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Discussions on rail in urban areas and rail history

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ABSTRACT

This paper includes discussions on rail in urban areas and railway history. More specifically commonly used terms and definitions for rail services, policy and practice in urban areas are discussed followed by an overview of railway developments around the world.

1. Rail in urban areas: discussion 1

Facilitated by Gökçe Aydin, Yıldız Technical University.

1.1. Scope

"Rail in Urban Areas" is a very broad term, which could mean a number of things. This term must first be defined clearly so that the scope of the study can be formed.

Rail in Urban Areas may refer to:

1. Urban Rail Systems such as trams, light rail, underground (metro, subway etc.);
2. Part of the national intercity rail network passing through an urban area;
3. A rail system that is specifically designed for transporting freight within an urban area;

All these have their own unique quality measures and/or design criteria. For the purposes of this discussion we elaborate on 2. "Part of the national intercity rail network passing through an urban area."

1.2. Quality measures for rail in urban areas

Quality of a transportation system cannot be defined from one single perspective, as there are multiple perspectives on this issue. We can define quality from three different perspectives, as follows:

1. User's perspective;
2. Service Provider's perspective;
3. Non-user's Perspective.

Defining the user is relatively straightforward; users are passengers for passenger transport systems and freight forwarders for freight transport systems. Passenger transport systems from the passenger's perspective can be evaluated according to the following quality criteria:

Safety: Defined by the probability that a train is involved in an accident. Accident may lead to injuries or casualties. The lower the probability is, the higher the safety level is.

Security: Defined by the probability that a passenger becomes a victim of a crime, such as murder, theft, robbery, etc. The lower the probability is, the higher the security level is.

Reliability: Defined by the probability that an advertised train service really operates, meaning that the train service is not cancelled. The higher the probability is, the higher the reliability level is.

Punctuality: Defined by the adherence of trains to the published timetable. Good punctuality is synonymous with less delay.

Frequency: Defined by the envisaged time between two successive train departures which serve the same origin/destination pairs. The lower the time is, the better the frequency is. Better frequency reduces the average waiting time, which is part of the total duration of a journey.

Speed: Physically, speed means the distance travelled per unit time. In transportation, it is related to the travel time, i.e., in what duration the train covers the distance between a specific origin/destination pair. Wasting less time on a journey is always an attractive feature.

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Comfort: Defined in dictionaries as a state of physical ease and freedom from pain or constraint.

Travel cost: Defined by the money spent directly for travel. It includes the ticket fare plus the cost of getting to – from the station. Naturally, it is desired to be as low as possible.

Accessibility: This is the most relevant of these quality criteria. It can be defined as the ease of accessing the rail stations for passengers. It is one of the very important quality measures for rail. Givoni and Rietveld (2009) claimed that improving accessibility is a cheaper way of improving passenger satisfaction.

A trivial way of improving accessibility is through reducing the travel distance to stations by building new stations. However this poses two major difficulties, in that one, building a station is incredibly costly and two, increasing the number of intermediate stops increases the time penalty on passengers who will travel further (Givoni & Rietveld, 2009). For example, in Amsterdam, the closest station is not always the first preference for the passengers.

Location of a station is also a critical decision. Building it in the heart of a city improves accessibility by public transport and by walking, but it can affect accessibility by road because of the inherent problems with congestion. Building it outside the city reverses the situation, and thus a compromise has to be made between public transport and car accessibility.

Service providers of rail in urban areas are municipalities, central government, infrastructure managers and train operators. Their quality measures differ from those of passengers. Some of them are outlined below:

Construction costs: This is the principal quality measure for infrastructure managers, municipalities and central government, i.e. whoever is in charge of building new railways. Naturally, they don't want to spend too much money. Construction costs include the actual infrastructure and also land acquisition costs.

Maintenance costs: This is a valid quality measure for infrastructure managers, municipalities and central government, i.e. whoever is in charge of maintaining the railways. Understandably, maintenance work costs should be kept to a minimum without compromising safety (within reason). From this particularly perspective, building the lines and stations underground, which may be required to increase the accessibility, is not very desirable from service provider's point of view since maintaining such lines and stations is a costly job.

