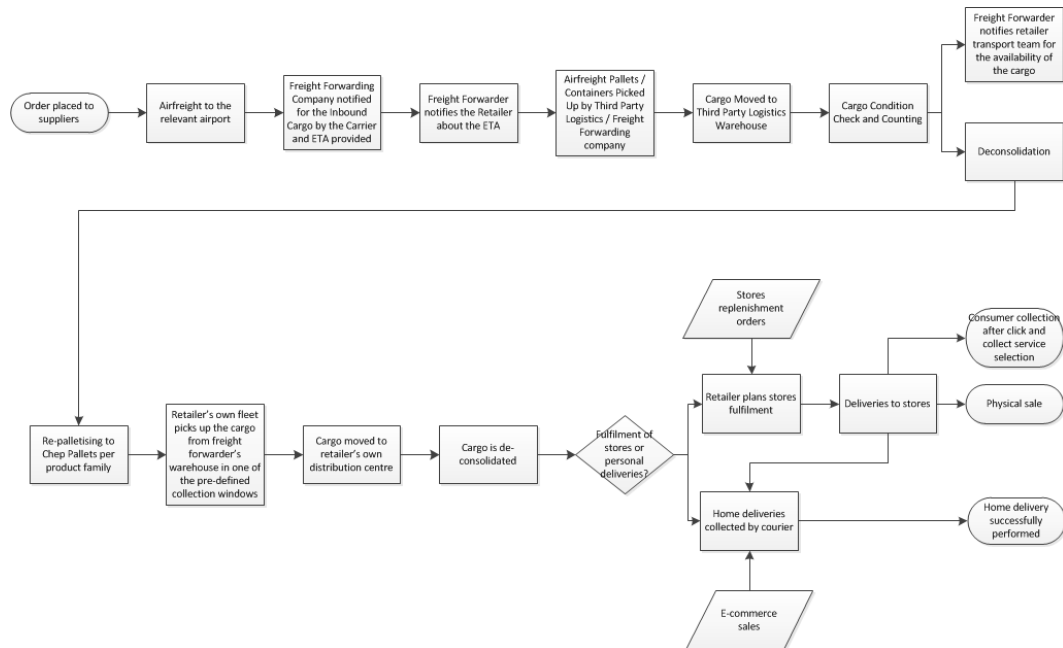
4.1.1 Electronics

Foxconn is located in Taiwan and its clients include major American, European, and Japanese electronics and information technology companies. Key products

that the company manufactures include the BlackBerry, iPad, iPhone, Kindle, Playstation 4, Xbox One, and Wii. Due to the characteristics of the products produced in Foxconn, air freight is used.

Figure 7 depicts in full detail the supply chain steps of a catalogue retailer selling electronics.

Figure 7 Catalogue Retailer Supply Chain for Electronics

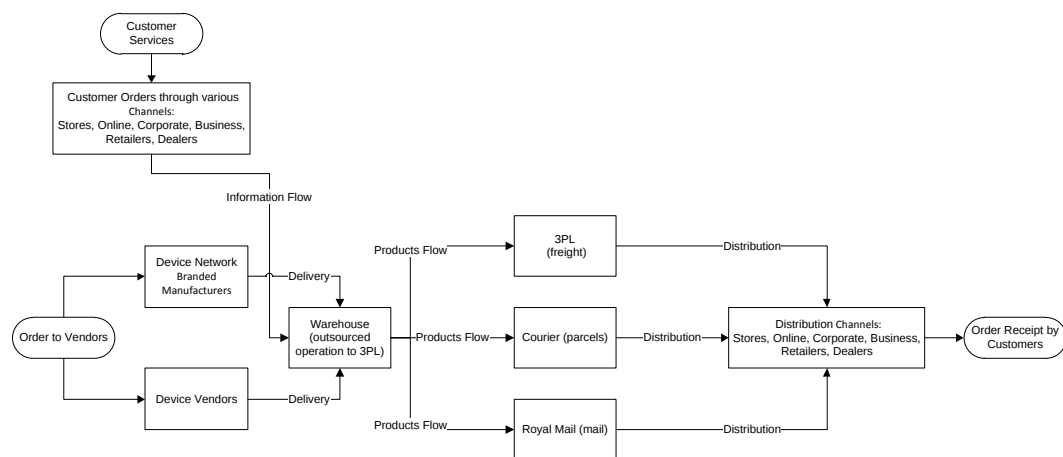


4.1.2 Mobile Phones

Various mobile phone vendors are located in China, Finland, Germany, Hungary, Korea, Romania and Taiwan. Mobile phones and accessories produced in Europe mainland are transported to the UK using road freight whilst anything produced in Asia is airfreighted into the UK.

An example of a mobile phone supply chain is illustrated in Figure 8.

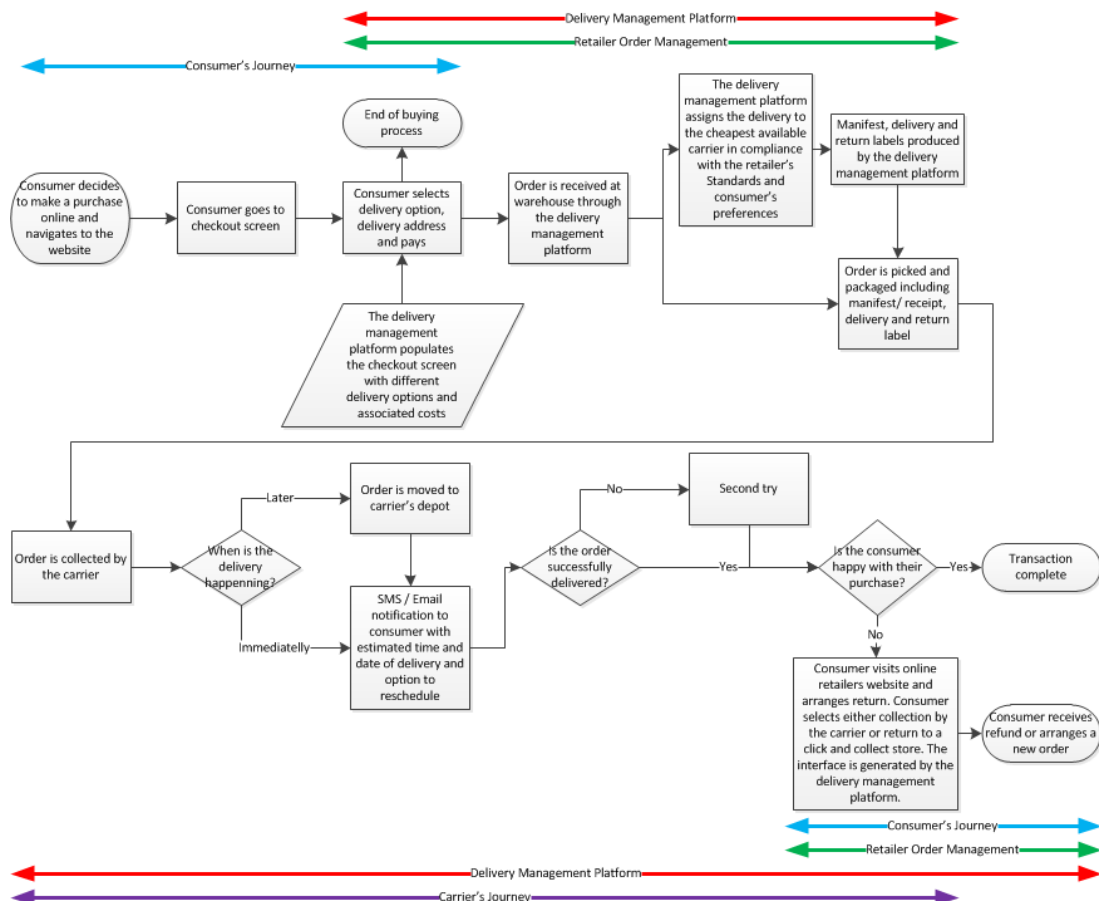
Figure 8 Mobile Phone Supply Chain Example



4.1.3 E-Commerce Supply Chain

Consumers today can expect to purchase and receive virtually anything they want, where and when they want it. Goods can be purchased and delivered almost anywhere without a single physical transaction taking place. To enable this choice, goods are sourced globally and supply chains have grown increasingly complex, an example of which can be found in Figure 9.

Figure 9 E-Commerce Supply Chain Example



It would be a mistake to view e-commerce van delivery activity as a single homogenous group. The nature of delivery activity differs from area to area and commodity to commodity.

The vast majority of people prefer to have purchases delivered to their home, provided that deliveries can be made at a convenient time with an acceptably short delivery window. Where home delivery is not an option, people typically and understandably opt to have small items delivered to work or click and collect.

When items are delivered to the workplace, they generate van activity within central locations and exacerbate problems of congestion and air pollution. The majority of people living in cities do not live near their workplace and so must then carry their deliveries home.

Generally the market is evolving reactively rather than proactively to meet forthcoming challenges, with the exception of end-to-end online retailers such as

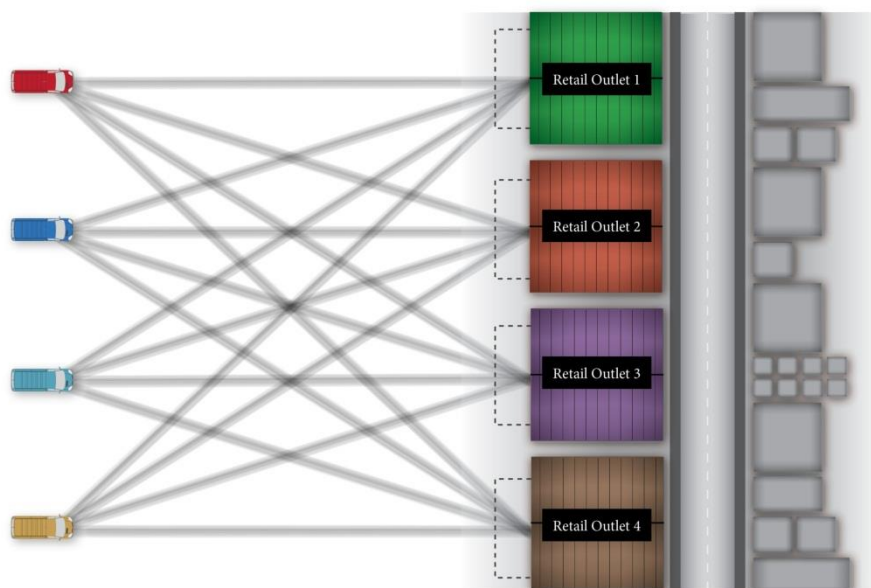
Amazon who are at the forefront of supply chain innovation. For example retailers may not see traffic congestion as a problem and ultimately react when customer service levels are negatively impacted. Nevertheless, operators do consider consolidation and load-sharing opportunities to reduce costs, but such collaboration faces challenges.

It is noted that although the environment is higher up the agenda, environmental measures are often only implemented when there is a direct benefit, for example customer loyalty or the realisation of cost savings.

4.1.4 First and Last Mile

Figure 10 shows the ‘as is’ situation, where multiple suppliers deliver to multiple retailers on the high street contributing negatively to congestion, accident-risk and poor air quality.

Figure 10 ‘As is’ distribution model

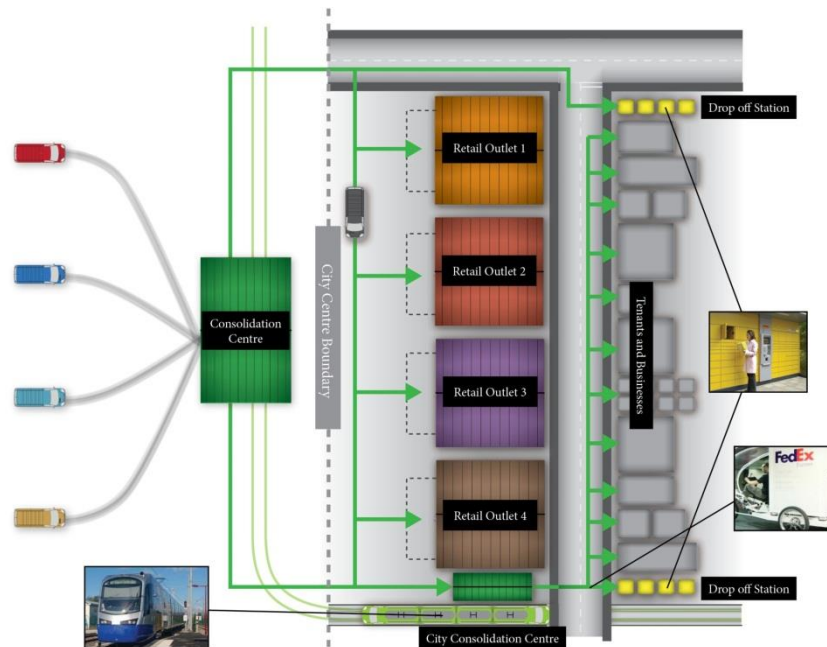


An idealised supply chain is depicted in Figure 11. Here multiple suppliers deliver in bulk to a consolidation centre where, in the case of this project, goods are then consolidated onto passenger trains, loaded onto highly utilised carriages/vehicles and delivered to a station that acts as a city-based micro-consolidation centre.

From these micro-consolidation centres, orders are fulfilled by environmentally friendly vehicles such as electric vans or cargo bikes. For home deliveries in particular, to reduce the percentage of failed first time deliveries, deliveries are made to consolidated drop-off stations. The impact of such an integrated holistic solution would be a significant reduction in the number of vans on city's streets. Cities are therefore most likely to be viable due to the station's often being termini (as have longer dwell times), are generally larger in size and therefore have more

space available and are located in the centre and so provide direct city to city connectivity.

Figure 11 ‘To-be’ optimum distribution model



4.2 Key Considerations for Consumers, Retailers and Third Party Logistics Carriers

A passenger rail service offering for the transportation of goods will need to align with what retailers and other customers want, address the key factors that are important to the operation of logistics providers as well as addressing consumer's needs. These primarily include delivery times, hours of operation, price and convenience for consumers. For many consumers the environment is a consideration provided that environmental benefits can be achieved without detrimental effect on cost.

Retailers want to ensure that any service they use for deliveries will:

- Maintain customer satisfaction and loyalty;
- Contribute to achieving a greater market share;
- Be cost effective;
- Have an appropriate level of service availability;
- Be efficient and reliable;
- Be priced competitively; and
- Have environmental credentials that are consistent with their own aspirations.

Common concerns of retailers about remote selling revolve around the loss of incremental sales when goods are delivered to a customer rather than click and collected from a store, and the potential customer expectation of free delivery.

There is nothing at this stage that suggests that use of passenger rail for moving these goods would have any impact on these concerns. It is noted that the service needs to be competitively priced. A number of retailers interviewed for this study saw the use of passenger rail as a potential advantage over their competitors as it would genuinely assist with environmental aspirations as well as providing faster journey times than by road for long distance routes.

Key factors for logistics providers when choosing carrier modes are:

- Flexibility;
- Reliability of service;
- Accessibility;
- Costs of door-to-door delivery;
- Costs relating to environment;
- Service availability (a 24/7 service);
- Safety and security of the goods (reducing the chance of losses, theft and damage);
- The ability to track and trace goods;
- Availability of schedules / timetables to meet business needs; and
- Ability to control / monitor temperature.

The larger logistics providers interviewed for this study view the carriage of goods by passenger trains as an opportunity. The service, however, needs to be easy to use and accessible as well as competitively priced. These logistics providers would be able to provide both first and last mile deliveries and so would integrate with the service. The environmental benefits, so long as the above requirements are achieved, would be an additional selling point. Key concerns are the flexibility of the service (road is flexible) and passenger rails reliability (perceived and real).

4.3 Summary

Supply chains served by freight and logistics are multimodal and the services required are not homogenous. However road freight remains the most dominant mode in the UK.

The courier and delivery market has grown significantly and is contributing to congestion in cities.

Rail freight continues to provide an opportunity for a modal shift from road to rail. Environmental, cost and journey time savings have meant that some traditional road based carriers use rail for the movement of freight (not passenger trains), including Colas Rail and DHL.

The e-commerce supply chain presents an opportunity for transporting goods on passenger trains. The passenger rail network links into this supply chain by providing direct links into city centres, from which sustainable last mile deliveries could be made. Stations could operate as city based micro-consolidation centres. Alternatively click and collect services could be integrated into the service provided, with collection points in stations (e.g. Doddle).

Consumer expectations continue to rise with regard to fulfilment. A number of factors influence consumer choices with regard to delivery options, including:

- Time slots;
- Operating hours;
- Convenience;
- Environmental (some consumers only); and
- Price.

