GPRA 2015

Global Port Research Alliance
Conference on "Port and Logistics Connectivity"

Academic Session E1: Optimisation in Shipping

- ❖ **Date: 22 May 2015**
- ❖ **Time: 1:45pm – 3:15pm**
- ❖ **Venue: R1109, R Core (Shirley Chan Building), PolyU**

Optimisation is the selection of best element among the set of alternatives. In this session, the shipping optimisation system (SOS) and integrated decision-making optimisation are examined. This session also presents the use of various optimisation techniques to resolve the problems of traffic congestion and vessel speed.

- The first study develops a suite of decision support systems by using the so-called 'Shipping Optimisation Systems (SOS)'. SOS optimises ship voyage gross profit per day via selecting optimal ports to call, sequencing of port calls, and cargoes to carry. SOS then uses this optimal gross profit to find the optimal allocation of ships' voyages to cargo trade areas. The author uses a case study to support SOS findings from the port development perspective.
- The second study aims to solve the problem of traffic congestion of external trucks at container terminals. The authors develop a disruption management solution consisting of a multistage response mechanism for different situation, and a real time optimisation for the determination of service sequence of late coming or non-appointed trucks. The evaluation of the effectiveness, efficiency, and fairness of the solution is carried out through numerical experiments.
- The third study presents an analytical formulation of the joint problems of speed optimisation, optimal vessel size and network structure. The findings show that piece-meal optimisation of only one of these operational problems results in less than optimal outcomes with important consequences for a variety of practical problems, such as pricing, greenhouse gas emission reduction, and competition regulation.
- The fourth study proposes a robust airport gate assignment model with the aim to protect airport gate assignment from uncertainty. The authors investigate the tractability of the model, and derive the equivalent binary linear programming counterpart. The robust model incorporated with data-driven approach based on historical data is highly competitive, demonstrated by the experimental results on the real-life test data from Hong Kong International Airport.

Session Chair: Prof. Michele Acciaro, Kühne Logistics University

Title	Author(s)
Shipping Optimisation Systems (SOS): Port Development Perspective	Said El Noshokaty (El Esteshary Information Systems)
Disruption management for truck appointment system at a container terminal	Na Li (Dalian Maritime University), Gang Chen (Aalborg University), Jin Zhihong (Dalian Maritime University), and Kannan Govindan (University of South Denmark)
Speed, vessel size and network configuration: Redefining optimal liner shipping operations	Michele Acciaro (Kühne Logistics University)
Robust Airport Gate Assignment	Jinjia Huang (The Hong Kong Polytechnic University), Fan Wang (Sun Yat-sen University), and Zhou Xu (The Hong Kong Polytechnic University)

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Academic Session E2: Port Development

❖ **Date: 22 May 2015**
❖ **Time: 1:45pm – 3:15pm**
❖ **Venue: R1106, R Core (Shirley Chan Building), PolyU**

This session aims to examine the important role of connecting sea-ports with their hinterland. The first study investigates the factors affecting the port performance and the second study examines the relationship between port development and economic development of hinterland. The third study deals with operations of blue economy.

- The aim of the first study is to construct a measurement model to highlight the tangible and intangible factors affecting the performance of the dry ports in emerging economics. The authors develop six hypotheses to ascertain the factors affecting the performance of the dry ports. Data was collected from 33 dry ports located in India to validate the hypotheses.

- The second study examines the relationship between the developments of sea-ports and the economic developments of hinterlands. The authors use structural equation modelling (SEM) to address various issues pertinent to the economic developments of regions affected by transport/logistics related factors and production inputs.

- Grounded on the two novel ideas of "globalization and free trade" and "limits to growth and sustainability", the third study aims to discuss Blue Ocean sea transportation systems and how to get there. The evolved state of economy, termed as blue economy, will signify lower costs, reduced waste, greater efficiency and higher value. However, it will also mean lesser production, reduced consumption and near sourcing.

Session Chair: Prof. Young-Tae Chang, Inha University

Title	Author(s)
Performance of Dry Ports in Emerging Economies: Evidences from India	Shaolong Tang (United International College), Girish Gujar, Hong Yan, and Wenjie Wang (The Hong Kong Polytechnic University)
Sea-Ports and Regional Economic Integration	Hong-Oanh Nguyen (Univeristy of Tasmania), and Young-Tae Chang (Inha Unviersity)
Blue Economy and SMART Sea Transportation Systems	Girish Gujar (The Hong Kong Polytechnic University), Bangar Raju (University of Petroleum and Energy Studies), and Hong Yan (The Hong Kong Polytechnic University)

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Parallel Session E3: Transhipment Operations

❖ **Date: 22 May 2015**
❖ **Time: 1:45pm – 3:15pm**
❖ **Venue: R1205, R Core (Shirley Chan Building), PolyU**

This session examines transhipment operations. The first study presents the empirical outputs to examine the competitiveness of transhipment ports. The second study proposes an optimisation model to estimate the export commodity freight. The third and fourth studies examine transhipment route diversion between two adjacent ports from the perspectives of service efficiency through co-operation and service efficiency by using simulating and game theory respectively.

