

TRAFFIC AND CAPACITY ANALYTICS FOR MAJOR PORTS

LITERATURE SURVEY:

ABSTRACT:

Transport is the lifeline of any developing economy. The growth and development of any nation truly rests on the growth of its transport sector. Transport provides access to opportunities, supports economic activities, and facilitates social interactions. India's transport sector is large and diverse and caters to the needs of about 1.03 billion people. Indian Railways (IR) is one of the largest and busiest rail networks in the world and is of vital importance to the economic development and social welfare of the country. Railways traverse through the length and breadth of the country covering 63,332 route kms, comprising broad gauge (45,099 kms), meter gauge (14,776 kms) and narrow gauge (3,265 kms). As the principal constituent of the nation's transport system, IR owns a fleet of 2, 16, 717 wagons (units), 39, 236 coaches and 7,739 locomotives and operates 14, 444 trains daily, including about 8,702 passenger trains. During 2006-07, it transported 6,219 million passengers registering a volume increase of 8.6% over the previous year. In the same period, IR loaded 727.75 million tonnes of revenue earning traffic and achieved 481 billion net tonnes kms of freight output.

1. Measuring the Capacity of a Port System:

Author: Jason Bryan Salminen

Year: 2013

It provides an overview of the academic and institutional research related to this thesis, prior to presenting the methods used for measuring port capacity and evaluating investment decisions under uncertainty, respectively. First, summarize past approaches for measuring port capacity generally, followed by a review of approaches for measuring capacity across the individual components (anchorage, waterway, terminal quay, terminal yard, and intermodal links) that comprise a port system. Second, it will present previous methods utilized to evaluate port infrastructure investments. To reiterate, please note that the primary methodologies – Lagoudis & Rice's methodology for port capacity measurement and de Neufville

& Scholtes's methodology for evaluating investment strategies under uncertainty – developed from past research and applied in this thesis.

2. Railway capacity analysis:

Authors: Anders Lindfeldt

Year: 2015

In this thesis the symptoms and underlying behaviour of congestion on railways are analysed and discussed. As well as in many other countries, Sweden faces increasing demand for transportation. To meet this new demand, railways play an important role. Today, the capacity of the Swedish rail network is not upgraded at the pace necessary to keep up with the increase in traffic demand. The sensitivity of the railway system rises as the capacity utilisation increases. At some point maximum capacity is reached when the marginal gain of operating one extra train is lower than the costs in terms of longer travel times and increased sensitivity to delays. Several different methodologies are employed in this thesis to analyse capacity. The first uses real data from the Swedish rail network, train operation and delays to analyse how different factors influence available capacity and train delays. Several useful key performance indicators are defined to describe capacity influencing properties of the infrastructure and the rail traffic. The rail network is divided into subsections for which the indicators have been estimated. This makes it possible to discern their different characteristics and identify potential weaknesses. The second approach employs the railway simulation tool RailSys in extensive simulation experiments. This methodology is used to analyse the characteristics of double-track operation. Simulation of several hundred scenarios are conducted to analyse the influence of traffic density, traffic heterogeneity, primary delays and inter-station distance on secondary delays, used timetable allowance and capacity. The analysis gives an in-depth understanding of the mechanisms of railway operation on double-track lines.

3. Online Analytical Processing of Port Calls for Decision Support:

Authors: Aidan Worth, Aris Televantos

Year: 2022

The port call process encapsulates a visitation cycle of a ship to a port and can generate a wealth of data. The real time analysis of port call data can be used to find bottlenecks in the port call process, establish targets based on key performance indicators (KPIs), and to understand how shipping traffic impacts a port's efficiency. This demonstration will showcase a new Power BI interactive report powered by a multidimensional OLAP cube for very fast performance, which is built on top of a data warehouse collecting information from various sources in real time. The report currently visualizes several KPIs and other types of information that can be filtered per port, time-period, vessel type, origin or destination ports, and various other categories to help manage arrivals, departures, and port operations.

4.Capacity Assessment in Freight-Passengers Complex Railway Nodes:

Authors: Kianinejadoshah, A.; Ricci

Year: 2022

An integrated approach to node and station operation analysis is possible by means of analytical methods, customized to this scope. Alternatively, the simulation models allow more in-depth analyses aiming at the optimization of the use of capacity. The general goals of the research are the comparison of methods for the assessment of railway lines and nodes' capacity, suitability for specific tasks, and stability of the results under variable scenarios. The comparison is finalised to quantify the relative level of confidence of the concerned literature methods. The work is part of a larger research project with the final goal of identifying the most appropriate approach for the optimization of the network capacity and the setup of specific guidelines. In this framework and perspective, the paper introduces synthetically the methods and applies them systematically to a real complex mixed-traffic network in Trieste, situated in Northeast Italy, including the main passengers and freight stations and a set of lines used for both services. The Potthoff method includes combinatorial procedures able to quantify the utilization

rate of single routes, station areas and the station as a whole. This method assumes that trains could arrive at any instant with the same probability within the reference time T ; therefore, it does not require an assigned timetable, which simplifies its application.

5. Planning of Inter Terminal Transport:

Authors: Bart Wiegman, Francesco Corman

Year: 2022

Nowadays, the major ports around the world usually consist of multiple terminals and service centers which are often run by different operators. Meanwhile, inland terminals have been also developed to reduce port congestion and improve transport efficiency. The integrated planning of inter-terminal transport (ITT) between the seaport and inland terminals helps in providing frequent and profitable services, but also could lead to higher overall planning complexity. Moreover, the ITT system usually involves multiple stakeholders with different or even conflicting interests. Although an increasing number of studies have been conducted in recent years, few studies have summarized the research findings and indicated the directions for future research regarding ITT. This paper provides a systemic review of ITT planning: we examine 77 scientific journal papers to identify what kind of objectives should be achieved in ITT system planning, which actors should be involved, and what methodologies can be used to support the decision-making process. Based on the analysis of the existing research, several research gaps can be found. For example, the multi-modality ITT systems are rarely studied; cooperation frameworks are needed in the coordination of different actors and quantitative methodologies should be developed to reflect the different actors' financial interests.

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