Key factors for retailers relating to deliveries which need to be considered in the context of utilising passenger rail for the carriage of goods are:

- Maintaining customer satisfaction and loyalty;
- Winning greater market share or maintaining market share;
- Profitability;
- Control over the delivery experience – part of the brand;
- Speed and reliability;
- Delivery costs and customer expectation of free delivery;
- Dependency on delivery partners (or need to invest) to provide tools that enhance the customer experience and improve delivery;
- Delivery hours; and
- Store network limits the convenience of click-and-collect.

Key factors for logistics providers when choosing carrier mode(s) which need to be considered in the context of utilising passenger rail for transporting goods are:

- Reliability of service;
- Costs of door-to-door delivery;
- Costs relating to environment;
- Service availability (a 24/7 service);
- Safety and security (reducing the chance of losses, theft and damage);
- The existence of a choice on the required route;
- The level of all transport costs, (including pre- and post-transport, costs for transshipment between modes, transaction costs, costs of adapting the system);
- Schedules / timetables to meet business needs;

- Temperature control / monitor; and
- Reduced cost of rail / increased grants to make rail cheaper or cost neutral to road.

The need to improve the financial viability of Britain's railways is an opportunity to identify options for improving value for money for both passengers and taxpayers. The current legislative framework requires a significant change to achieve environmental, societal and road capacity objectives.

The huge growth in e-commerce means that customers, retailers and supply chains require reliable, time sensitive delivery of lower density and higher value goods. Passenger trains provide direct links into city centres, from which sustainable last mile deliveries could be made. Stations could operate as city based micro-consolidation centres. Alternatively click and collect services could be integrated with collection points in stations (e.g. Doddle).

There is also the potential to provide rural connectivity should the market / demand identify a need.

Retailers are also aware that they need to address and be seen to address environmental issues, and there is already evidence of interest in rail's green credentials.

A service proposition will need to align with what retailers want, address the key factors that are important to the operation of logistics providers as well addressing consumer's and TOCS needs / requirements. A number of innovations that make effective use of the passenger rail network and infrastructure (InterCity RailFreight, Newcastle Metro Study, Colas Rail and TNT Trial and Monoprix) have been trialled, studied or implemented, which demonstrate (where information is available) the ability to address some of these concerns / requirements.

5 Supply

5.1 Overview

There is good awareness of precedents for the carriage of goods on passenger trains across the range of TOCs that engaged as part of the stakeholder engagement stage of the study. Examples cited (past and present) included:

- InterCity RailFreight (formerly 5PL) on East Midlands Trains;
- Eurostar – use of a small luggage compartment on Eurostar trains, which accommodates parcels (approximately 3 cubic metres per train);
- EuroCarex – although it is noted that these are freight trains using the passenger network infrastructure;
- Royal Mail use of passenger trains to carry post at Christmas – used to fill up carriages with mail bags;
- Passenger trains from Cornwall carrying fresh flowers;
- Passenger trains carrying fresh lobsters;
- Red Star Parcels; and
- Carriage of mail for a private organisation on a single line, using sacks which were stored in the guards van where there was a secure cage to hold the sacks. The sacks were loaded and offloaded by couriers and so did not require handling by TOC staff.

5.2 Passenger Train Capacity

There is scope to utilise spare passenger space / capacity in a variety of ways, including the use of vestibules and luggage space which could accommodate smaller volumes of goods. Larger volumes could be achieved by locking off a whole carriage or the 1st Class compartment. All of these were examples considered to be viable by TOCs. It is noted that detailed assessment of the routes and specific timings would be required for different franchises.

The use of spare passenger space is being capitalised on by InterCity RailFreight, who utilise secure lockable space within carriages (as well as rolling crush space for larger items) on East Midlands Trains. It is noted that this limits the volume of goods that can be transported; InterCity RailFreight are moving small volumes in totes. The operation is profitable and currently requires minimal input from East Midlands Trains, as their staff do not handle the goods. It is noted that should there be more than one operator requiring use of these dedicated compartments, this would require a greater level of administration by East Midlands Trains or dedicated lockable space for each operator. InterCity RailFreight also transport fresh fish from Cornwall to London on Great Western Trains.

There is spare passenger capacity on arrivals outside of the AM peak period and in general there is spare capacity on departures outside of the PM peak period. Off-peak and inter-peak spare capacity was acknowledged by the TOCs during the

stakeholder engagement stage; opportunities to use empty carriages i.e. shut off a carriage during the inter-peak and off-peak periods was discussed and considered to have potential. The busiest times for distance freight movements is usually early evening and throughout the night and so this is a potential opportunity. The carriage of smaller volumes of goods was considered achievable through the use of vestibules and luggage space and considered to be implementable with minimal input from the TOC (as per the InterCity RailFreight model).

To illustrate the opportunity, the DfT's "Rail passenger numbers and crowding on weekdays in major cities in England and Wales: 2012" was used during a previous stage of this study to assess the seating capacity on train services serving a number of cities throughout the day to identify whether there is spare capacity that provides an opportunity to carry goods on passenger services. The percentage of seats occupied was calculated to identify which time periods are the busiest and which cities / stations have trains which are loaded beyond their seating capacity.

It was assumed that when 70% or more of seating is occupied there is no spare capacity. Below 70% indicated that there is available capacity that could be utilised for the carriage of goods. 70% has been used for the following reasons:

- The data is general and will conceal trains running with much higher peak loads – therefore at average crowding levels of over 70% it is highly likely that individual service crowding will approach 100%;
- It is difficult to provide separated storage space on trains if the majority of seats are occupied. Provision of goods accommodation within a train may compromise up to 30% of available capacity; and
- Passenger surveys suggest that perceptions of comfort decline dramatically the nearer to 100% seat utilisation is achieved. In many cases passengers will stand rather than occupy the last few seats.

It should be noted that individual services are not identified in the data so this assessment provides a general indication for the time periods that are busy rather than identifying the services which have available capacity.

Table 1 provides a summary of the opportunities for the carriage of goods on passenger trains for arrivals and Table 2 for departures, where 70% or less of passenger seats are occupied.

Table 1 shows that there is spare capacity on all arrivals outside of the AM peak period.

Table 2 illustrates that in general there is spare capacity on departures during the period from the start of service through to the PM peak, with spare capacity in the evening period from the stations outside of London, with less availability from some of the London stations in the evening.

Tables 3 and 4 illustrate the time periods when 50% or less of passenger seats are occupied for arrivals and departures, respectively. Tables 5 and 6 illustrate when 30% or less of passenger seats are occupied for arrivals and departures, respectively.

Table 1 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Arrivals (70% or less of seats are occupied)

Time Period	Elephant & Castle (for Blackfriars)	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for)	Paddington	St Pancras International	Victoria	Vauxhall (for)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
0700-0800 (AM peak)	×	×	×	×	√	×	×	×	×	×	×	×	×	√	√	×	√	√	×	√	√	√
0800-0900 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	√	×	×	√	×	×
0900-1000 (AM peak)	×	×	×	√	√	×	×	×	×	×	×	×	√	√	√	√	√	√	√	√	√	√
1000-1500 (Interpeak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
1500-1600 (Interpeak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
1600-1700 (PM peak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
1700-1800 (PM peak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	×
1800-1900 (PM peak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
1900-2000	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2000-2100	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2100- end of service	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 2 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Departures (70% or less of seats are occupied)

Time Period	Elephant & Castle (for buses)	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for Moorgate)	Paddington	St Pancras International	Victoria	Vauxhall (for Waterloo)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0700-0800 (AM peak)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0800-0900 (AM peak)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0900-1000 (AM peak)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1000-1500 (Interpeak)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1500-1600 (Interpeak)	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1600-1700 (PM peak)	✓	×	✓	✓	✓	×	✓	✓	×	✓	✓	×	×	×	✓	×	✓	×	×	✓	✓	×
1700-1800 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	✓	✓	×
1800-1900 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	✓	✓	×	✓	×	✓
1900-2000	×	×	✓	×	✓	×	×	✓	×	✓	×	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2000-2100	✓	×	✓	×	✓	×	×	✓	×	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2100- end of service	✓	×	✓	✓	✓	✓	×	✓	×	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 3 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Arrivals (50% or less of seats are occupied)

Time Period	Elephant & Castle (for Blackfriars)	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for)	Paddington	St Pancras International	Victoria	Vauxhall (for)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	✓	×	×	✓	✓	×	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0700-0800 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	✓
0800-0900 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
0900-1000 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	✓	×	×	×	×	✓	✓	×
1000-1500 (Interpeak)	✓	×	✓	×	✓	✓	×	✓	×	✓ (from 1100)	✓ (from 1100)	✓ (from 1100)	✓	✓	✓	✓ (from 1100)	✓ (from 1100)	×	✓ (from 1100)	✓	✓	×
1500-1600 (Interpeak)	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	×
1600-1700 (PM peak)	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	×	✓	×	×	✓	×	×	✓	×
1700-1800 (PM peak)	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	×	×	×	✓	×	×	✓	×	×	×	×
1800-1900 (PM peak)	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	×	✓	×	✓	✓	×	✓	×	×	✓	×
1900-2000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2000-2100	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2100- end of service	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 4 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Departures (50% or less of seats are occupied)

Time Period	Elephant & Castle (for	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for Moorgate)	Paddington	St Pancras International	Victoria	Vauxhall (for Waterloo)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
0700-0800 (AM peak)	√	√	√	√	√	√	√	√	√	√	√	√	√	×	√	√	√	√	√	√	√	√
0800-0900 (AM peak)	√	×	√	√	√	√	√	√	√	√	√	√	√	×	√	√	×	√	√	×	√	×
0900-1000 (AM peak)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	×	√	√	√	√	×
1000-1500 (Interpeak)	√	×	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	×
1500-1600 (Interpeak)	√	×	√	×	√	√	×	√	×	√	√	×	√	√	√	×	×	×	×	×	√	×
1600-1700 (PM peak)	×	×	×	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1700-1800 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1800-1900 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1900-2000	×	×	×	×	×	×	×	√	×	×	×	×	√	√	√	√	√	×	×	√	√	√
2000-2100	×	×	×	×	√	×	×	√	×	√	×	×	√	√	√	√	√	√	√	√	√	√
2100- end of service	√	×	×	×	√	×	×	√	×	√ (not 2200)	√	×	√	√	√	√	√	√	√	√	√	√

Table 5 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Arrivals (30% or less of seats are occupied)

Time Period	Elephant & Castle (for Blackfriars)	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for)	Paddington	St Pancras International	Victoria	Vauxhall (for)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	√	×	×	×	×	×	×	√	×	×	×	×	×	×	√	×	√	√	√	√	√	√
0700-0800 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
0800-0900 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
0900-1000 (AM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1000-1500 (Interpeak)	√ (from 1100)	×	√ (from 1200)	×	√ (from 1100)	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1500-1600 (Interpeak)	√	×	√	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1600-1700 (PM peak)	√	×	√	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1700-1800 (PM peak)	√	×	√	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1800-1900 (PM peak)	√	×	√	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1900-2000	√	×	√	×	√	√	√	√	×	√	√	×	×	×	√	×	×	×	×	×	√	×
2000-2100	√	×	√	√	√	√	√	√	×	√	√	√	√	×	√	×	×	√	×	×	√	×
2100- end of service	√	×	√	√	√	√	√	√	√	√	√	√	√	√ (from 2200)	√	√	×	√	×	√ (from 2200)	√	√

Table 6 Train Space Opportunity for the Carriage of Goods on Passenger Trains: Passenger Capacity – Departures (30% or less of seats are occupied)

Time Period	Elephant & Castle (for	Euston	Fenchurch Street	King's Cross	Liverpool Street	London Bridge	Marylebone	Old Street (for Moorgate)	Paddington	St Pancras International	Victoria	Vauxhall (for Waterloo)	Birmingham	Bristol	Cardiff	Leeds	Leicester	Liverpool	Manchester	Newcastle	Nottingham	Sheffield
start service to 0700	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
0700-0800 (AM peak)	√	×	√	×	√	√	√	√	×	√	√	√	×	×	√	×	×	×	×	×	×	×
0800-0900 (AM peak)	√	×	√	×	√	√	√	√	×	√	√	√	×	×	×	×	×	×	×	×	×	×
0900-1000 (AM peak)	√	×	√	×	√	√	√	√	×	√	√	√	√	×	√	×	×	×	×	×	×	×
1000-1500 (Interpeak)	√	×	√(until 1400)	×	√	√(until 1400)	√(until 1300)	√	×	√(until 1400)	√	√(until 1400)	√(until 1300)	×	√	×	×	×	×	×	×	×
1500-1600 (Interpeak)	×	×	×	×	×	×	×	√	×	×	√	×	×	×	×	×	×	×	×	×	×	×
1600-1700 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1700-1800 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1800-1900 (PM peak)	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1900-2000	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
2000-2100	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	√	×
2100- end of service	√	×	×	×	×	×	×	√	×	×	√	×	×	√(from 2200)	√	×	×	×	×	×	√	√

5.3 Rolling Stock – Existing Space

The use of spare space on rolling stock is being capitalised on by InterCity RailFreight, who utilise crush space for larger items as well as lockable compartments within carriages. Eurostar also make use of this space for the carriage of goods. Opportunities for utilising existing space varies across rolling stock.

It is noted that the use of crush space will need to be considered against any existing uses for example for cycles on a case by case basis.

5.3.1 Overview

Prior to the 1990s, British Rail operated dedicated parcels services, but also conveyed parcels (including Red Star) newspapers and mail (for Royal Mail) on standard passenger trains. Up to that date therefore, as a matter of course, parcel accommodation was provided on all rolling stock. Some types have areas which could be converted from seating to parcels accommodation by locking an intermediate door.

From the late 1980s onwards this changed. Royal Mail ceased to use passenger trains for normal mail traffic, the newspaper industry moved to a road based distribution network as part of restructuring the print industry, while the parcels business ceased as a result of the impact of privatisation. From this point forwards no space has been provided for goods on new rolling stock, though for other reasons some stock does have spare space, which provide an opportunity to carry goods on passenger rolling stock. The only remaining items for which accommodation is provided are passengers' bicycles, which are always accompanied.

Different routes operate different specifications of rolling stock, of different age, and with specific goods carrying capabilities. The main features of the different categories of stock are summarised below.

5.3.2 High Speed Trains

Figure 12 HST Unused Van Space: Space for the Carriage of Goods



High Speed Trains (HSTs) are a 1970s design, and comprise a number of passenger coaches and power cars at either end. There is unused van space (see Figure 12) in each power car which was designed for the carriage of goods and used as such until 1994. Bicycles are currently carried in these areas. They are segregated from normal passenger use, and accessed from the platform by a sliding door.

HSTs operate on the following routes:

- First Great Western to Swansea, Bristol and Penzance;
- East Midlands Trains to Nottingham, Derby and Sheffield; and
- East Coast to Leeds, York, Edinburgh, Aberdeen and Inverness (partial service only).

There are also some currently used by Arriva Cross Country between Penzance and Aberdeen via Birmingham and York, and an open access operator, Grand Central, between Sunderland and Bradford and London via Doncaster.

HSTs will be replaced by Intercity Express Programme (IEP) rolling stock in the next five years on all Great Western (except to Exeter, Plymouth and Penzance) and East Coast routes.

5.3.3 Mark 4 sets (East Coast Main Line)

Figure 13 Driving Van Trailer: Space for the Carriage of Goods



Electric sets run between London, Leeds, Newcastle, Edinburgh and Glasgow, and are formed of Mark 4 sets with a Driving Van Trailer (DVT), as illustrated in Figure 13, which is effectively an empty coach. It is not used for passengers due to impact crush space requirements. The sets were introduced in the 1980s and the DVT space was designed in part for the carriage of goods. The DVT is inaccessible from passenger accommodation and can be accessed directly from the platform.

Mark 4 DVTs will be replaced by IEPs within the next 5 years.

5.3.4 Other DVT operations

Figure 14 Other Driving Van Trailer: Space for the Carriage of Goods



DVTs are used by Chiltern on some trains between London, Birmingham and Kidderminster and is illustrated in Figure 14.

Greater Anglia also runs trains with a different type of DVT with some limited space potential goods capacity between London, Ipswich and Norwich.

There are no current plans to replace these sets, but they are unlikely to continue in operation much beyond 2020.

5.3.5 Pendolinos

Figure 15 Pendolinos: Space for the Carriage of Goods



Virgin runs most of its services between London, Birmingham, Manchester, Liverpool, Preston, Carlisle, Glasgow and Edinburgh using tilting Pendolino sets, built in the 1990s. These sets have the end halves of each driving coach reserved for non-passenger use due to impact crush space requirements. The first class end of the set is used for a first class kitchen, while the standard class end is used only for cycles. The area is inaccessible to passengers. There is thus some space for goods in Pendolinos (see Figure 15).

Pendolinos are expected to be in service until at least 2025.

