Investigation on Baggage Transfer Service at Newcastle Central Station to Serve Various Destinations: Interim Report

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Chapter 1: Introduction

Due to the absence of current baggage transfer service in any of the UK’s train station, the main aim of this project is to investigate the possibility of launching a newly baggage transfer system at Newcastle Central Station to serve various destinations across the country. Although this study only related to Newcastle Central station, it can be extended to any part of the country in the future if proven feasible. This new service is intended to facilitate boarding and alighting trains for those carrying large luggage to give a smoother and thus more comfortable journey.

In this chapter, the problem would be first formulated and the intended methodology of the project would be introduced with expected outcomes. Followed by this chapter would be some of the background research related to market uptake including some case studies and information about Newcastle Central station. Moreover, there would be a detailed literature review of simulation on system design and then concluding the report by stating the current work for the project.

1.1 Motivations

According to the latest road traffic estimates in Great Britain issued by Department of Transport, it has revealed that over 324 billion vehicle miles has been travelled on UK’s road in the year ending March 2017 which is 1.7% higher than the previous year and has set a new record level since 2007. The rolling annual motor vehicle traffic has also been increasing for the past 4 years [1]. The increase in road traffic results in worsening the air pollution level by toxic nitrogen oxides and other greenhouse gases like carbon dioxide. Apart from general pollution problem, with an increase in road traffic, the travel journey time will therefore be increased and it makes harder to predict the journey time due to traffic congestions. However, many travellers still opt for driving their cars for intercity travel partly because of the hardness of transporting their baggage especially when they become bulky.

Among different modes of public transport, railway is one of the most cleanest and sustainable transportation modes for long intercity journeys. In terms of carbon emission, the emission by average diesel car is 0.181 kg CO₂/km with national rail around 0.0485 kg CO₂/km [2]. Car carbon dioxide emission is thus around 4 times more than national rail.

In UK, there is an extensive network of railway covering most part of the country which provides a generally shorter journey time than other means of road transport. By combining the above benefits, it is time to attract more travellers giving up their cars and use railway for intercity travel, it is essential to provide them with a smooth and comfortable journey. Dealing with heavy luggage plays an important role in improving the journey. However, it was found that one quarter of UK railway customers showed dissatisfied view towards the space for luggage on train [3]. As a result, this project is investigating a newly designed baggage transfer system which allows travellers dropping off their baggage just before their actual travelling time so as to achieve baggage less journey.

The new service is designed to use normal passenger train as the medium for transporting the baggage. This further utilised the capacity of the railway service that promotes sustainable transport and benefits from less environmental damage when compared with road couriers. It is not a new
idea that few studies have been done seeing the potential possibility of merging freight transports with normal passenger trains which will be discussed in the later sections.

1.2 Problem Formulation

The objective of this project is to identify the potential customers and to design and analyse a new baggage collection point at Newcastle Central Station which will be used for baggage transfer service to various destinations by rail.

1.3 Methodology and Expected Outcomes

The main method of this investigation would be based on a mixture of system approach and road mapping. That is to understand the market needs of such a service with the help of some case studies where baggage transfer service is available currently and also in the past around the world. It is then used to understand why the newly designed service is better, more practical and more convenient to the potential customers.

A proposed design of the baggage drop of point would be made with the selection of location at the station as well as proposing storage, security issues and movement mechanism solutions across the station. Difficulties in implementing the practice would also be identified and offering solutions to these or alternative proposals.

A simulation of the baggage movement within the station would be done using SIMUL8 software. The intended path for movement across the station would be identified and input to the simulation. The results would be used to evaluate the whole system concept. It is expected to work out the capacity if the system and potentially the interference of crowd control at the station. Moreover, some of the running costs of the service and the cut-off time for receiving the baggage could then be worked out.

Chapter 2: Market Uptake

2.1 Baggage Size and Railway Policy

According to National Rail Conditions of Carriage, each passenger can take one piece of hand luggage which can be held on lap if required plus 2 extra items with size not more than 30cm x 70cm x 90cm. Each passenger should be able to manage their luggage without any extra help from rail staff member. However, some items that cannot be brought on board including stuff that may cause injury, inconvenience or a nuisance; there is not enough room for it; loading or unloading would cause delay of train or it is not packed in a suitable manner. Any item that exceeds the limit may be required to be conveyed into a separate carriage with subjection to an extra charge but not exceeding half of the adult single fare for the journey [4].