- To examine the competitiveness of transhipment port empirically, the first study attempts to investigate the transhipment throughput of ports in Northeast Asia. The results suggest that properties of transhipment throughput are different from those of direct trade. The authors also conduct a review on the regional competition of transhipment ports and examine the statues of competitive strategy of Hong Kong as a transhipment port.

- The second study develops an optimisation model using the transhipment concept to estimate the export commodity freight from a Chinese city to one or more Chinese ports (i.e., transhipment points or hub), then from US ports (i.e., transhipment points or hubs) to their final US metropolitan statistics areas (MSA), and vice versa. The authors use a version of Huff spatial interaction model to estimate the probabilities of the selected Chinese cities and MSAs.

- Based on a two-server vessel queuing model for transhipment activity, the third study develops a model and applies it to a case scenario where transhipment route diversion is undertaken between two neighbouring container ports which co-operate for minimising ships' waiting time and optimising service efficiency. The results show that the benefits of cooperation far outweigh those of the non-cooperation, although differences exist depending on vessel size as well as on the structure and characteristics of the shipping route. The fourth study presents a case study whereby two neighbouring ports co-operate to minimise ships' waiting time and optimise service efficiency. Simulation and game theory are used to analyse diversion strategies based on real data. The results show that the benefits of cooperation far outweigh those of the non-cooperation, although differences exist depending on vessel size as well as on the length and scope of the shipping route.

Session Chair: Dr Tsz Leung Yip, The Hong Kong Polytechnic University

Title	Author(s)
An empirical study of the transshipment ports and their competition	Dingtong Yang, and Tsz Leung Yip (The Hong Kong Polytechnic University)
Estimating Sino-US Inter-Urban Import-Export Freight Using the Transshipment and Spatial Interaction Models	Guoqiang Shen (The University of Oklahoma), and S. Gizem Aydin (Caterpillar Logistics, Inc.)
Transhipment Route Diversion between two Adjacent Ports: Analysis of Service Efficiency through Co-operation	Khalid Bichou (Imperial College London)
Transhipment Route Diversion between two Adjacent Ports: Analysis of Service Efficiency using Simulation and Game Theory	Khalid Bichou, and Liu Wen (Imperial College London)

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Academic Session E4: Port and Terminal Operations

- ❖ **Date: 22 May 2015**
- ❖ **Time: 1:45pm – 3:15pm**
- ❖ **Venue: R1206, R Core (Shirley Chan Building), PolyU**

The four studies of this session aim to use modelling techniques to address issues in port and terminal operations. The first and second study examine berth allocation. The third study focuses on optimisation of AStCs in container terminals while the fourth study deals with ship traffic in cruise ports.

- The first study proposes a collaborative mechanism between container shipping lines and port operators to facilitate port operators to properly make berth allocation decisions. This study contributes to terminal operation by developing a model for the tactical berth allocation problem incorporating the utilities provided by shipping lines which leads to more efficient and equitable berth allocation plans.
- The second study presents mathematical models for the discrete berth allocation problem (DBAP). The models were successfully implemented using the Excel solver for a small-sized instance of the problem, as the DBAP is known to be NP-hard. The authors also demonstrate that significant gains in berth efficiency and utilisation can be made when optimisation is applied to berth allocation problems at ports compared with the usual First Come First Served (FCFS) approach. Another useful result from this study is the choice of performance measure (PM) when using optimisation models in berth allocation as different PMs will result in different service orders and different degrees of customer satisfaction.
- The third study aims to compare the impact on productivity of yard-side operations in a container terminal of utilising different numbers of Automated Straddle Carriers (AStCs) by using queuing theory, Petri Networks (PNs) and discrete event simulation. The optimal number of AStCs is determined by using Venice's new off-shore terminal to model the complex process of a container terminal. The optimal solution gained from the queuing theory is used to validate the results of the proposed PNs.
- The four study presents models of ship traffic and ship exhaust emissions evaluation in cruise port. The models were applied to evaluate ship traffic, ship exhaust emissions and port performance of Adriatic cruise ports such as Dubrovnik (Croatia), Kotor (Montenegro) and Koper (Slovenia). In addition, the ship emission inventory within the considered cruise ports is estimated through the application of the ship activity-based methodology. A simulation model of air pollution dispersion is developed and connected to the GIS system, taking the operating conditions into account.

Session Chair: Prof. Michael Bell, The University of Sydney

Title	Author(s)
Berth Allocation for Containerships: Collaboration between Shipping Lines and Port Operators	Shuaian Wang (Old Dominion University), Zhiyuan Liu (Monash University), and Xiaobo Qu (Griffith University)
Dynamic Berth Allocation in Container Terminals	Collins Teye, and Michael Bell (The University of Sydney)
Comparison of Equipment Sizing Models for Horizontal Transportation of Shipping Containers using Automated Straddle Carriers	B Anvari, A Ziakopoulos (Imperial College London), J Morley (Morley Designs Ltd), D Pachakis (Royal HaskoningDHV), and P Angeloudis (Imperial College London)
Ship Traffic and Emission Modelling in Cruise Ports	Branislav Dragovic (University of Montenegro), Vassilis Tselentis, Ernestos Tzannatos (University of Piraeus), Davorin Kofjac (University of Maribor), and Maja Skuric (University of Montenegro)