5.3.6 Voyagers

Figure 16 Voyagers: No Current Space for the Carriage of Goods



Bombardier diesel voyager units were built in the 1990s and are used for Cross Country services between, Aberdeen, Glasgow and Edinburgh to Reading, Bournemouth, Bristol and Penzance, East Midlands services between London, Sheffield, Derby and Nottingham, and some Virgin services to Chester, Holyhead and Wrexham (and in the next two years to Shrewsbury and Blackpool). Some open access operator services also use voyagers. However despite being high speed units they do not have the same crush load space provision as other types, and there is only limited end space, which is currently used for passenger luggage and catering equipment. These units therefore have no space for the carriage of goods at present (see Figure 16), and would need some conversion work to create it.

5.3.7 Inter City Express Programme

Figure 17 InterCity Express Programme: No Space for the Carriage of Goods



This is new rolling stock being built by Hitachi (see Figure 17), and due to take over most services on the Great Western Route to Bristol, Cardiff and Swansea, and East Coast to Leeds, Newcastle and Edinburgh from 2016 onwards. The layout is similar to voyagers, with very limited cycle and luggage stowage areas at each end, and no provision for the carriage of goods. Given that this is a DfT controlled specification it might be possible to divert a very limited area at one end to goods with no passenger access. It is noted that the TARA for the IEP states that *'not use any Set for, or in connection with, the carriage of any goods, materials or items of cargo or in any other manner, in each case, which could reasonably be expected to cause damage to such Sets or to diminish their*

expected operational or design life or which is not covered by the insurances or which would invalidate, avoid or otherwise prejudice any insurances or in contravention of any restriction imposed by insurances on lines, routes or depots.’ Use of these carriages for the carriage of goods would need to be appropriately operated to address the above stipulation.

5.3.8 Suburban and regional rolling stock

Figure 18 Suburban and Regional Rolling Stock



All electric and diesel sets built since 1985 have had no specific parcels or cycle accommodation. Early versions had an area at one end of the set which could be locked out for parcels traffic, but this has now been removed. Some stock has a larger circulation area with tip up seats which can be used for cycles, but which is open to all passengers. In no case is there any accommodation on this type of stock for the carriage of goods. If a section of the train were locked out for the carriage of goods, there would be an issue in terms of passenger access, in that most stock has through corridor connections, both within the set and at the set ends between sets. It would not be acceptable to TOCs to restrict this.

5.4 Future Rolling Stock Design

Flexible use of passenger rolling stock provides an opportunity to make stock suitable for the carriage of goods with no impact on peak period passenger capacities. Multi-purpose carriages are considered an opportunity by key stakeholders, including TOCs.

Given the lack of storage space for goods on existing rolling stock, this provides an opportunity to ensure that space is provided; either as dedicated space or flexibly used.

Opportunities to use passenger carriages flexibly are being considered as part of a design competition ‘Tomorrow’s Train Design Today’, which the DfT in association with the Royal Institute of British Architects and the FutureRailway Team launched in March 2014. The competition intends to identify passenger rolling stock designs that demonstrate design solutions that deliver:

- The industry's high-level objectives of reducing costs and carbon emissions whilst increasing capacity and customer satisfaction; and

- Rolling stock interiors with a focus on flexibility and adaptability to provide the opportunity to reconfigure internal layouts at very short notice to meet different service requirements.

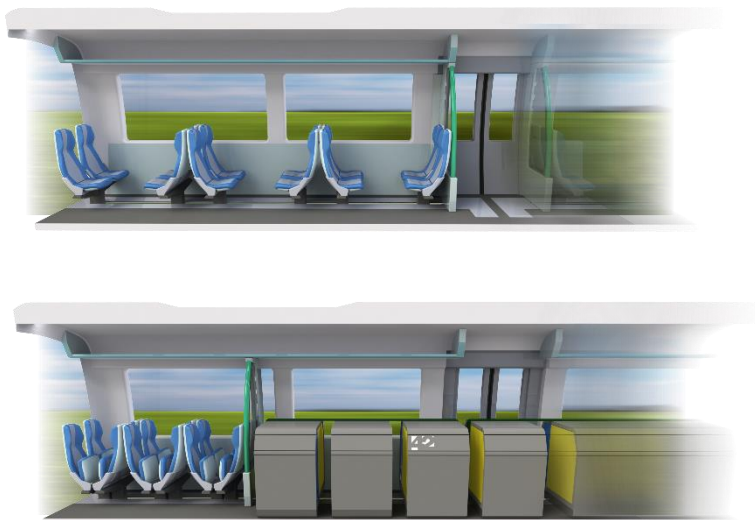
Following interviews with ten shortlisted teams the competition panel has identified three finalists for further funded development:

- 42 Technology: Adaptable Carriage –a flexible purpose carriage achieved through the automatic stowage and movement of seating.
- Andreas Vogler with the German Aerospace Center DLR: Aeroliner 3000 - the development of a combination of many singular elements concerning aerodynamics, locomotion, structure, interactive control systems and even passenger psychology will be orchestrated under the umbrella of a modern design and engineering culture informed by consequent lightweight thinking.
- Priestman Goode: Horizon - a train that increases capacity and improves passenger experience, it includes a seating concept that can flex between peak and off peak periods to offer a standard seat during off peak to a commuter seat in peak hours.

42 Technology's Adaptable Carriage concept proposes a flexible purpose carriage that will carry passengers as usual (seats in a standard configuration) with the ability to reconfigure spare space on carriages outside of peak times for the carriage of goods. This is illustrated in Figure 19. Carriages can therefore be quickly and automatically reconfigured in the station to create space for goods when not required for passengers.

The current phase of the project is funded for the next 12 months and will produce a laboratory-based prototype demonstrator of the sliding seat system. The prototype will be used to demonstrate the technical feasibility of the technology and will form the basis upon which 42 Technology will be bid for funding and support to build the technology into a train carriage in order to demonstrate the technology with a trial service. The current estimate is that the technology will add a cost of around £200k to each carriage (though design work is ongoing and this cost is only an initial estimate).

Figure 19 42 Technology Adaptable Carriage Concept



5.5 Additional Carriages

Modern trains are formed into permanent formations (known as multiple units) consisting of a number of coaches, with a driving cab at each end. It is only practical to add extra intermediate coaches into each multiple unit as permanent enhancement (London Overground is currently expanding its fleet in this way and the Pendolino fleet has been so treated in the last 2 years). Therefore any addition of coaches providing goods capability into multiple units can only be on a permanent basis.

An alternative is to create additional coaches, single or multiple, which can form a new multiple unit train which can be attached to an existing passenger train. This can be used on a specific basis with trains strengthened or reduced according to need, and it is possible to attach and detach multiple units at intermediate stations on the end to end journey.

Provision of new multiple units would require a high level of commercial confidence in the long term financial case underpinning the acquisition of a new fleet with a 30 year projected service life. An alternative might be to convert existing vehicles, although there are few spare multiple units available, due to the continuously increasing passenger demand.

A complication however is that there are considerable differences in coupler types, electrical controls, and traction types which mean that there is no universal multiple unit type which can attach to all fleets operating on different corridors. In effect a number of different, multiple unit types will be needed, either adapted for the carriage of goods use from existing passenger multiple units or a specific new build of more modern rolling stock.

Lengthening trains by coupling an additional multiple unit is not always possible. Many routes have stations which have platform lengths geared to the current service and operational restrictions which limit train lengths. For example,

suburban trains from Waterloo can only physically be extended from 8 to 10 cars once major platform lengthening works and track layout remodelling has been completed, and new rolling stock supplied. This scheme has taken nearly 10 years to design and implement, and is still not fully completed. There is therefore no capacity to lengthen these trains further to provide carriages with goods accommodation. The use of old rolling stock specifically for this use is an opportunity to provide additional capacity for the carriage of goods.

There is therefore an opportunity to provide additional carriages on trains both a permanent carriage or by coupling an additional carriage at specific stations, however this will need to be considered on a route by route basis. It is noted that during the stakeholder engagement stage TOCs indicated a preference for fixed formation trains that avoid the need for shunting vehicles.

5.6 Additional Services

5.6.1 During the Day

The provision of additional services would need to be considered on a route by route basis.

5.6.2 Passenger Trains at Night

Very few routes have passenger services which operate at night beyond around midnight or before 0600, because of a lack of demand. Track maintenance has traditionally been carried out either overnight or at weekends, when no trains are running.

Up until around 1990 express services carrying parcels, newspapers and mail operated overnight, and arrangements had to be made to provide access for these services. Since this time Railtrack and subsequently Network Rail have increased overnight maintenance to cope with the increasing number of daytime train services being run.

As a result those services which do run overnight (and freight traffic) have to be provided with a range of diversionary routes to avoid maintenance sites, and timings have to be extended to allow for this. Diversion of trains makes it difficult to maintain a service to intermediate stations, while the extended journey times may make service provision unattractive compared to road.

In the early 2000s EWS set up regular goods flows from the West Midlands to Scotland for Securicor, but the service ultimately ceased, partly due to these journey time and service reliability issues. The same issues drove Royal Mail's decision to withdraw its Railnet national mail by rail network despite significant investment in new stations and rolling stock.

Use of the network overnight will therefore require planning to ensure diversionary routes are in place to accommodate maintenance.

5.7 Punctuality and Reliability of Passenger Services

The DfT Rail Statistics Factsheet (October 2014) provides an overview of the public performance measure (PPM), which is an indicator of the performance and reliability of Britain's railways. It is the proportion of passenger trains that arrive at their final destination on time (defined as within 5 minutes of the timetabled time for regional and London & South East train services, and 10 minutes for long-distance services). Figure 20 illustrates this.

Figure 20 Percentage of trains arriving on time: GB 1997/98 to 2013/14

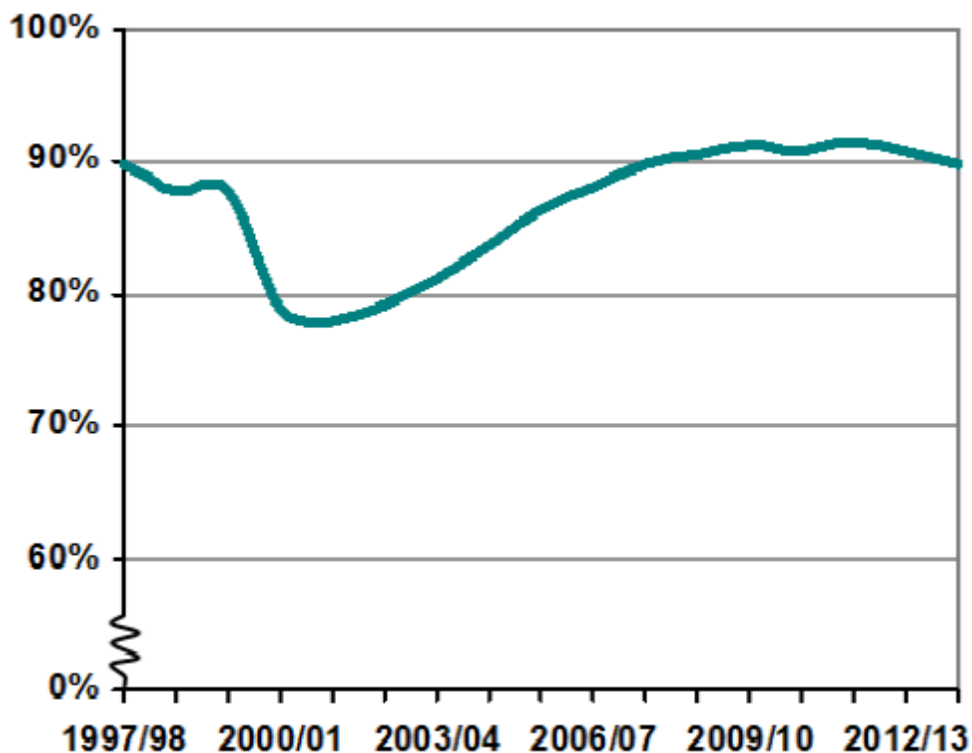


Figure 20 shows that in 2013/14, 90.0 per cent of franchised operators' trains arrived on time at their destination, a decrease from 90.9 per cent the previous year. This was slightly lower for long-distance operators, at 87.0 per cent.

By way of comparison statistics from the Highways England Traffic Information System (HATRIS) Database show that 78.7% of journeys on Highways England (formerly Highway Agency) managed roads between April 2014 and March 2015 were 'on time'. This is a lower level of reliability than passenger rail services.

The passenger rail network is therefore more reliable than the road network in terms of journey repeatability. This addresses one of the key factors retailers and logistics providers require for a service. It is noted that there the perceived poor reliability of the passenger rail network will need addressing.

It is also noted that road is more flexible than rail, so when there is a service suspension there is not an alternative route. Road however would be able to find an alternative route if a road is closed.

5.8 Security

A security protocol for the carriage of goods on passenger trains will need to be agreed between the DfT and the relevant TOC for inclusion in the TOCs existing safety and security plans. This would need to include:

- An explanation of how the operation will work, including what is being transported, how it will be transported, lines of communication;
- Identifying storage locations on each type of train stock to be used;
- How items / storage locations will be secured and procedures for checking these remain secure or dealing with any suspicion of tampering;
- Security procedures relating to storage at stations – identifying a secure location, ensuring existing relevant station security requirements are applied;
- If freight is being handled by a third party, the recognised format of ID for accessing platforms/trains;
- Confirmation that trains will not be held for consignments;
- Immediate suspension of the operation if DfT notifies of a move to Security Response Level 3;
- Incident response protocols;
- Contingency plans for dealing with Security Response Level 3 and a range of potential scenarios (such as there are more packages in the consignment than expected on the manifest; consignments over-carried to a depot; service delays etc.); and
- Training for TOC staff in the protocol.

A security protocol has been agreed for InterCity RailFreight's arrangement with East Midlands Trains, which has formed the basis of a generic protocol for potential expansion of InterCity RailFreight's business to other TOCs. This will therefore address the logistics providers and TOC requirements about safety and security of passengers and the goods being transported.

5.9 Key Considerations for TOCs

A passenger train service offering for the transportation of goods will need to ensure that it addresses the following concerns / considerations for TOCs relating to the transportation of goods on passenger trains:

- Safety and security of passengers is paramount;
- Safety and security of the goods, including who is responsible needs to be clear;
- Quantification of the financial benefits to the TOC;
- Reliability of passenger services – reliability of services should be maintained;
- Utilising spare space on trains that cannot be filled with passengers is an opportunity;

- Corporate social responsibility / environmental benefits;
- Potential changes to subsidy based on increased revenue;
- Winning the franchise bid.

5.10 Role of the Station

If passenger trains are used for the carriage of goods, additional requirements may be needed at stations, which will perform the key role of interchanging traffic onto and off trains without impacting on current operations. This will depend upon the volume of goods being transported and the associated handling requirements.

It is likely to be impractical to insert calls at stations with short dwell times, particularly for larger volumes of goods. A prime consideration is that existing station dwell times (usually between 1 and 2 minutes) can be maintained. Note that InterCity RailFreight achieve an average of 45 seconds load times on East Midlands Trains, however this is for small volumes; totes being put into and collected from lockable compartments on trains. Therefore there must be arrangements for rapid loading and unloading of the goods being transported. This may require both specific handling equipment, and also the facility to provide level access to the carriage (in the same way as TOCs use wheelchair ramps) to provide rapid loading.

Secure facilities may be required for the storage of goods on platforms in a way which can eliminate security risks from unattended parcels. This will be subject to the service being provided and the volume of goods being transported. This may also require specific retail facilities operated either by the TOC which owns the station, or by a third party.

Stations will require either lift or step free access to every platform utilised for the movement of goods and existing station furniture or facilities to be reconfigured for higher volumes / heavier items. Manual handling equipment such as a stair climbing trolley can be used for smaller items. It may also be possible to use existing back of house routes outside of peak business as usual delivery times.

Most (but not all) major stations already do have step free access, and more is being done under the DfT Access For All programme to extend provision, so this may not be a specific issue. This provision is for passengers and so will need to ensure that passenger safety and experience at stations is not impeded by the movement of goods. Loading equipment may also be required to load and unload from road vehicles.

Utilising passenger infrastructure across the country for the movement of goods could therefore mark the re-emergence of the railway as a business to business and business to customer channel. It would also mark the re-emergence of rail stations as key centres for moving goods around the country. Stations could act as micro consolidation centres.

There would be a requirement for loading bays for the first and last mile deliveries, which requires space and could also result in an increase in traffic at stations that will need to be considered. However this is dependent upon the

volume being transported. There may be potential to utilise existing loading bays outside of peak delivery hours.

5.11 Summary

There is spare passenger capacity on arrivals outside of the AM peak period and in general there is spare capacity on departures outside of the PM peak period, with less availability from some of the London stations in the evening period. This provides opportunity to transport goods at these times. From discussions with TOCs there is agreement that there is available capacity during the inter-peak and off-peak periods for the carriage of goods on passenger trains.

Using existing space could include the use of vestibules, luggage space or locking off a carriage. This would be dependent upon the volume of goods and the amount of spare capacity available on the route required.