In general, the largest suitcase size available in the market is around 32 inch across which gives around 80cm x 54cm x 30cm. For hand luggage carrying onto a flight, it varies with companies but generally the dimension would be around 55cm x 35cm x 20cm [5]. This should fit the criteria set by
National Rail. However it may be very hard to get on board with two pieces of luggage of these sizes as there is usually large gap and unlevelled between the train and platform edge.

2.2 Passenger Studies

In year 2015, 20% of passenger journeys are using National Rail which also takes 61% of passenger kilometre. There is a growth in trend in rail usage in the last 20 years across the UK [6]. 8% of English people used National Rail at least once a week. For the age group that used rail the most is 21-29 years old for both males and females [7].

For the purpose of long distance train journeys, the majority is to visit friends or relatives (54%) followed by days out and holiday (28%) and then business trip (19%). For the reason to use train instead of car, a majority suggested that it was easier and quicker by train (40%) followed by not willing to drive (20%) [8].

It is also found that the use of railway increases with income. People with the highest income households travel almost 6 times more than the lowest income households by rail in 2015. Similarly, managerial and professional people travel by rail far more than those who are unemployed or doing routine and manual jobs. Those with the highest income made their travel mainly because of commuting and business trip, it was 3 times more than the lowest income group. Followed by business trip, the next purpose of travel is visiting friends which share similar proportion as the other income groups [9].

2.3 Case Studies on Similar Services

There are some baggage transfer services across the world with some using courier services and a few using railway. Some of these would be studied to find out what is required to keep the service running and popular. However, some of the services are less successful and being withdrawn will also be studied as a negative point of view to prevent the new service repeating the same step as they did.

2.3.1 Current UK Services

There is no luggage transfer service provided by any rail operators in the UK currently. The only method to get the baggage shipped is by using courier service using road transport like HGVs or vans. Some of the services provide drop off in shop for example Parcelforce and DPD. Service like InPost yet allows users to drop off and pick up their baggage at destined self-managing lockers. However, there is size limit of 64cm x 38cm x 38cm with maximum weight of 15kg [10]. Some of the other couriers provide door-to-door courier service for example CitySprint, DHL and UPS. However, all these services are intended for shipment of parcels and express services internationally and thus charging the user a premium fare. Apart from this, many of these services require pre-book for pick up one day earlier and do not offer same day delivery. Furthermore, a majority of these services do not pick up or deliver in weekends or otherwise another extra cost would be added to the final bill. As a result, these services are not very attractive to railway users who only wanted to turn up and send their baggage at train station right before their travel and then pick it up upon their arrival at the destination.
2.3.2 Current Services in Other Countries
Due to the fact that there is currently no baggage transfer service in the UK, some examples in the other countries were chosen to understand how their systems work and survive within large competition with other courier companies.

2.3.2.1 Hong Kong Airport Express Line
Hong Kong Airport Express Line is one of the services in MTR system. It connects the Hong Kong International Airport in Chap Lap Kok with city centre in Kowloon and Hong Kong Island. The main usage of this airport express service is a shuttle between airport and city centre as when the train leaves the airport, all the stations in the rest of the line is only for set-down only. Similarly for inbound service, the stations towards the airport are only for pick-up only. There are on board luggage racks but there is still free in-town check-in service for major airlines provided in Hong Kong Station and Kowloon Station to allow passengers to travel baggage-free. The baggage can be checked-in between 90 minutes and one day prior to the scheduled departure time of the flight. There is however a baggage size limit of 145cm x 100cm x 85cm and a maximum weight limit of 90kg when using such service. This is yet exceeding most of the airline luggage limits so it should be covering all bags to be checked-in. Once the baggage is checked-in, the traveller will only meet their bags upon arrival at the airport abroad. There is no separate freight train transporting the baggage but they will be sent to one of the carriages at either end of the airport express train which is used for loading of baggage only [11].

2.3.2.2 Hong Kong MTR Intercity Through Train
There are cross borders trains connecting Hong Kong and 4 cities in China including Guangzhou, Foshan, Shanghai and Beijing. The free luggage allowance for each passenger is 20kg. Any luggage that is in excess of the limit is required to get consigned. The check-in point and the pick-up point is located at the train terminus stations. The baggage service is not free and is based on a base fare plus extra prices for each 5kg of luggage. For a 20kg luggage to be consigned on the Hong Kong to Shanghai service (20hours travel time), it would only cost HKD $77 which is approximately equals to £8. The maximum weight of each checked luggage allowed is 50kg but there is no mention of size limit. After the baggage check-in, all of the luggage will be transferred onto the same train as the passenger but separated into a different carriage. As such, the baggage can be picked-up at the train station right after arrival at the destination [12].