Reduced headache: Service providers pay some attention to passenger satisfaction, albeit not as big as passengers themselves do. This is due to the fact that lower passenger satisfaction simply means more complaints and more complaints means more headaches for the service provider.

The term non-user is somewhat tricky to define. A non-user is a person who is neither a passenger nor a service provider of the system. But, this still leaves a problem of definition. Any passenger does not spend all of his or her time riding on trains, and at the same time, a person who works for a service provider does not spend all of his or her time at work. In order to draw the correct picture, there has to be the assumption that everybody is a non-user of the system.

Non-users are in continuous interaction with the rail transport system. They are the residents of the cities that live in the surroundings of the railways; the people who need to cross the railways, the people who are affected by the noise of the railways and so on. We can discuss three different aspects with respect to non-users, namely noise, interaction with the city life and traffic generated by the passengers who try to access the rail terminals.

Noise: Any sound that causes discomfort can be defined as noise; it has to do with both the timbre and the amplitude of the sound. Noise is one of the very important quality measures with respect to non-users of the rail system.

WG Railway Noise of the European Commission (2003) states that freight operations are the most significant contributor to railway noise. Tables 1 and 2, sourced from WG Railway Noise of the European Commission (2003), summarises this situation.

There are a number of classical approaches to solve this problem. Since freight transport is the major contributor to the noise problem, one way to improve the situation may be to build peripheral railways to bypass freight traffic but this is considered much too costly. Noise barriers and the building of railways underground (again considered very costly) are also alternative solutions.

Integration with the City Life: The most relevant topic for this aspect is the "intolerable barrier cliché", whereby Rail in Urban Areas can be seen to create borders and divide cities into parts (Metropolitics, 2012); one can question the fact if it is good or bad practice?

2. History of railway transport by continents and regions: discussion 2

Facilitated by Dr Anna Dzhaleva-Chonkova, Higher School of Transport

> *"The opening of the Stockton and Darlington Railway in 1825 heralded the railway age and the Liverpool-Manchester Railway, the first designed specifically for steam locomotion and as a common carrier, inaugurated it in 1830" (*Cameron & Neal, 2003*, pp. 199–203).*

2.1. Background

The existence of railways can be traced back into ancient history when wagons were driven by gravity, horses or manpower. In Greece freight carts were moved around in tracks carved into rock and in the 16th century wooden-railed wagonways were used in Germany and other countries. The industrial revolution in England rapidly pushed track construction; in 1783 Benjamin Outram set into operation a mile-long tramway with L-shaped cast iron rails, William Jessop manufactured cast iron rails without guiding ledges (the cart wheels had flanges) and in 1807 the Oystermouth Railway, the first passenger-carrying public railway with horse-drawn carriages began to operate on an existing tramline.

What accelerated the development of modern railways was the invention of the steam engine. In 1804 Richard Trevithick designed and built the first (unnamed) steam locomotive to run on smooth rails, this was followed by John Blenkinsop and Matthew Murray in 1812 when they created the first commercially successful steam locomotive called Salamanca intended for Middleton Railway. By 1813 William Hedley and Timothy Hackworth had designed "Puffing Billy" for the tramway between Stockton and Darlington and a year later their design was improved upon by George Stephenson whose first locomotive Blücher used single-flanged wheels (1814).

A decisive step in railway development was the recruitment of George Stephenson as an engineer for Stockton-Darlington line in 1821. It was where on 27 September 1825, he set into operation "Locomotion No 1" giving the birth of the first locomotive-hauled public railway in the world. Five years later, on 15 September 1830, Liverpool and Manchester Railway (L&MR) was opened not only for freight conveyance but also as the world's first inter-city passenger service with steam locomotives and timetabled, ticketed trains.

2.2. Railway development in Europe

2.2.1. Patterns of railway development

Railway transport developed most rapidly in Europe and North America (the USA). By the end of the 19th century all European countries had built their first railway lines and even connected some of them into a trans-border system proving their international nature as a main attribute.