Space allocated to non-passenger movement on rolling stock varies according to rolling stock type and most of it is allocated to bicycle storage or catering equipment. There is therefore some opportunity to transport goods on passenger trains. However it is expected that any significant volume of goods will require modifications to the current rolling stock.

Adaption of existing rolling stock to provide additional carriages is a further option to be considered on a route by route basis.

Opportunities to utilise passenger rolling stock flexibly provides an opportunity for the carriage of goods. Any impact of existing use for cycles will need to be considered.

There is scope to provide additional carriages, however this requires further work to determine the viability. Fixed train formations would require a permanent solution unless it is viable to add a new multiple unit on at an intermediate station – however this will impact on journey times. Also, provision of new multiple units would require a high level of confidence in the long term financial case underpinning the acquisition of a new fleet with a 30 year projected service life. In addition not all platforms have the same platform length and so would need to be taken account of in any proposals.

Operating passenger trains at night will require co-ordination with Network Rail due to the current use of this time period for overnight maintenance work. Where journeys are possible they would potentially be at extended journey times, and possibly not guaranteed to operate all year round. Success of the use of passenger trains is directly related to the reliability and speed of the services compared to the use of road vehicles and therefore any night services will need to be fully scoped out based on market demand.

Passenger train services provide reliable services comparable to the road vehicle reliability rates achieved by the road based sector. It is also noted that road is more flexible than rail, so when there is a service suspension there is not an alternative route. Road however would be able to find an alternative route if a road is closed.

Stations used for the loading / unloading of goods will need to consider the impact on platform capacity and station operations. It is anticipated that intermediary stations will be challenging to load /unload large volumes of goods due to the short dwell times.

Stations will need to ensure that they have appropriate facilities to accommodate goods and any services offered, including space for loading bays for first and last mile deliveries. Existing loading facilities and back of house routes may be used outside of peak business as usual delivery times.

It is an opportunity for stations to be key centres and to integrate with sustainable logistics innovation.

6 Opportunities and Barriers / Concerns

A number of key considerations related to the transportation of goods on passenger trains exist and can be defined for primary demand and supply stakeholder groups. These can constitute either opportunities or barriers / concerns to the implementation and longevity of a service and are considered in sections 6.1 and 6.2. The key considerations are:

- TOCs:
 - Safety and security of passengers;
 - Safety and security and responsibility for goods;
 - Financial benefits to the TOC;
 - Reliability of passenger services – ensure that the reliability of the passenger services are maintained;
 - Opportunity to utilise spare space on trains that cannot be filled with passengers; and
 - Winning the franchise bid.
- Retailers:
 - Customer satisfaction and loyalty;
 - Market share;
 - Profitability;
 - Service availability;
 - Journey time – quicker than by road;
 - Reliability of service; and
 - Delivery costs.
- Logistics providers:
 - Flexibility;
 - Reliability of service;
 - Costs of door-to-door delivery;
 - Costs relating to environment;
 - Service availability (a 24/7 service);
 - Safety and security of the goods;
 - Track and trace;
 - Availability of schedules / timetables to meet business needs; and
 - Ability to control temperature.
- Consumers:
 - Delivery times;
 - Operating hours;
 - Convenience;
 - Environmental; and
 - Price.

There are also a number of other considerations that are more general:

- Environmental benefits;

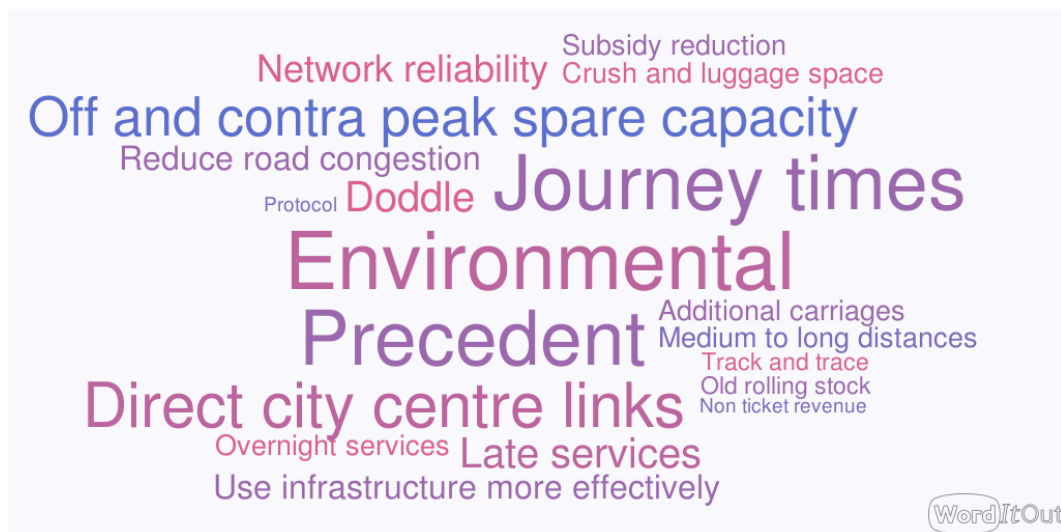
- Societal benefits;
- Modal shift from road to rail (reduced number of vehicles on the road);
- Cost savings for passenger and taxpayer;
- Station facilities;
- City to city connectivity;
- Better use of infrastructure; and
- Advocacy / promotion.

These key considerations have been assessed throughout the study and an assessment of the key opportunities and barriers / concerns related to the carriage of goods on passenger rail services has been undertaken in relation to these considerations and is presented in the following sections.

6.1 Opportunities

Figure 21 illustrates the key opportunities identified from the stakeholder engagement undertaken during the study. Environmental benefits, past and current precedents, quicker journey times over medium to long distances by rail compared to road, direct city centre connectivity as well as the provision of spare off and contra peak capacity were seen as a key opportunities by all stakeholder groups.

Figure 21 Summary of Opportunities All Stakeholders



The following section considers the key opportunities related to the carriage of goods on passenger rail services in relation to the key TOC, retailer, logistics provider / couriers and consumer considerations.

6.1.1 TOC Considerations

Opportunities that relate to the key TOC considerations are presented in Table 7.

Table 7 Opportunities: TOC Considerations

Consideration	Opportunities
Safety and security - passengers	InterCity RailFreight has an established protocol and therefore sets a precedent Red Star Parcels is a historical precedent (noted that it was a precedent with a different threat profile) A successful trial(s) would prove that this can be addressed
Safety and security and responsibility for goods	InterCity RailFreight has an established protocol and therefore sets a precedent Trains are tracked and so the location of the goods will be known at all times Goods can also be tagged and therefore would be traceable A protocol would be established for any bespoke service following on from the InterCity RailFreight protocol A successful trial(s) would prove that this can be addressed Speed of trains and frequency of stops potentially makes rail more secure than road; however stops are scheduled in advance and published.
Financial benefit to TOC	Use of existing unused space requires minimal investment by TOC InterCity RailFreight is profitable (noted that it is small scale) and has demonstrated for this model that minimal investment from EMT is required TOCs are looking to increase non-ticket revenue It is a model that has run well in past – learn from this There is a need to use passenger rail infrastructure more effectively
Reliability of passenger services	InterCity RailFreight has an established protocol and sets a precedent as it operates without impacting passenger services. Also the protocol ensures that passenger services will not be impacted Considered a good thing by TOCs and Authorities if it works without impacting passenger services as it would utilise otherwise unused space A successful trial(s) would demonstrate this
Use spare space on rolling stock that cannot be used by passengers	Crush and luggage space identified as an opportunity that could be implemented in the short term Future opportunities exist if rolling stock is flexible and adaptable Use of old rolling stock as dedicated carriages that can be adapted / gutted e.g. Gatwick Express old rolling stock (GVT) Luggage space could be adapted to be lockable Existing spare space is seen as an opportunity to capitalise on by TOCs and Authorities (need to check current utilisation by cycles etc.) A successful trial(s) would demonstrate it works Spare capacity inter-peak and off-peak
Winning the franchise bid	Need to use infrastructure more effectively - asset utilisation has been highlighted as important Innovation through franchise

6.1.2 Retailer Considerations

Opportunities that relate to the key retailer considerations are set out in Table 8.

Table 8 Opportunities: Retailer Considerations

Consideration	Opportunities
Customer satisfaction / loyalty	For retailers who have a customer base that consider environmental considerations important, the use of passenger rail would achieve these benefits and assist with customer satisfaction / loyalty More reliable adherence to delivery slots
Market share	Could assist with aspirations to gain advantage
Profitability	No information available to assess though some interest from retailers during engagement who could envisage benefits. Detailed work required to assess against specific market demand
Service availability	The passenger network is not currently 24/7 (with the exception of a small number of sleeper services), however this could be addressed by additional services Connectivity is direct to city centre – therefore can deliver direct to city centre stores Opportunity for late services – could close off a carriage where there is available capacity Could store overnight in stations for collection in the morning
Journey time	Road has speed restrictions – rail can achieve quicker journey times A successful trial(s) would prove this point
Reliability of service	Road is congested – rail is not InterCity RailFreight sets a precedent as a reliable service The passenger rail network is more reliable than road A successful trial(s) would prove this point
Delivery costs	Red Star Parcels lessons learned – get right offering for the right operational costs Start with a limited network over the right distances and implement an offering that is right for the market Delivery costs by road are known to retailers – ensure rail is priced competitively or can price above road based on a USP such as achieving faster journey times (end to end) than road

6.1.3 Logistics Providers / Couriers

Opportunities that relate to the key logistics providers / couriers considerations are discussed in Table 9.

Table 9 Opportunities: Logistics Providers / Couriers

Consideration	Opportunities
Flexibility of service	Could provide additional flexibility to existing road based operations by providing an alternative to road
Reliability of service	Road is congested – rail is not InterCity RailFreight sets a precedent as a reliable service The passenger rail network is more reliable than road A successful trial(s) would prove a point
Door to door delivery costs	Need to be competitive with road. Delivery costs by road are known to logistics providers – ensure rail is priced competitively or can price above road based on a USP such as achieving faster journey times (end to end) than road
Environmental costs	Environmental importance is changing due to European standards and greater awareness If reliable, fast, easy to use and cheap logistics providers would love to use as it would enhance their environmental performance credentials Can be part of some companies procurement process so could be a USP
Service availability (24/7)	The passenger network is not currently 24/7, however this could be addressed by additional services Connectivity is direct to city centre – therefore can deliver direct to city centre stores Opportunity for late services – could close off a carriage where there is available capacity Could store overnight in stations for collection in the morning
Safety and security – goods	InterCity RailFreight has an established protocol and therefore sets a precedent Trains are tracked and so the location of the goods will be known at all times Goods can also be tagged and therefore would be traceable A protocol would be established for any bespoke service following on from the InterCity RailFreight protocol A successful trial(s) would prove that this can be addressed Speed of trains and frequency of stops potentially makes rail more secure than road; however stops are scheduled in advance and published
Regulate / monitor temperature	Has been tested and is achievable
Track and trace	Trains are tracked and so the location of the goods will be known at all times – accurate real time knowledge of where they are Goods can also be tagged and therefore would be traceable
Level of service to meet business needs	There are a number of ways that the carriage of goods on passenger trains can be achieved in terms of volume and also when services can be run for example additional services at night could be possible or additional carriages during the day

6.1.4 Consumer Considerations

Opportunities that relate to the key consumer considerations are outlined in Table 10.

Table 10 Opportunities: Consumer Considerations

Consideration	Opportunities
Delivery times	There are a number of ways that the carriage of goods on passenger trains can be achieved in terms of when services can be run for example additional services at night could be possible or additional carriages during the day to ensure integration with last mile deliveries that achieve consumer requirements Could store goods overnight in stations for collection in the morning for delivery at times that work for consumers
Operating hours	Run overnight services
Convenience	Doddle, click & collect, home delivery etc. are all opportunities that can be exploited
Environment	Environmental importance is changing due to European standards and greater awareness By removing vehicles from the road it will reduce congestion on the road network, particularly in city centres, improve air quality and reduce noise pollution. If integrated with sustainable first and last mile logistics end to end benefits can be realised A lot of companies have carbon responsibility, Corporate Social Responsibility etc. though measures tend to be implemented when they are financially viable The InterCity RailFreight service appeals to some customers for environmental reasons
Price	No information to assess, however delivery costs by road are known – ensure rail is priced competitively

6.1.5 Other Considerations

Opportunities that relate to the other key considerations are set out in Table 11.

Table 11 Opportunities: Other Considerations

Consideration	Opportunities
Environmental benefits	Environmental importance is changing due to European standards and greater awareness The InterCity RailFreight service appeals to some customers for environmental reasons By removing vehicles from the road it will reduce congestion on the road network, particularly in city centres, improve air quality and reduce noise pollution. If integrated with sustainable first and last mile logistics end to end benefits can be realised. Contribute to a better environment for communities Important for large customers Can be part of some companies procurement process Reduced EU fines
Societal benefits	By removing vehicles from the road it will reduce congestion on the road network, particularly in city centres, improve air quality and reduce noise pollution. Contribute to a better environment for communities
Modal shift from road to rail	Road is congested – therefore rail is an opportunity Major gain is road space Doddle is currently road based as is station retail – therefore opportunity
Cost savings for passenger and taxpayer	Non-ticket revenue Could achieve a reduction in subsidy Need to use infrastructure more effectively
Station infrastructure / space (internal movement, storage and first / last mile integration)	Provision existed before the carriage and receipt of goods Stations were originally built for goods Same Day parcels market volumes can be moved easily and so likely to be achieved within existing station infrastructure Could utilise existing infrastructure provision
Staffing / handling requirements	Increase skill and therefore job satisfaction Third party could handle goods without need for existing station staff
City to city connectivity	Passenger rail access centre of towns / cities
Better use of infrastructure	Utilising existing spare space is an easy win Or where existing infrastructure can be easily adapted is an easy win
Advocacy / promotion	Organisations are willing to promote the use of passenger rail for the carriage of goods
Legislation	None required DfT could influence through the franchise process
Liability	Compared to a bike carrying temperature sensitive goods e.g. organs rail provides an opportunity to mitigate liability by reliability of journey and could also provide active cooling rather passive cooling

6.2 Barriers / Concerns

Figure 22 illustrates the main barriers / concerns identified from the stakeholder engagement undertaken during the study. Cost of the service, station access and space as well as perceptions that there is no spare capacity or space on passenger trains and that road is more reliable than rail were seen as key barriers / concerns by all stakeholder groups.

Figure 22 Summary of Barriers / Concerns All Stakeholders



6.2.1 TOC Considerations

Barriers / concerns that relate to the key TOC considerations are presented in Table 12.

Table 12 Barriers / Concerns: TOC Considerations

Consideration	Barriers / Concerns	How Overcome
Safety and security - passengers	Transportation of dangerous goods Avoid conflict with passengers Freight and people don't mix May need security screening requirements	Potentially controlled through protocol in line with EU regulations or exclude these goods InterCity RailFreight has an established protocol and therefore sets a precedent (if protecting against threats). A protocol would be established for any service provided following on from the existing InterCity RailFreight protocol Full consideration would be given to the service provided (there are different operational models that would be looked at), ensuring that it could operate safely where there is interface/potential interface with passengers A successful trial(s) would demonstrate it works It is likely that it will be necessary to manage perceptions The passenger rail network is an open network (only exception is the Eurostar) If customer requirements, these will need to be considered when determining operational viability on a route by route basis.
Safety and security and responsibility for goods	If lockers allocated to one provider at a time requires more co-ordination from TOC Goods to be transported securely	TOC to allocate resource. Additional volume will result in increased revenue and profit InterCity RailFreight has an established protocol and therefore sets a precedent (if protecting against threats). A protocol would be established for any service provided following on from the existing InterCity RailFreight protocol (if protecting against threats) Trains are tracked and so the location of the goods will be known at all times Goods can also be tagged and therefore would be traceable A successful trial(s) would prove that this can be addressed

Consideration	Barriers / Concerns	How Overcome
Safety and security and responsibility for goods continued	Concerned about security as trains do not have storage Current staffing level not able to cope with additional tasks May require additional payment for multi-purpose role Unions may object	Operational models could be a locked off carriage or a lockable compartment within the train (dependent upon volume), which would provide a secure way to store goods for transit Enhanced security compared to overnight deliveries where vehicle and driver stop in lay by. Station staff may not handle goods Third party responsibility protocol would be established Unions would be engaged with, if required Staff may want a more varied role
Financial benefit to TOC	InterCity RailFreight profitable but is small scale and therefore is this the limit to operation? Needs to be economically viable If TOC does not think there is a business case it will put them off	InterCity RailFreight current model is a low volume model and currently requires minimal investment from the TOC. There are alternative operational models that would achieve higher volumes. All operational models will need to be assessed on a case by case basis. Market growth for InterCity RailFreight could increase profitability InterCity RailFreight is a current operation that is profitable and therefore sets a precedent Use of existing unused space requires minimal investment by TOC It is a model that has run well in past – learn from this There is a need to use passenger rail infrastructure more effectively
Reliability of passenger services	Dwell times are tight and therefore loading / offloading goods could impact performance The carriage of goods on passenger trains must not impact passenger services	InterCity RailFreight has an established protocol and sets a precedent as it operates without impacting passenger services. The protocol ensures that passenger services will not be impacted The operational model will need to fully consider which stations on the identified routes provide dwell times that will match the service level A successful trial(s) would demonstrate it works It is likely that it will be necessary to manage perceptions

Consideration	Barriers / Concerns	How Overcome
Use spare space on rolling stock that cannot be used by passengers	Existing space limits volume Current and future space is designed for passengers not goods Not enough space on existing rolling stock / too small scale for major carriers	Crush and luggage space identified as an opportunity that could be implemented in the short term Future opportunities exist if rolling stock is flexible and adaptable Use of old rolling stock as dedicated carriages that can be adapted / gutted DfT ensure rolling stock provided with enough storage – note limitations with IEP, however are supporting the FutureRailways competition Other opportunities for volume e.g. shut off a carriage, flexible carriages, dedicated carriages. These alternative operational models could provide medium to high volumes
Winning the franchise bid	TOCs should stick to what they are good at – running passenger services	The operational model implemented by TOC would not impact passenger services Franchises could realise benefits to the taxpayer and passengers

6.2.2 Retailer Considerations

Barriers / concerns that relate to the key retailer considerations are set out in Table 13.