2.3.2.3 Swiss SBB Luggage and Flight Luggage Service
Switzerland national railway company SBB provides different kinds of courier services which servers both internationally and within the country. They used to use rail for transportation of the baggage in the past but have switched to use AKS courier services now. The general rules for luggage transfer is that any piece of the luggage cannot exceed 25kg. Items that can be shipped include bags, suitcase, skis, snowboard, sledge and bicycle. In order to use the luggage transfer service, one must possess with a valid train ticket for the whole journey to the destination or holding an annual travel card. The entire luggage transferred includes insurance to cover the value of CHF 2000 or more depending on each service [13].

For domestic services, it includes luggage drop off at 32 selected train stations across the country. However, it takes two days to get the baggage to be shipped to the destination station with a charge of CHF 12 per item. A faster option is available which requires a drop off of the baggage in the
morning, with varying cut off time from 9am to 11am, and able to be picked up on the same day after 6pm. However, this service requires an extra CHF 30 for flat rate for shipping. Apart from baggage drop-off at station, SBB also offers door-to-door service as well as an express version of this at a further extra cost of flat rate of CHF 40 and CHF 70 respectively. However, for door-to-door service, they require a registration of pick up date 2 days prior to that and one day for express service [13].

For international service, it is currently available to send the luggage to Germany only. It takes 4 to 6 days for the shipment of the baggage to a Germany mainland address [14]. It is also available for door-to-door service from Swiss to Germany, but not return. This works principally very similar to the domestic service [13].

Other than normal luggage service, SBB also provides flight luggage service. If one is travelling to or from Geneva or Zurich airport with Swiss or Edelweiss Airline, they can check in their flight baggage at any of the selected train station the evening before their flight. They can get back their baggage upon arrival at the airport abroad. This service is similar to Hong Kong Airport Express Line as discussed above. However, there is an extra charge of CHF 22 per item. Similar to normal luggage services provided by SBB, there are express and or door-to-door services at a further extra cost to the customers [15].

2.3.2.4 Austria Haus-Haus-Gepäck Service
Similar to SBB door-to-door service, Austria railway company ÖBB also provide luggage transfer service by courier. It is required to book this service when purchasing the train ticket and is required to allow at least two working days before actual pick-up date. However, the pick-up and deliver day would be only in Monday to Friday 8am to 5pm and there is no weekend service. Pick-up and delivery is also available abroad from Germany, South Tyrol and Switzerland with extra cost and time. For domestic normal luggage including suitcase, bags, rucksack and ski boot bag, the price is 19.4 Euro. And for special luggage like skis, snowboard, wheelchair, pram and pushchair, the price is 29.4 Euro [16].

2.3.3 Ceased Services
There are some services that were found environmental unfavourable and thus being ceased including Virgin Bag Magic in the UK and Bangkok city centre check-in for flights.

Virgin Trains launched a luggage delivery service in November 2014 called Virgin Bag Magic. This service allows a courier company, Parcels 4 Delivery (P4D), to pick up the baggage on the day before the actual travel date from any address including home, office or hotel. The baggage would be delivered using courier vans on the following day or a pre-selected date to any address in the UK. The price of this service started from £9.99 per piece and is available to every day throughout the year except Christmas and New Year Day [17]. The baggage allowed to be delivered includes bags, cases, presents or bicycles but the service has come to an end on 12 August 2016 without mentioning the reason from Virgin Trains or P4D [18]and [19].

Similar research has been done by Reece, 2015, it was found that two airlines offered baggage check-in at Bangkok city centre with Bangkok Airport Rail Link [20]. The check in time was 3 to 12 hours prior to the flight departure. This service is very similar to the case in Hong Kong Airport Express Line but this one only lasted for around 3 years and was closed in 2014 due to high cost and
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low popularity as the station accessibility is poor, unpunctuality in train time, poor carriage design and similar price as taxi service which keeps customers away from using it [21].

Chapter 3: Background Research on Newcastle Central Station

3.1 Technical Characteristics

Newcastle Central Station is one of the largest stations in north east England. This station lines on East Coast Main Line (ECML) connecting London and North East Scotland including Edinburgh and Aberdeen. Virgin Trains East Coast is currently managing the station and providing services running along ECML. Apart from this, Arriva Cross Country provides services that connect Scotland and South or South West England via Birmingham. First TransPennine Express also provides services connecting Newcastle to Manchester and Liverpool. Northern provides services connecting Newcastle to the North West of England. It can therefore be seen that Newcastle Central Station is a hub for services to various destinations across the whole country.