Table 13 Barriers / Concerns: Retailer Considerations

Consideration	Barriers / Concerns	How Overcome
Customer satisfaction / loyalty	None identified	n/a
Market share	None identified	n/a
Profitability	Linked to the cost of the service – cost needs to be competitive to road. No information available to consider in detail – though some interest from retailers during engagement who could envisage benefits. Detailed work required to assess against specific market demand	Ensure it is priced correctly – delivery costs by road are known
Service availability	Railway closes overnight for maintenance	All maintenance works are planned, therefore it will be possible to schedule around these planned works

Consideration	Barriers / Concerns	How Overcome
Service availability continued	Passenger frequencies too low during off-peak limiting potential Passenger services too full when required	This could be addressed by additional services Late services provide an opportunity to close off a carriage where there is available capacity Could store overnight in stations for collection in the morning There is spare capacity on the network. However additional capacity could also be achieved by the provision of additional carriages on existing services
Journey time	Road is ideally suited for speed	Over medium to long distances rail is quicker Road has speed restrictions – rail can achieve quicker journey times A successful trail(s) would prove a point
Reliability of service	Road more flexible than rail Consider road more reliable than the passenger rail network	It is a fixed network - it is likely that it will be necessary to influence / manage perceptions about ease of use Road is congested Road is congested – rail is not InterCity RailFreight sets a precedent as a reliable service The passenger rail network is more reliable than road A successful trail(s) would prove a point It is likely that it will be necessary to influence / manage perceptions
Delivery costs	Additional link in supply chain; increases costs	Potential for operational, financial and market benefits when rail operates quicker journey time or provides value added service compared to road Also environmental benefits may be attractive to retailer customers Also goods by rail not accompanied by staff, therefore no staff cost whilst on the train

Consideration	Barriers / Concerns	How Overcome
Delivery costs continued	The parcel / courier market is a very price sensitive market so will have to ensure can compete	Ensure it is priced correctly – delivery costs by road are known USP that medium to long distances for the Same Day market means that can potentially charge more. Providing time definite services Get the offering right; right volume, right distance (lessons learned from Red Star Parcels)

6.2.3 Logistics Providers / Couriers

Barriers / concerns that relate to the key logistics providers / couriers considerations are discussed in Table 14.

Table 14 Barriers / Concerns: Logistics Providers / Couriers

Consideration	Barriers / Concerns	How Overcome
Flexibility of service	Road more flexible than rail Size and weight restrictions plus price	It is a fixed network - it is likely that it will be necessary to influence / manage perceptions about ease of use Road is congested Size and weight may not be able to overcome (depends on goods) as must operate within the existing operational parameters for the passenger network A successful trail(s) would prove a point
Reliability of service	Consider road more reliable than the passenger rail network	Road is congested – rail is not InterCity RailFreight sets a precedent as a reliable service The passenger rail network is more reliable than road A successful trail(s) would prove a point It is likely that it will be necessary to influence / manage perceptions
Door to door delivery costs	Additional link in supply chain; increases costs	Potential for operational, financial and market benefits when rail operates quicker journey time or provides value added service compared to road Also environmental benefits may be attractive to retailer customers Click and collect at mainline stations could remove a link in the supply chain for some goods

Consideration	Barriers / Concerns	How Overcome
Door to door delivery costs continued	The parcel / courier market is a very price sensitive market so will have to ensure can compete	Ensure it is priced correctly – delivery costs by road are known USP that medium to long distances for the Same Day market means that can potentially charge more. Providing time definite services Get the offering right; right volume, right distance (lessons learned from Red Star Parcels)
Environmental costs	Governments and local authorities could do more – stick measures e.g. tolls	DfT / local authorities could implement
Service availability (24/7)	Railway closes overnight for maintenance Passenger frequencies too low during off-peak limiting potential	All maintenance works are planned, therefore it will be possible to schedule around these planned works This could be addressed by additional services Late services provide an opportunity to close off a carriage where there is available capacity Could store overnight in stations for collection in the morning
Safety and security – goods	Goods to be transported securely	InterCity RailFreight has an established protocol and therefore sets a precedent (if protecting against threats). A protocol would be established for any service provided following on from the existing InterCity RailFreight protocol (if protecting against threats) Trains are tracked and so the location of the goods will be known at all times Goods can also be tagged and therefore would be traceable Operational models could be a looked off carriage or a lockable compartment within the train (dependent upon volume), which would provide a secure way to store goods for transit A successful trial(s) would prove that this can be addressed
Regulate temperature	Goods may require temperature regulation	This is achievable
Track and trace	Ability to track and trace goods	Trains are tracked and so the location of the goods will be known at all times Goods can also be tagged and therefore would be traceable

Consideration	Barriers / Concerns	How Overcome
Level of service to meet business needs	If the volume the market wants is not available it will prevent the market from using passenger rail	Opportunities for night services, additional carriages, locked off carriages, additional train paths could overcome this
	Passenger frequencies too low during off-peak limiting potential	Offset by higher speed than road This could be addressed by additional services Late services provide an opportunity to close off a carriage where there is available capacity Could store overnight in stations for collection in the morning A successful trial(s) would prove that this can be addressed
	Passenger services too full when required	Opportunities for night services, additional carriages, locked off carriages, additional train paths could overcome this

6.2.4 Consumer Considerations

Barriers / concerns that relate to the key consumer considerations are presented in Table 15.

Table 15 Barriers / Concerns: Consumer Considerations

Consideration	Barriers / Concerns	How Overcome
Delivery times	None identified	n/a
Operating hours	Railway closes overnight for maintenance	All maintenance works are planned, therefore it will be possible to schedule around these planned works
Convenience	Door to door service required	Ensure operational model incorporate this, considering end to end service Plus Duddle, click and collect are opportunities that could be exploited
Environment	Concern end of journey not sustainable	First and last mile sustainable logistics exists and the operational models could integrate with these services
Price	Additional link in supply chain; increase costs	Potential for operational, financial and market benefits when rail operates quicker journey time or provides value added service compared to road Goods on train are not accompanied therefore no staff cost whilst in transit on passenger rail

Price continued		Click and collect at mainline stations could remove a link in the supply chain for some goods Also environmental benefits may be attractive to consumers (at the right price)
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6.2.5 Other Considerations

Barriers / concerns that relate to the other key considerations are outlined in Table 16.

Table 16 Barriers / Concerns: Other Considerations

Consideration	Barriers / Concerns	How Overcome
Environmental benefits	Governments / local authorities could do more – stick measures e.g. tolls Concern end of journey not sustainable	DfT / local authorities could implement First and last mile sustainable logistics exists and the operational models could integrate with these services
Societal benefits	None identified	n/a
Modal shift from road to rail	Logistics carriers have existing road and air networks	Promote the opportunities that rail provides over these – speed, journey time Ensure that the cost is competitive A successful trial(s) would prove that this can be addressed
Cost savings for passenger and taxpayer	None identified	n/a
Volume	Larger lockers may be required for low volume of goods If the volume the market wants is not available will prevent market	Convert seats / luggage space, future rolling stock specification to include Opportunities for night services, additional carriages, locked off carriages, additional train paths could overcome this

Consideration	Barriers / Concerns	How Overcome
Station facilities (internal movement, storage and first / last mile integration)	May require adapting to accommodate	Same Day market can be moved easily and so likely to be achieved within existing station infrastructure DfT/NR to consider any adaption Private investment could facilitate A successful trial(s) would prove what is required
Station facilities (internal movement, storage and first / last mile integration) continued	Not enough space. Would result in conflict between passengers and goods. Health and safety implications. Unions may object	Station staff may not handle goods Third party responsibility protocol would be established Unions would be engaged with, if required A successful trial(s) would prove that this can be addressed
	Less staff now – won't be able to undertake additional role	Station staff may not handle goods Integrate with Doddle
	Wear and tear of station infrastructure	Only operate where it will work Monitoring
	Movement of goods though station – barriers / platforms	Ensure is fit for purpose – may require investment A successful trial(s) would prove that this can be addressed
Staffing / handling requirements	May impact type and volume of goods Unions may be have concerns	Protocol Manual handling limits the weight Opportunities for multi-skills Station staff may not handle goods Unions would be engaged with, if required A successful trial(s) would prove that this can be addressed
City to city connectivity	Interoperability between TOCs can be a challenge	Start with one TOC and then build from a successful established network, if there is demand for it Establish a protocol for operation A successful trial(s) would prove that it works
Better use of infrastructure	None identified	n/a

Consideration	Barriers / Concerns	How Overcome
Advocacy / promotion	None identified	n/a
Legislation	None identified	n/a
Liability	Where does liability for goods sit	Protocol will establish this

The assessment set out in Tables 12 to 16 demonstrate that although there are a number of barrier / concerns identified these are potentially addressable and so not considered insurmountable.

7 The Operational Models

7.1 Potential Operational Models

There are several potential operational models for the carriage of goods on passenger trains; there is not one predetermined model for the passenger network. One or several of the operational models may be applicable to a TOC, a route and a market. Full consideration should be given to a number of factors when determining the most appropriate model to implement, including the market requirements / volume, where there is available passenger capacity on routes, timescales and opportunities to utilise existing or future space on rolling stock and an assessment of demand against supply on these routes. Consideration of first and last mile requirements and the impact at stations will also need to be considered.

The potential operational models which are outcomes of the physical constraints / opportunities discussed in Chapter 5 for the carriage of goods on passenger trains are summarised as follows:

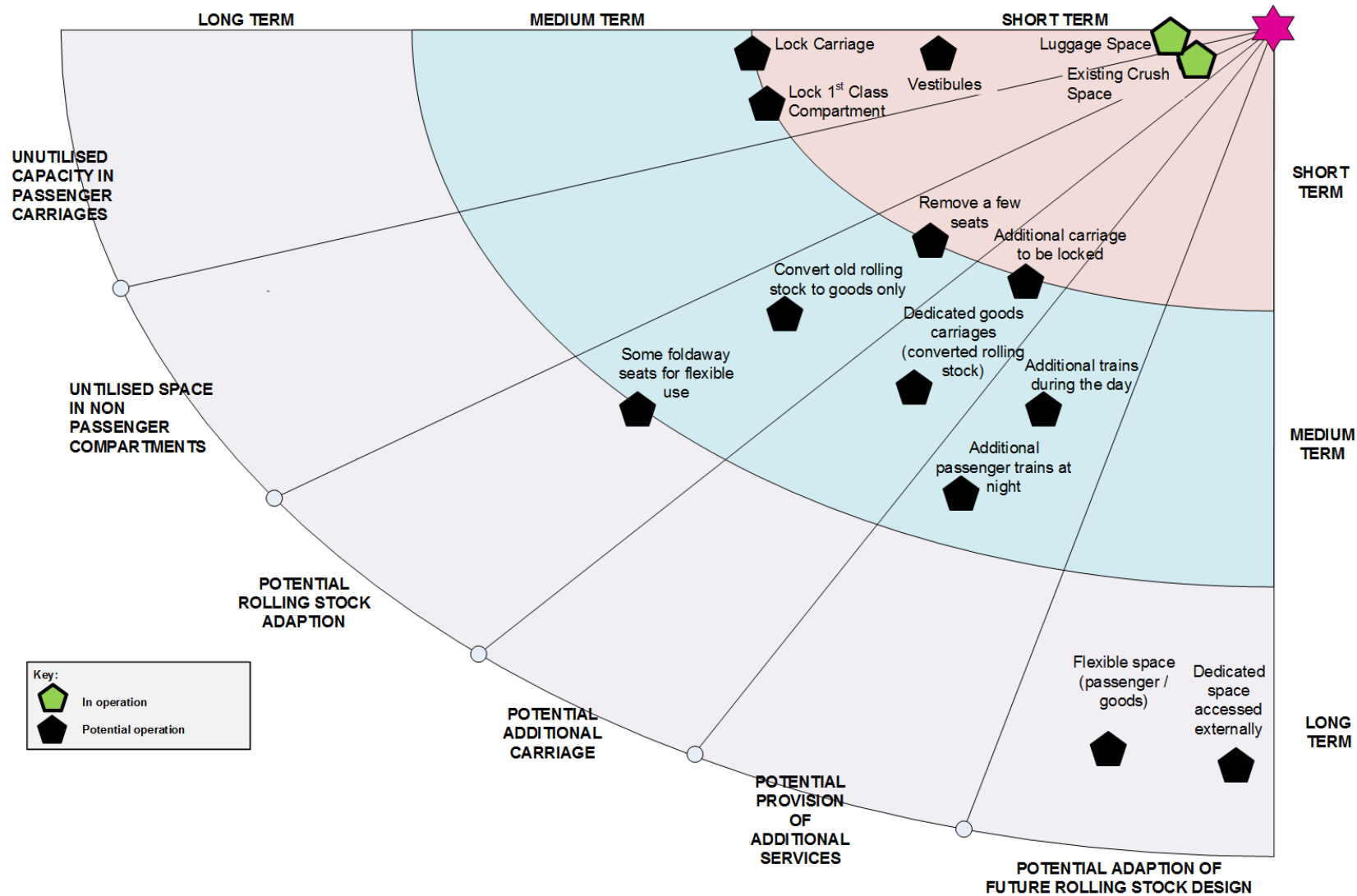
- **Unutilised capacity in passenger carriages**– utilising existing spare passenger capacity including use of luggage space, vestibules, locking off a carriage when there is available capacity and locking off the 1st class compartment when there is available capacity. This model does not require any significant changes to rolling stock and so can be easily implemented in the short term with minimal capital cost. The volume of goods that can be transported will be defined by the amount of space provided (as well as operational considerations at stations related to first and last mile integration).
- **Unutilised space in non-passenger compartments** – utilising existing spare space on rolling stock i.e. crush space. This model does not require any significant changes to rolling stock and so can be easily implemented in the short term and with minimal capital cost. As with the use of spare passenger capacity, the volume of goods that can be transported will be defined by the amount of space available for use (as well as operational considerations at stations related to first and last mile integration).
- **Potential rolling stock adaption** – this could mean adapting existing passenger space on existing rolling stock. For example, removing a few seats so that space is more readily available for goods or providing some foldaway seats so that the space can be flexibly used for passengers / goods. Alternatively it could mean converting old rolling stock to goods only carriages i.e. remove interior fittings. This model requires some changes to rolling stock and could be implemented in the medium term without significant capital cost.
- **Potential additional carriage(s)** – the creation of additional carriages, single or multiple, which can form a new multiple unit train which can be attached to an existing passenger train. This can be used on a specific basis with trains lengthened or reduced in length according to need. It is possible to attach and detach multiple units at stations on the end to end journey. This model would

provide high volumes as it would be achieved either through the provision of locked carriages or by converted rolling stock.

- **Potential provision of additional services** – this could mean operating additional train paths during the day or night. It is anticipated that these would require high volume to justify and so these additional services could be providing locked carriages, converted rolling stock.
- **Potential adaption of future rolling stock design** - flexible use of passenger rolling stock provides an opportunity to make stock suitable for the carriage of goods with no impact on peak period passenger capacities. This includes multi-purpose carriages as well as the opportunity to access space externally.

Figure 23 illustrates the potential operational models and considers them against timescales for implementation.

Figure 23 Potential Operational Models



As illustrated by Figure 23 there are two models currently in operation. Use of spare passenger capacity (luggage space) and existing spare space on rolling stock (crush space) is being used by InterCity RailFreight on East Midlands Trains and on the Eurostar.

All of the operational models that utilise existing spare passenger capacity and existing spare space on rolling stock could be implemented in the short term.