Newcastle Central Station is the busiest station in the region with hundreds of services each day. There are over 8.1millions usage in year 2015-2016 with an increase of around 2% from the previous year [22]. There will be extra seats provided by the new trains on Virgin Trains East Coast in 2018 as well as up to 22minutes reduced for journey time [23]. Also, Office of Rail and Road has approved that there will be an introduction of new train operator by First Group running on ECML between London and Edinburgh calling at Newcastle from 2021 [24]. With all these favourable factors, there should be a continuous growth of passenger number of the station in the future.

The floor plan of the station can be found in Appendix 1. There is one main entrance to the station located at the bottom of the map with an arrow denote the flow of passengers into the station. Along the concourse, there are some shops and facilities in front of the ticket gates. Moreover, there are two car parks at each end of the station with one for long stay and one for short stay. As Tyne and Wear Metro serves as one of the most important public transports across the station, there is a station exit slightly on the left hand side of the main entrance which is again fairly close to the ticket gates. For the platform layout, Platform 1,2,9-12 are located on the concourse side of the station whereas Platform 3-8 are located across the bridge. The footbridge is equipped with ramps and alternatively there is a lift connecting Platform 3-4 to the concourse but not Platform 5-8 [25].

3.2 Location of Collection Point

There are a few criteria to select the location of the collection point which include:

- Avoid large modification of existing infrastructure of the station
- Reduce interference with other passengers
- Large empty space nearby available for storage of received or untransported baggage
- Public easily assessable to the collection point
- Get close to the operable barriers to reduce transport time
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Based on the above criteria, there are two locations of baggage collection point identified possible. They are denoted A and B on the map shown in Appendix 1.

Position A is a better choice in terms of location. However as the location is currently a car park, some of the spaces of the car park may be required to be sacrificed in order to build a collection point with storage. It is closer to Metro exits and main entrance, so passengers who would like to use our service do not need to walk a long way to get to our collection point. It is also closer to the barrier and the lift resulting in shortening the transportation time to or from the train.

There are also some advantages choosing Position B. One of the most obvious pros is that there are quite a few empty shops at the far end near the ticket office. Our collection point can utilise the empty space to build our check-in point and storage there. The location is quieter and thus less passenger interference would occur. However, the shop itself is quite small and may not be easily transformed to allow large trolley to go in and out without using the customers’ door. Moreover, as it is further away from the platform, this means a longer transportation time is required.

Apart from the location, there are however a few points to note when designing the service:

- For safety aspect, there should be security check when dropping-off the baggage.
- The trolley should be covered with plastic shields as part of the station platform is located in open area.
- The trolley cannot be designed to be taller than 2 metre as there is low height limit in the subway connecting the lifts.
- Transporting to and from Platform 5-8 only available using footbridge and should try to avoid those services.
- To solve the problem of the gap between the platform and the train, devices used at present may be one of the possible solutions:

![Figure 1 Ramp for Food Trolley](image-url)
Chapter 4: Literature Review of Simulation of System Design

Modelling is one of the most effective ways of testing a new proposed design. Many transportational studies have been using different kinds of modelling including mathematical modelling like [20] as well as simulation modelling to analyse the prototype idea. Simulation modelling provides a wide range of situations and the parameters are easily modified, it can be applied to many aspects including Metro signalling for driverless operation [26], freight train operation in yard [27], And some similar modelling topic related to this project about baggage transfer has been done by previous studies [28]. There are different simulation software, but as [28] suggests, SIMUL8 software is a good option to be used in this project as it is simple to use as well as broader range for less complex modelling.

Baggage handling system is important in airports to deal with large amount of baggage each day including routing, scheduling, cart management and security control. Each part of the control should be linked together as a smooth chain to avoid delays. It has been studied in a few papers namely [29], [30]. The handling system can also be automated by using destination coded vehicles (DCVs) for more efficient work [31]. For the luggage transfer service that is currently designing, it is very similar to airport baggage handling system but only with a much smaller scale.

Chapter 5: Current Work

The current work includes conducting a lot more detail about literature review. By taking more studies of previous work, some of the ideas may be possible to be implemented into the new design work and simulation exercise. Topics that intended to be added may include crowded control or passenger flow within station,

Also, simulation model would be building up after the completion of the literature review. Then different parameters may be set to compare the results and followed by a detailed discussion of the findings and provide practical suggestions to the problem.

If time is available, mechanisms moving around station should also be designed using karts or trolleys with ramp access to the train.

References


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Appendix 1: Station Route Map