Where adaption of existing rolling stock design or additional services or carriages are required these operational models could be implemented in the medium term.

Longer term operational models include adapting future rolling stock design.

All of the above operational models can be considered in terms of the potential volume of goods that could be transported, categorised as high, medium and low volumes.

7.2 Initial Assessment

An initial assessment of the potential operational models identified in Figure 23 against the potential markets identified in Chapter 3 has been undertaken and is presented in Table 17.

Table 17 Assessment of Potential Market with Potential Operational Models

Volume Category	Potential Operational Model		Potential Market			
			Next Day and 2 to 3 Day	Same Day	Niche	Retailer
Low	Unutilised capacity in passenger carriages	Luggage Space	N	Y	Y	N
Low	Unutilised capacity in passenger carriages	Vestibules	N	Y	Y	N
Low	Unutilised capacity in passenger carriages	Lock 1st Class Compartment	N	Y	Y	N
Low	Unutilised space in non-passenger compartments	Existing Crush Space	N	Y	Y	N
Low	Potential adaption of future rolling stock design	Dedicated space accessed externally	N	Y	Y	N
Medium	Unutilised capacity in passenger carriages	Lock Carriage	N	Y	Y	Y
Medium	Potential rolling stock adaption	Remove a few seats	N	Y	Y	N
Medium	Potential rolling stock adaption	Provide some foldaway seats for flexible use	N	Y	Y	N
High	Potential rolling stock adaption	Convert old rolling stock to goods only carriages	Y	Y	Y	Y
High	Potential additional carriage(s)	Additional carriage/s to be locked	N	Y	Y	Y
High	Potential additional carriage(s)	Dedicated goods carriages/s (converted rolling stock)	Y	Y	Y	Y
High	Potential provision of additional services	Additional trains during the day – locked carriage/s	N	Y	Y	Y
High	Potential provision of additional services	Additional trains during the day – dedicated goods carriage/s (converted rolling stock)	Y	Y	Y	Y
High	Potential provision of additional services	Additional trains at night - locked carriage/s	N	Y	Y	Y
High	Potential provision of additional services	Additional trains at night - dedicated goods carriage/s (converted rolling stock)	Y	Y	Y	Y
High	Potential adaption of future rolling stock design	Flexible space (passenger / goods)	Y	Y	Y	Y

Table 17 illustrates that the Next Day and 2 to 3 Day market is not suitable for a number of the operational models. In particular due to the volume of goods required for transportation the low and medium volume models including those related to the use of spare passenger capacity, existing space on rolling stock and adapting existing rolling stock (remove a few seats or provide some flexible seats) are not viable.

The retailer market is also not considered suitable for the operational models that provide space for low and medium volumes of goods, with the exception of the medium volume available by locking a carriage.

The Same Day and Niche markets are anticipated to be able to suitable for all potential operational models.

7.3 Operation Overview

An overview of the operation for the movement of low, medium and high volumes of goods, setting out key operational steps are illustrated in Figures 24 , 25 and 26, respectively. Key stakeholders are also identified.

Figure 24 Low Volume: Key Operational Steps

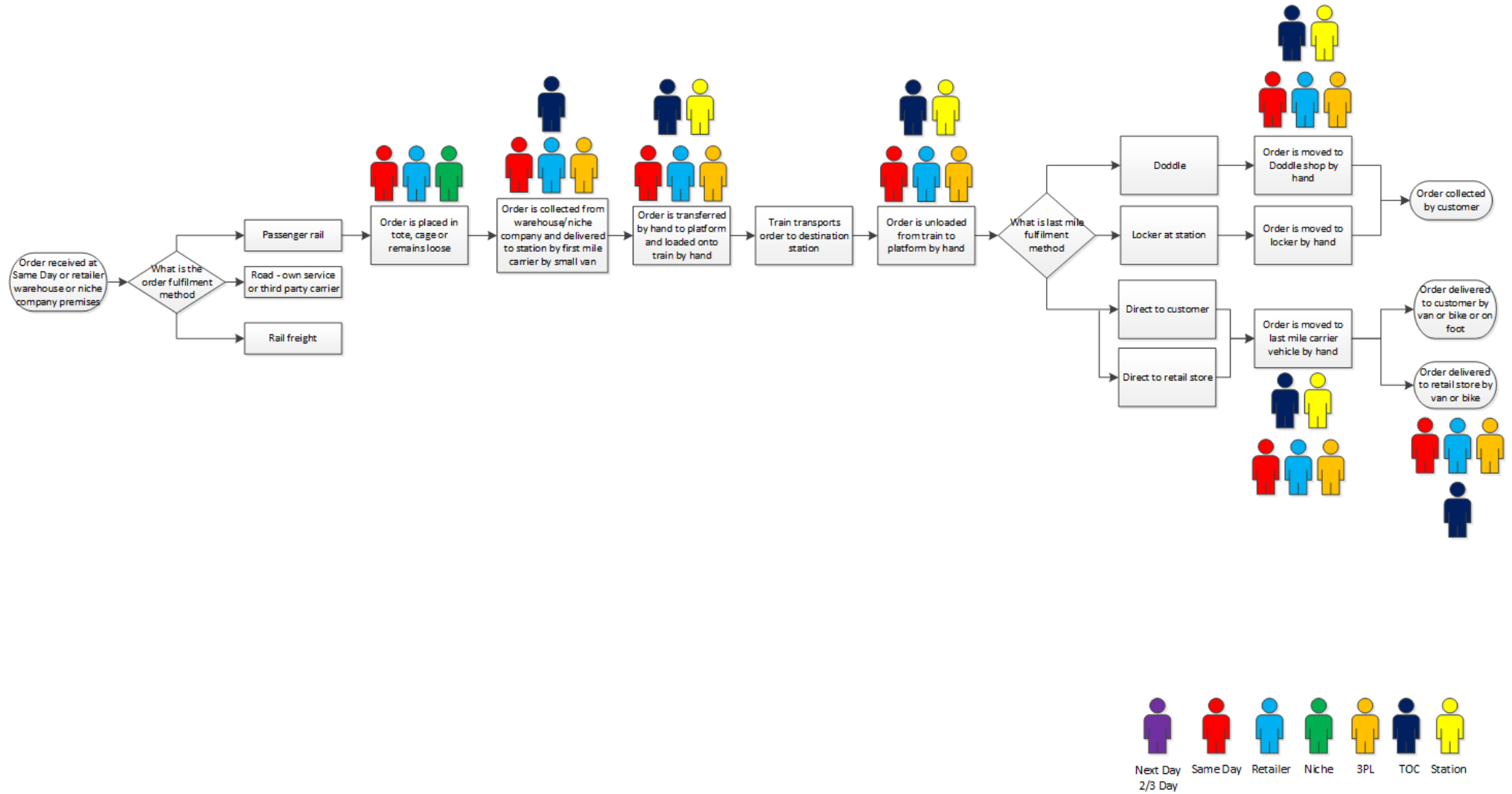


Figure 25 Medium Volume: Key Operational Steps

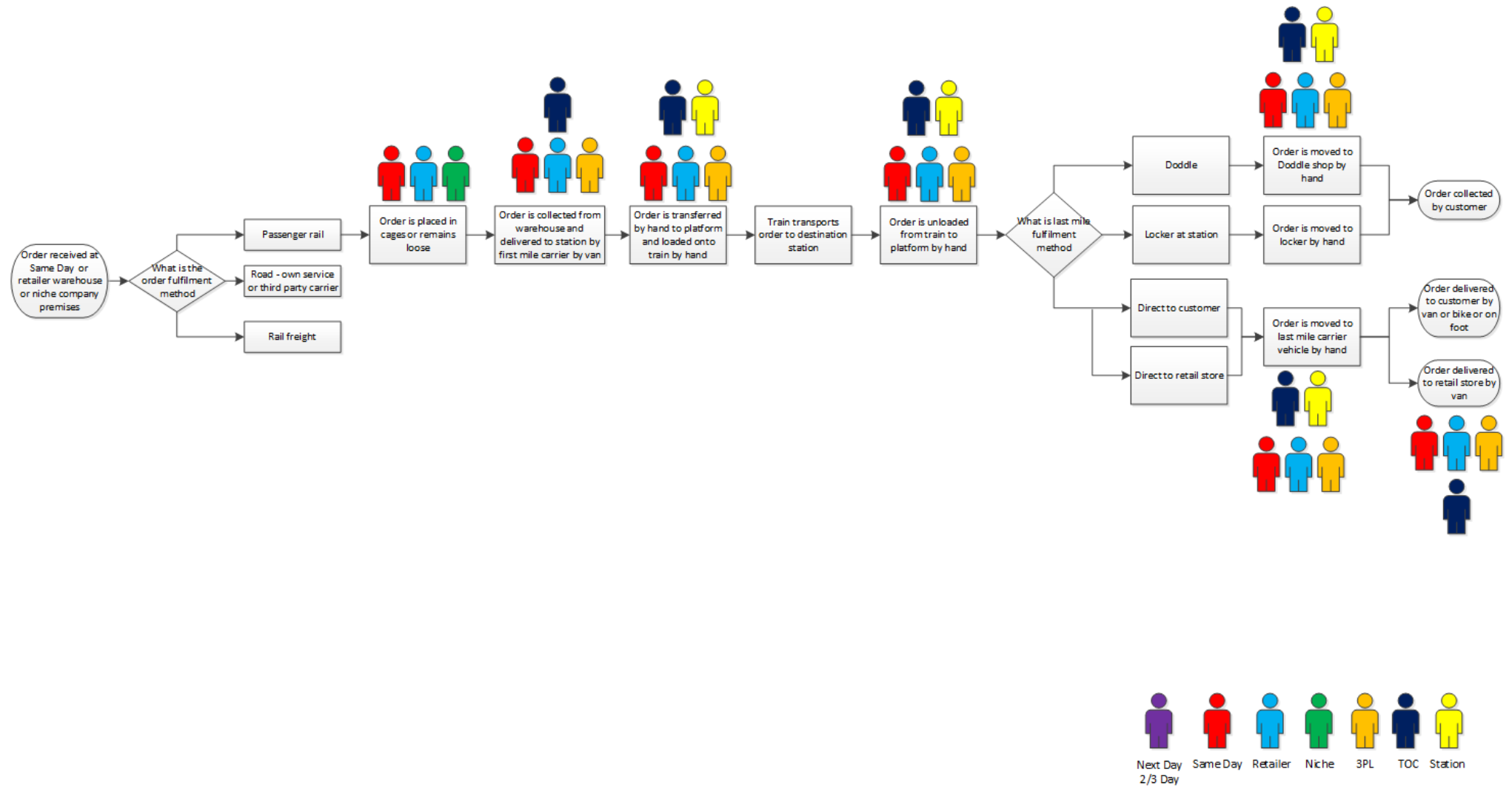
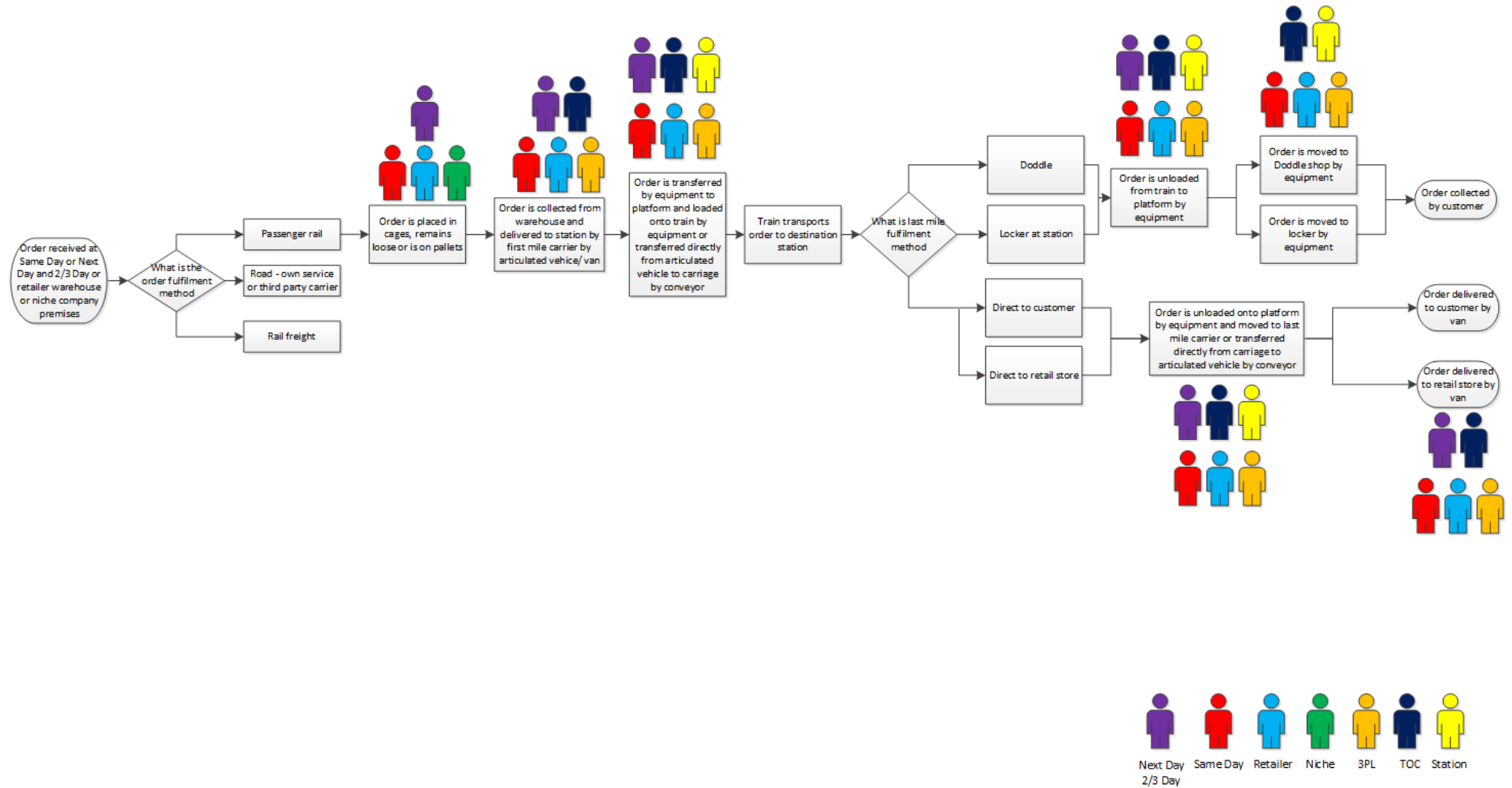


Figure 26 High Volume: Key Operational Steps



7.3.1 Equipment Examples

Examples of goods containers and handling equipment are set out in Table 18.

Table 18 Goods Containers / Handling Equipment

Goods Container / Handling Equipment		Dimensions
Roll Cage		Overall width: 731 mm Overall length: 847 mm Overall height: 1,687 mm
Pallet		Width: 1,000 mm Length: 1,200 mm
Plastic / wooden crate		Overall width: 1,000 mm Overall length: 1,200 mm Overall height: 400 mm
Tote box		Overall width: 400 mm Overall length: 600 mm Overall height: 365 mm
Ride on electric tow tractor		Overall width: 1,830 mm Overall length: 1,000 mm Overall height: 1360 mm

Goods Container / Handling Equipment	Dimensions
Pedestrian towing tractor	 Overall width: 700 mm to 1100 mm Overall length: 1,620 mm Overall height: 1050 mm
Electric pallet truck	 Overall width: 550 mm Overall length: 1,150 mm

If back of house routes are not available, access to platforms may be constrained by ticket gates at stations, these gates include standard and wide gates:

- Standard gate width:– 600 mm to 620 mm
- Wide gate width: –900 mm to 1080 mm

Therefore containers and equipment handling would need to utilise the wide gates to access platforms if an alternative route is not available at stations. The width of the wide gate will restrict the size of containers and handling equipment; pallets, pallet trucks and ride on trucks will be too large to utilise gates that are 900mm wide.

7.4 Station Requirements

The impact and therefore the requirements at stations will be dependent upon the operational model(s) implemented.

Key considerations are:

- **External access** – for vehicles for first and last mile logistics. It will be important to determine whether there is sufficient space at the time it is needed to accommodate the vehicle types required and if this requirement is competing with existing station activities.
- **Internal access** - for the movement of goods to and from passenger trains. It will be necessary to ensure that the goods routes are accessible, as well as consider if they conflict with passengers and whether the internal station infrastructure (barriers etc.) impede the movement of goods.
- **Storage requirements** – this includes temporary storage within the station or on the platform, as a wider goods capability is required due to the station being a hub for consolidation or should the offering integrate with Doodle.

- **Security** – goods and passengers. This will need to be achieved to be able to operate the service. The InterCity RailFreight protocol has established parameters from which further protocols can be established as required.
- **Staffing** – this relates to who is responsible for handling and managing the goods. If this is within the remit of the TOC staff, roles will need to be fully considered (could be an opportunity to increase skills and job satisfaction) and engagement would be required with unions. Alternatively this could be contracted to a third party who is responsible for all handling and the safety and security of the goods.
- **Alterations to provide wider goods capability** – this is an opportunity for stations to become city hubs, facilitating deliveries of goods directly into city transport hubs, which can then be distributed on electric vehicles. This could deliver substantial benefits to air quality and emission for urban authorities and for those living and working in these locations.
- **Doddle** – integrating with Doddle or other in station service is also an opportunity.

An initial high level consideration of the likely impact at stations for the potential operating models is set out in Table 17. It is noted that this provides a general overview and that each station will need to be considered on an individual basis. This considers the impacts as Red (R), Amber (A) and Green (G). Green means no / minimal impact / risk, Amber equates to manageable risks / reasonable cost and Red equates to high risk / impact that is difficult to overcome. Note that this assessment could change depending upon the business model used to take forward the opportunity as well as being undertaken in the context of a specific station.

External access:

- **Green** - no impact / risk i.e. first and last mile deliveries can access the station by existing facilities i.e. no additional loading bays are required or does not require a vehicles i.e. can be undertaken on foot or by bike
- **Amber** - manageable risk / able to mitigate i.e. likely to be able to access the station by existing facilities or that the first and last mile can be undertaken on foot by bike or by small electric vehicle
- **Red** - additional facilities are likely to be required due to the size of vehicle required to be able to access the station for first and last mile deliveries

Internal access:

- **Green** - no impact / risk i.e. no conflict with passengers, easily accessible by the goods and does not require alterations to existing internal infrastructure
- **Amber** – manageable risk / able to mitigate i.e. able to provide route that does not conflict with passengers with limited alterations to existing internal infrastructure
- **Red** – high risk / difficult to overcome i.e. significant alterations to internal infrastructure, goods routes are in conflict with passengers

Storage:

- **Green** – no impact / risk i.e. unlikely to require storage
- **Amber** – manageable risk / able to mitigate i.e. may require some storage either temporary or as wider station offering
- **Red** – high risk / difficult to overcome i.e. likely to not be achievable without temporary station /platform storage or storage within the station which could be difficult to provide

Security:

- **Green** – no / minimal risk – within established protocol
- **Amber** – manageable risk/ able to mitigate i.e. able to amend / update established protocol
- **Red** - high risk/ difficult to overcome i.e. difficult to amend / update established protocol

Staff:

- **Green** – no / minimal risk i.e. unlikely to require station staff to move goods
- **Amber** – manageable risk/ able to mitigate i.e. may require some input from station staff
- **Red** - high risk/ difficult to overcome i.e. will require input from station staff and anticipate union action, staff unwilling to undertake role

Table 19 Assessment of Potential Operational Models with Key Station Requirements

Volume	Potential Operational Model		External Access	Internal Access	Storage	Security	Staff
Low	Unutilised capacity in passenger carriages	Luggage Space	G	G	G	G	G
Low	Unutilised capacity in passenger carriages	Vestibules	G	G	G	G	G
Low	Unutilised capacity in passenger carriages	Lock 1st Class Compartment	G	G	G	G	G
Low	Unutilised space in non-passenger compartments	Existing Crush Space	G	G	G	G	G
Low	Potential adaption of future rolling stock design	Dedicated space accessed externally	G	G	G	G	G
Medium	Unutilised capacity in passenger carriages	Lock Carriage	A	A	A	A	A
Medium	Potential rolling stock adaption	Remove a few seats	A	A	G	G	A R ¹
Medium	Potential rolling stock adaption	Provide some foldaway seats for flexible use	A	A	A	A	A R ¹
High	Potential rolling stock adaption	Convert old rolling stock to goods only carriages	R	R	R	A	A R ¹
High	Potential additional carriage(s)	Additional carriage/s to be locked	A	A	A	A	A
High	Potential additional carriage(s)	Dedicated goods carriages/s (converted rolling stock)	R	R	R	A	A R ¹
High	Potential provision of additional services	Additional trains during the day – locked carriage/s	A	A	A	A	A R ¹
High	Potential provision of additional services	Additional trains during the day – dedicated goods carriage/s (converted rolling stock)	R	R	R	A	A R ¹
High	Potential provision of additional services	Additional trains at night - locked carriage/s	A	A	A R	A	A R ¹
High	Potential provision of additional services	Additional trains at night - dedicated goods carriage/s (converted rolling stock)	R	R	R	A	A R ¹
High	Potential adaption of future rolling stock design	Flexible space (passenger / goods)	A R ²	A R ²	A R ²	A	A R ¹

1 Could be undertaken without the need for station staff if a logistics provider is contracted to move goods (this may still require station staff to operate station infrastructure e.g. open station at night) or station staff could be responsible for moving goods.

2 Depends on the market and vehicle requirements

8 Option Evaluation

The assessment presented in Table 17 identified which markets are viable for the potential operational models identified in Figure 18. The operational models that are viable for each market have therefore been evaluated against some of the key considerations discussed in Chapter 6 and are presented in the matrices illustrated by Tables 20 to 23 in this chapter.

This considers the impacts as Red (R), Amber (A) and Green (G). Green means no / minimal impact / risk, Amber equates to manageable risks / reasonable cost and Red equates to high risk / impact that is difficult to overcome.

Note that this assessment could change depending upon the business model used to take forward the opportunity as well as being undertaken in the context of a specific station.

Table 20 Next Day and 2 to 3 Day Market Evaluation

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
High	Potential rolling stock adaption	Convert old rolling stock to goods only carriages	High volume requires access for articulated vehicles and conveyor to carriage	Specialist equipment required	Anticipated will be able to update protocol	Significant impact at stations for external and internal access	Anticipated will be able to update protocol. Dedicated and lockable carriage	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of HGVs for section of journey by passenger rail network	Significant infrastructure requirement
High	Potential additional carriage (s)	Dedicated goods carriages/s (converted rolling stock)	High volume requires access for articulated vehicles and conveyor to carriage	Specialist equipment required. Additional carriages	Anticipated will be able to update protocol	Significant impact at stations for external and internal access	Anticipated will be able to update protocol. Dedicated and lockable carriage	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of HGVs for section of journey by passenger rail network	Significant infrastructure requirement
High	Potential provision of additional services	Additional trains during the day – dedicated goods carriage/s (converted rolling stock)	High volume requires access for articulated vehicles and conveyor to carriage	Specialist equipment required.	Anticipated will be able to update protocol	Significant impact at stations for external and internal access	Anticipated will be able to update protocol. Dedicated and lockable carriage.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of HGVs for section of journey by passenger rail network	Significant infrastructure requirement
High	Potential provision of additional services	Additional trains at night - dedicated goods carriage/s (converted rolling stock)	High volume requires access for articulated vehicles and conveyor to carriage	Specialist equipment required	Anticipated will be able to update protocol	Significant impact at stations for external and internal access	Anticipated will be able to update protocol. Dedicated and lockable carriage	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of HGVs for section of journey by passenger rail network	Significant infrastructure requirement
High	Potential adaption of future rolling stock design	Flexible space (passenger / goods)	High volume requires access for articulated vehicles and conveyor to carriage	Specialist equipment required	Anticipated will be able to update protocol	Significant impact at stations for external and internal access	Anticipated will be able to update protocol. Dedicated and lockable carriage	To be designed	Over medium to long distances	Long term	Passenger network more reliable than road	Reduces number of HGVs for section of journey by passenger rail network	Significant infrastructure requirement

Green = Most beneficial/lowest risk/low cost; Amber = Reasonable benefits/manageable risks/reasonable cost; Red = Limited benefit/significant cost/high risk/difficult to overcome

Table 21 Same Day and Niche Market Evaluation

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
Low	Unutilised capacity in passenger carriages	Luggage Space	Access required for small vehicles anticipated to utilise existing facilities. Goods within size of luggage and so no alterations required to internal infrastructure	Unlikely to require station staff to handle goods. Not anticipated to need specialist equipment.	Within established protocol. Low volume – within existing passenger luggage and train equipment parameters	No impact within station or carriage	Within established protocol	Minimal adaption	Over medium to long distances	Short term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
Low	Unutilised capacity in passenger carriages	Vestibules	Access required for small vehicles anticipated to utilise existing facilities. Goods within size of luggage or cages and so no alterations required to internal infrastructure	Unlikely to require station staff to handle goods. Not anticipated to need specialist equipment	Within established protocol. Low volume – within existing passenger luggage and train equipment parameters	No impact within station or carriage	Within established protocol	Minimal adaption	Over medium to long distances	Short term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
Low	Unutilised capacity in passenger carriages	Lock 1st Class Compartment	Access required for small vehicles anticipated to utilise existing facilities. Goods within size of luggage or cages and so no alterations required to internal infrastructure	Unlikely to require station staff to handle goods. Not anticipated to need specialist equipment	Anticipated will be able to update protocol. Dedicated section lockable carriage. Low volume – within existing passenger luggage and train equipment parameters	No impact within station. Perception of locked carriage may be negative	Anticipated will be able to update protocol. Dedicated section lockable carriage.	Minimal adaption	Over medium to long distances	Short to medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
Low	Unutilised space in non-passenger compartments	Existing Crush Space	Access required for small vehicles anticipated to utilise existing facilities. Goods within size of luggage or cages and so no alterations required to internal infrastructure	Unlikely to require station staff to handle goods. Not anticipated to need specialist equipment	Within established protocol. Low volume – within existing passenger luggage and train equipment parameters	No impact within station. Not using passenger space	Within established protocol	Minimal adaption	Over medium to long distances	Short term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
Low	Potential adaption of future rolling stock design	Dedicated space accessed externally	Access required for small vehicles anticipated to utilise existing facilities. Goods within size of luggage and so no alterations required to internal infrastructure	Unlikely to require station staff to handle goods. Not anticipated to need specialist equipment	Within established protocol. Low volume – within existing passenger luggage and train equipment parameters	No impact within station. Not using passenger space	Within established protocol	To be designed	Over medium to long distances	Long term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Significant investment required

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
Medium	Unutilised capacity in passenger carriages	Lock Carriage	Likely to access the station by existing facilities. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May need TOC staff to lock carriage. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Locked carriage	Might have some impact within station. Perception of locked carriage may be negative	Anticipated will be able to update protocol. Locked carriage.	Minimal adaption	Over medium to long distances	Short to medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
Medium	Potential rolling stock adaption	Remove a few seats	Likely to access the station by existing facilities. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Within existing passenger luggage and train equipment parameters	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. May be accessible to passengers.	Requires adaption	Over medium to long distances	Short to medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
Medium	Potential rolling stock adaption	Provide some foldaway seats for flexible use	Likely to access the station by existing facilities. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Within existing passenger luggage and train equipment parameters	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. May be accessible to passengers.	Requires adaption	Over medium to long distances	Medium to long term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential rolling stock adaption	Convert old rolling stock to goods only carriages	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station.	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential additional carriage(s)	Additional carriage/s to be locked	Although high volume. Likely to access the station by existing facilities subject to loading bay facility. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
High	Potential additional carriage(s)	Dedicated goods carriages/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains during the day – locked carriage/s	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains during the day – dedicated goods carriage/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains at night - locked carriage/s	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
High	Potential provision of additional services	Additional trains at night - dedicated goods carriage/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential adaption of future rolling stock design	Flexible space (passenger / goods)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. May be accessible to passengers	To be designed	Over medium to long distances	Long term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Significant investment required

Green = Most beneficial/lowest risk/low cost; Amber = Reasonable benefits/manageable risks/reasonable cost; Red = Limited benefit/significant cost/high risk/difficult to overcome

Table 22 Retailer Market Evaluation

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
Medium	Unutilised capacity in passenger carriages	Lock Carriage	Likely to access the station by existing facilities. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May need TOC staff to lock carriage. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Locked carriage	Might have some impact within station. Perception of locked carriage may be negative	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Minimal adaption	Over medium to long distances	Short to medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Minimal investment required
High	Potential rolling stock adaption	Convert old rolling stock to goods only carriages	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station.	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential additional carriage (s)	Additional carriage/s to be locked	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential additional carriage (s)	Dedicated goods carriages/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
High	Potential provision of additional services	Additional trains during the day – locked carriage/s	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains during the day – dedicated goods carriage/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains at night - locked carriage/s	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required
High	Potential provision of additional services	Additional trains at night - dedicated goods carriage/s (converted rolling stock)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. Locked carriage segregated from passengers.	Requires adaption	Over medium to long distances	Medium term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Some investment required

Volume Category	Potential Operational Model		Station Infrastructure / Space	Staffing / Handling Requirements	Passenger Safety and Security	Passenger experience	Goods Safety & Security	Rolling Stock	Journey Time	Timescales	Reliability	Environmental	CAPEX
High	Potential adaption future rolling stock design	Flexible space (passenger / goods)	Although high volume. Likely to access the station by existing facilities subject to loading bay availability. Likely to be able to provide route without requiring significant alterations to infrastructure	Unlikely to require station staff to handle goods. May require some specialist handling i.e. assisted movement	Anticipated will be able to update protocol. Dedicated carriage for goods.	Might have some impact within station. Visible to passenger so might have negative perception	Anticipated will be able to update protocol. May be accessible to passengers.	To be designed	Over medium to long distances	Long term	Passenger network more reliable than road	Reduces number of vehicles on the road. Opportunity for sustainable first and last mile	Significant investment required

Green = Most beneficial/lowest risk/low cost; Amber = Reasonable benefits/manageable risks/reasonable cost; Red = Limited benefit/significant cost/high risk/difficult to overcome

As illustrated by the matrix presented in Table 20, the Next Day and 2 to 3 Day market is expected to have a significant impact on station infrastructure, staff requirements and passenger experience. This is due to the high volume of goods that require direct access at stations for articulated vehicles which themselves required direct access to dedicated carriage for loading. This is likely to be difficult to achieve at stations. As a result of the infrastructure requirements there is a significant capital cost.

Tables 21 and 22 show that all of the potential operational models for the Same Day and Niche (Table 21) and Retailer (Table 22), with the exception of the two that require adaption to rolling stock, are considered to be either beneficial or low risk or provide reasonable benefits or manageable risks for each of the criteria.

9 Potential Business Models

9.1 Business Models

There are several potential business models that could be considered by the industry, namely:

- TOC led;
- Market led (logistics provider or retailer contracting with TOCs);
- TOC with carrier; and
- Specialist company (liaise between TOC, NR, Doddle, carrier).

These business models are considered below.

9.1.1 TOC Led

This model assumes that the TOC will determine, develop, promote / market the operational models available for the carriage of goods for their franchise. The TOC may operate the end to end supply chain i.e. operate first and last mile deliveries and handle the goods. Alternatively the TOC may contract out the first and last mile and goods handling to a logistics provider.

9.1.2 Market Led

This model assumes that the market demand is leading the evaluation and development of the operational models required across the passenger network rather than the TOCs. The TOC may operate the end to end supply chain i.e. operate first and last mile deliveries and handle the goods. Alternatively the TOC may contract out the first and last mile and goods handling to a logistics provider.

9.1.3 TOC with Logistics Provider / Courier

This model assumes that a TOC will enter into a joint venture with a logistics provider / courier who provides specialist support to the TOC with the evaluation, development, promotion / marketing of the operational models available for the carriage of goods for their franchise. The logistics provider will operate the end to end supply chain i.e. operate first and last mile deliveries and handle the goods.

9.1.4 Specialist Company

This business model assumes that one overarching company will co-ordinate with all parties (TOC, Network Rail, logistics providers, retailers and Doddle or other station service provider) and will determine, develop, promote / market the operational models available for the carriage of goods for across the franchises or individual franchises. The company will sell the operational services available from each TOC. This could be diverse providing individual routes or could become a bespoke network over time. It would provide consistent branding for the offering.

9.2 Assessment

An initial assessment of the business models for each of the key stakeholders (TOC, retailer, logistics provider, and consumer) has been undertaken against the key categories of risk, liability, and profit and cost. Tables 23 to 26 illustrate this.

Table 23 TOC Led Business Model Assessment

Criteria	TOC	Retailer	Logistics Providers / Couriers	Consumer
Profit and cost	High profit as all profit to TOC but capital and operating cost may be higher as not core business and unlikely to benefit from economy of scale.	Cost to the retailer needs to be competitive to attract. This might be affected by it not being core business for TOC and the TOCs lack of knowledge and potential inability to benefit from economy of scale.	Cost to logistics providers needs to be competitive to attract. Market type may drive appetite from logistics providers e.g. Same Day attractive for medium and long distances.	Price needs to be right.
Risk	High risk if operating own supply chain and infrastructure – not core business. Can mitigate some risk by contracting out first and last mile. High risk if own staff are handling goods. Not core business for TOC. Do not understand the market. Will need to undertake own marketing. Lots of individual TOCs providing an operational model(s) would result in lack of consistent branding of service and therefore may be confusing to customers. Risk TOCs may not pursue the opportunity as it is not their core business.	Multiple offerings means that there is not a clear message about the services that are available for retailers to buy and where the service is provided. This could reduce appetite from retailers as it is not made easy. It's not the TOCs core business so retailers may see it as a risk.	Some risk transferred to the TOC but are associated with the supply chain.	No risk if it works well as it is invisible to the consumer. Note consumer may not know passenger trains are being utilised to move their goods unless it is stated as a specific option when buying the goods. Environmental credentials could be a selling point. TOCs may be an unknown service provider
Liability	Liability for the goods would be with the TOC and therefore could possibly result in a higher rate of insurance because not covered by their overarching insurance. If TOC staff are handling goods will have additional liability in relation to their staff if it is a new role.	May be less comfortable with a TOC being liable for goods as it is not their core business / have not done this before	Reduced overall liability but reputation is still integrated. May require sign off of a strategy about when liability is transferred during first and last mile (if contracted to a logistics provider)	n/a

Table 24 Market Led Business Model Assessment

Criteria	TOC	Retailer	Logistics Providers / Couriers	Consumer
Profit and cost	Shared profit	Cost to the retailer needs to be competitive to attract. Market led means that expertise and knowledge may assist with realising benefits from economy of scale.	Cost to logistics providers needs to be competitive to attract. Market led expertise should mean that this is achieved. Market type may drive appetite from logistics providers e.g. Same Day attractive for medium and long distances.	Price needs to be right.
Risk	Lower risk if a logistics provider is operating the supply chain and infrastructure as it is not core TOC business. Lower risk if not TOC staff handling goods. Will reduce risk associated with marketing. Lots of individual markets/companies providing an operational model(s) would result in lack of consistent branding of service and therefore may be confusing to potential customers.	A clear message about the services that are available for retailers to buy and where the service is provided as would be integrated with the existing supply chain. If multiple offerings this may make message unclear. Core business for retailer so would not be seen as a risk	Risk retained by logistics provider if operating the end to end delivery. Some risk may be transferred to the TOC but are associated with the supply chain.	No risk if it works well as it is invisible to the consumer. Note consumer may not know passenger trains are being utilised to move their goods unless it is stated as a specific option when buying the goods. Environmental credentials could be a selling point.
Liability	Liability for the goods would be with the market. If TOC staff are handling goods will have additional liability in relation to their staff if it is a new role	Likely to be more comfortable with logistics provider being liable for goods as it is their core business	May have reduced overall liability if TOC operating some/all of the supply chain. Nevertheless logistics provider reputation is still integrated. May require sign off of a strategy about when liability is transferred during first and last mile (if contracted to a logistics provider)	n/a

Table 25 TOC with Logistics Provider / Courier Business Model Assessment

Criteria	TOC	Retailer	Logistics Providers / Couriers	Consumer
Profit and cost	Shared profit	Cost to the retailer needs to be competitive to attract. This should be achieved as is JV with logistics provider. Expertise and knowledge from logistics provider may assist with realising benefits from economy of scale.	Cost to logistics providers needs to be competitive to attract. This should be achieved as is JV with logistics provider. Expertise and knowledge from logistics provider may assist with realising benefits from economy of scale. Market type may drive appetite from logistics providers e.g. Same Day attractive for medium and long distances.	Price needs to be right.
Risk	Lower risk if logistics provider is operating the supply chain and infrastructure as it is not core TOC business. Lower risk if not TOC staff handling goods. Will reduce risk associated with marketing. Lots of individual TOCs providing an operational model(s) would result in lack of consistent branding of service and therefore may be confusing to customers. Could be reduced if brand is with fewer logistics providers.	A clear message about the services that are available for retailers to buy and where the service is provided as would be integrated with known logistics providers. If multiple offerings this may make message unclear. Core business for logistics providers so would not be seen as risk.	Lower risk if market (logistics provider) is operating the supply chain and infrastructure as it is not core TOC business.	No risk if it works well as it is invisible to the consumer. Note consumer may not know passenger trains are being utilised to move their goods unless it is stated as a specific option when buying the goods. Environmental credentials could be a selling point.
Liability	Liability for the goods likely to be with the logistics provider. If TOC staff are handling goods will have additional liability in relation to their staff if it is a new role. Not the case if logistics provider staff handle goods.	Likely to be more comfortable with logistics provider being liable for goods as it is their core business	May have reduced overall liability if TOC operating some/all of the supply chain. Nevertheless logistics provider reputation is still integrated. May require sign off of a strategy about when liability is transferred during first and last mile (if contracted to a logistics provider)	n/a

Table 26 Specialist Company Business Model Assessment

Criteria	TOC	Retailer	Logistics Providers / Couriers	Consumer
Profit and cost	Shared profit	Cost to the retailer needs to be competitive to attract. This should be achieved as will co-ordinate operational models with logistics provider. Expertise and knowledge from logistics provider may assist with realising benefits from economy of scale.	Cost to logistics providers needs to be competitive to attract.	Price needs to be right.
Risk	Lower risk if logistics provider is operating the supply chain and infrastructure as it is not core TOC business. Lower risk if not TOC staff handling goods. Will reduce risk associated with marketing. If one organisation co-ordinating across all the TOCs would provide consistent branding of service and therefore consistent message to customers.	A clear message about the services that are available for retailers to buy and where the service is provided as would be integrated with the existing supply chain. Core business for logistics providers so would not be seen as risk.	Lower risk if market (logistics provider) is operating the supply chain and infrastructure or using their knowledge and experience to set up the supply chain as it is not core TOC business.	No risk if it works well as it is invisible to the consumer. Note consumer may not know passenger trains are being utilised to move their goods unless it is stated as a specific option when buying the goods. Environmental credentials could be a selling point.
Liability	Liability for the goods likely to be with the logistics provider. If TOC staff are handling goods will have additional liability in relation to their staff if it is a new role. Not the case if logistics provider staff handle goods.	Likely to be more comfortable with logistics provider being liable for goods as it is their core business	May have reduced overall liability if TOC operating some/all of the supply chain. Nevertheless logistics provider reputation is still integrated. May require sign off of a strategy about when liability is transferred during first and last mile (if contracted to a logistics provider)	n/a

9.2.1 Summary

A TOC led business model works well for the niche market as this would allow the TOC to respond to a specific requirement from a single supplier.

A market led business model works well for the Same Day and retailer markets as it provides these markets with the opportunity to improve / enhance their existing supply chain and delivery model by capitalising on the benefits of reliability, journey time as well as city to city connectivity that the passenger rail network provides. Market led will ensure that expertise and knowledge of the retailers or logistics providers would reduce key risks as well as realise benefits to ensure the operations work effectively and are attractive.

The TOC with Logistics provider / courier model and the Specialist Company model works well for all of the markets.

9.2.2 Integration with Doddle / Other Station Service Provider

An additional business model could be a model that integrates with Doddle or other station service provider that develops an end user package for retailers and the Same Day markets that integrate with click and collect services for consumers.

9.3 Role of the DfT

The appropriate role for DfT would be to encourage the carriage of goods on passenger trains and to provide advice relating to the potential opportunities for this through the franchise process. Any one of the above business models could be used to achieve this.

The DfT will also encourage the use of available funding mechanisms such as the innovation in franchising fund that are available.

10 Summary and Conclusions

10.1 Current Initiatives

InterCity RailFreight use passenger trains for the movement of a wide range of freight consignments. Security, safety and train performance key issues have been tested and there is no impact on East Midlands Trains in terms of delays to trains, impact upon passengers, or damage to property or trains. Trains are fast and frequent on the key routes and since they are running anyway the cost and emission savings can be significant.

Colas Rail and TNT have trialled a freight train carrying express parcels and perishable products for distribution in central London. Converted passenger rolling stock was used, but the train ran as a dedicated service, not as part of a regular passenger train. The goods were then transhipped into a fleet of TNT electric and low-emission vehicles, which was achieved in less than an hour. The trial was a success; it was reliable, was faster than by road and reduced emissions.

Other innovations relate to options for customers to collect or receive their goods, such as Lockers (BentoBox), local collections points (Doddle). These initiatives could easily be integrated with the use of passenger trains for transporting goods.

Key lessons learned from these innovations include:

- Environmental benefits are achieved;
- Safety and security of passengers and goods achieved;
- Journey times that are faster than road are achieved;
- It is possible to load / unload without impacting upon reliability of passenger services at terminals and intermediate stations;
- Passenger services are not detrimentally impacted;
- Potential to integrate with city urban consolidation centres;
- Potential to integrate with emission free or low emission last mile delivery; and
- Potential to integrate with click and collect and lockers at stations.

10.2 The Market

Goods that could readily be transported on passenger trains are those that:

- Are time sensitive e.g. require guaranteed delivery or urgent transportation;
- Are valuable e.g. have a high retail value or profit margin (and require secure carriage);
- Are important e.g. need to be transported securely; and

- Can easily be transported on passenger trains i.e. easily accommodated into cages that can be efficiently and safely moved on and off passenger trains and that do not require special handling.

All of these types of goods are goods that are currently transported by the delivery market, including the Next Day and 2 to 3 Day market and the Same Day market.

In addition there is opportunity for niche services, which provide a very specific or bespoke delivery requirements as well as for retailers.

Therefore the following markets that could be considered for transportation by passenger rail are:

- Next Day and 2 to 3 Day;
- Same Day;
- Niche; and
- Retailers.

The Same Day market over medium to longer distances is considered the most appropriate focus for movement by passenger rail because it could generate better levels of revenue without requiring significant capital investment or modifications to existing rolling stock compared to the Next Day and 2 to 3 Day market.

These markets typically provides door-to-door collection and delivery, therefore the passenger rail offering will need to integrate with first and last mile logistics or click and collect.

10.3 Demand

Supply chains served by freight and logistics are multimodal and the services required are not homogenous. However road freight remains the most dominant mode in the UK. The courier and delivery market has grown significantly and is contributing to congestion in cities.

There are a number of key considerations for consumers, retailers and logistics providers / couriers that need to be considered. A service proposition must therefore achieve the 5 R's of supply chain management:

- Right time;
- Right place;
- Right quantity;
- Right quality; and
- Right price.

In addition environmental drivers are important. Retailers and logistics providers are aware that they need to be seen to be addressing environmental issues, and there is already evidence of interest in rail's green credentials.

An assessment of the key drivers has been undertaken and a number of opportunities were identified alongside barriers / concerns relating to the carriage of goods on passenger trains. The analysis demonstrated that of the barriers / concerns identified, all could be addressed.

10.4 Operational Models

There is not one predetermined model for the passenger network. One or several of the operational models may be applicable to a TOC, a route and a market.

There are several potential operational models for the carriage of goods on passenger trains, which can transport high, medium and low volumes of goods:

- Unutilised capacity in passenger carriages – low to medium volumes;
- Unutilised space in non-passenger compartments – low volumes;
- Adapt existing rolling stock design – low, medium or high volumes;
- Additional carriage(s) – high volumes;
- Additional services – high volumes; and
- Adapt future rolling stock design – low, medium or high volumes.

An initial assessment of the markets against the potential operational models identified that the Next Day and 2 to 3 Day market is not suitable for a number of the operational models. In particular due to the volume of goods required for transportation the low and medium volume models including those related to the use of spare passenger capacity, existing space on rolling stock and adapting existing rolling stock (remove a few seats or provide some flexible seats) are not viable.

An assessment of the Next Day and 2 to 3 Day market against a number of key criteria found that the impact on station infrastructure, staff requirements and passenger experience are expected to be significant. This is due to the high volume of goods that require direct access at stations for articulated vehicles which themselves required direct access to dedicated carriage for loading. This is likely to be difficult to achieve at stations. As a result of the infrastructure requirements there is a significant capital cost.

The Retailer market is also not considered suitable for the operational models that provide space for low and medium volumes of goods, with the exception of the medium volume available by locking a carriage. An assessment of the retailer market against a number of key criteria found that with the exception of the longer term model that requires adaption to rolling stock all impacts are considered to be either beneficial or low risk or provide reasonable benefits or manageable risks for each of the criteria.

The Same Day and Niche markets are anticipated to be able to suitable for all potential operational models and with the exception of the two models that require adaption to rolling stock all impacts are considered to be either beneficial or low risk or provide reasonable benefits or manageable risks for each of the criteria.

10.5 Role of the Station

Stations used for the loading / unloading of goods will need to consider the impact on platform capacity and station operations. Stations will need to ensure that they have appropriate facilities to accommodate goods and any services offered, including space for loading bays for first and last mile deliveries.

It is an opportunity for stations to be key centres and to integrate with sustainable logistics innovation.

An assessment of the potential operational models demonstrated that the low volume models will have a low impact at stations in terms of external and internal access requirements, storage requirements, security impact and staff requirements. The medium volume models have a low to manageable impact and the high volume a manageable to high risk impact.

10.6 Potential Business Models

There are four potential business models that could be considered by the industry, namely:

- TOC led;
- Market led (logistics provider or retailer contracting with TOCs);
- TOC with logistics provider; and
- Specialist company (liaise between TOC, Network Rail, Doodle and logistics provider).

The TOC led business model would work well for the niche market. It is considered that the market led business model would work well for the Same Day and retailer markets. The TOC with Logistics provider / courier model and the Specialist Company model would work well for all of the markets.

10.7 Role of the DfT

The role for the DfT would be to encourage the carriage of goods on passenger trains. The DfT should also provide advice relating to the potential opportunities for this through the franchise process.

11 Pathway to Implementation

11.1 Undertake trials or market led testing to demonstrate viability

A number of potential consortiums / trials emerged as a result of information / discussions during the stakeholder engagement stage. These included:

Option 1:

- Route: London to / from Bristol / Birmingham / Newcastle / Glasgow / Edinburgh
- Potential market: Same Day – logistics provider (volume several cages / postal sacks)
- Potential stakeholders: logistics provider, TOCs (First Great Western or Virgin), Network Rail plus potential for integration with Doddle

Option 2:

- Route: London to / from Manchester
- Potential markets: 2 to 3 Day – logistics provider (volume two carriages) and Same Day - logistics provider (volume several cages / postal sacks)
- Potential stakeholders: logistics provider (2 to 3 Day), logistics provider (Same Day), TOC (Virgin), Doodle, Network Rail

Option 3:

- Route: Manchester to / from Leeds
- Potential markets: Same Day - logistics provider (volume several cages / postal sacks)
- Potential stakeholders: TOC (Transpennine Express), logistics provider, Network Rail

Option 4:

- Route: London to / from Milton Keynes
- Potential markets: Same Day - logistics provider (volume several cages / postal sacks) and retail store / click and collect (volume tbc)
- Potential stakeholders: logistics provider, retailer, TOCs (Virgin or London Midland), Network Rail and Doodle

Option 5:

- Route: Birmingham to / from Scotland
- Potential markets: retail (high volume, overnight train)
- Potential stakeholders: retailer, TOC (Virgin), Network Rail

11.1.1 Trials: Role Out Framework

1. Consultation and Engagement:
 - Engage with potential consortia members (e.g. TOC, Network Rail, Doddle, logistics provider, retailer, British Transport Police) and arrange a meeting to confirm interest and commitment
 - Agree Terms of Reference with potential consortia members
2. Define demand and feasibility:
 - Gather realistic estimates of potential volumes, flows and revenues from logistics provider or retailer
 - Define hours of operation of service offering
 - Define products and services
 - Define pricing and charging mechanisms
 - Define and agree parameters for marketing
 - Define potential start-up expenses
 - Determine start-up capital requirements
 - Produce income projection statement
 - Produce sales forecast, profit and loss and balance sheet statements
 - Produce break-even analysis
 - Agree milestones
 - Confirm go-ahead for trial to take place
3. Operational Model:
 - Design and agree with all potential consortia members how the operational model will work.
 - Draw up and agree standard operating procedures and processes
 - Procure operational handling equipment (if required)
 - Training of all relevant personnel
 - Test Run
4. Launch Trial
5. Monitor, Review, Revise (if required)
6. Publish findings

11.2 Further Dissemination**Next Steps:**

- Produce article for publication in association's publications to use for promotion / advocacy by these associations e.g. CILT; and

- Produce communications piece for DfT to utilise for dissemination.

11.3 Recommendations to the DfT

It is recommended that the further involvement of the DfT should include the following:

- Publish this research and continue supporting innovation in this area;
- Include these key recommendations in the Rail Investment Strategy and Rail Freight Strategy;
- Seek to credit value to this opportunity in new franchises through quality points;
- Seek the direct involvement of the Rail Delivery Group e.g. via a presentation;
- Promote use of the 1% pilot innovation fund to take forward some of the options identified by the research;
- Update station planning guidance to facilitate the carriage of goods on passenger trains where possible; and
- Publicise the commercial opportunity and encourage private sector involvement to take forward this opportunity to carry goods by passenger trains.