

**RESEARCH GRANTS COUNCIL
THEME-BASED RESEARCH SCHEME (TRS)**

Completion Report on Funded Project

Project start date: 01 Nov 2011
Project completion date: 31 Oct 2016

1. Project Title: Transforming Hong Kong's Ocean Container Transport Logistics Network (T32-620/11)

2. Names and Academic Affiliations of Project Team Members[#]

Project Team	Name / Post	Unit / Department / Institution	Average number of hours per week spent on this project in the current reporting period
Project Coordinator	*LEE, Chung-Yee (Visiting Professor)	IELM/HKUST	23 hours
(Co)-Principal Investigator(s)	HA, Albert (Chair Professor)	ISOM/HKUST	7 hours
	*HONG, Jeff (Chair Professor)	Mgt.Sci & Econ. & Fin. / City U	4 hours
	LIU, Qian (Associate Professor)	IELM/HKUST	4 hours
	*MAK, Ho-Yin (Associate Professor)	MS/Oxford U	4 hours
	QI, Xiangtong (Professor)	IELM/HKUST	4 hours

	*WANG, James (Visiting Associate Professor)	Mgt.Sci/City U	7 hours
	YAN, Houmin (Chair Professor)	Mgt Sci/City U	7 hours
	ZHANG, Hongtao (Professor)	ISOM/HKUST	4 hours
	ZHANG, Jiheng (Associate Professor)	IELM/HKUST	5 hours
	ZHANG, Rachel (Professor)	IELM/HKUST	4 hours
Co-investigator(s)			
Other Collaborators	FRANSOO, Jan (Professor)	Technische Universiteit Eindhoven, Netherlands	
	KIM, Kap Hwan (Professor)	Pusan University, Korea	

Please highlight the approved changes in the project team composition and quote the date when the RGC granted approval of such changes. For changes in the project team composition, please submit a separate request, together with the justification and the curriculum vitae of the new member(s), to the RGC three months prior to the intended effective date of the change.

*Prof. Chung-Yee Lee has become a visiting professor effective 1st July 2017.

*Prof. Jeff Hong has become an external Co-PI effective 11th August 2014. (Change request sent to RGC on 30th July 2014)

*Prof. Ho-Yin Mak has become an external Co-PI effective 26th July 2015 and joined the University of Oxford effective 1st August 2015. (Change request sent to RGC on 22nd July 2015)

*Prof. James Wang has become a visiting associate professor and joined City University of Hong Kong effective 18th September 2017.

3. Project Objectives

Summary of objectives addressed/achieved:

Objectives*	Percentage achieved	Remarks**
1. Area 1: Tactical Issues on Ocean Container Logistics Supply Chain Networks: Develop model, conduct analysis and publish research papers on the following	Area 1: Percentage achieved goal of	

Objectives*	Percentage achieved	Remarks**
<p>four issues in the ocean container supply chain of Hong Kong and other related ports in the region:</p> <ul style="list-style-type: none"> (i) container port operations improvement; (ii) vessel speed optimization; (iii) safety and disruption management; (iv) tactical liner service network design. 	<p>whole project: 100%</p> <p>-----</p> <ul style="list-style-type: none"> (i) 100% (ii) 100% (iii) 100% (iv) 100% 	
<p>2. Area 2: Strategic Issues on Ocean Container Logistics Supply Chain Networks:</p> <p>Develop model, conduct analysis and publish research papers on the following six strategic issues in the Hong Kong ocean container supply chain:</p> <ul style="list-style-type: none"> (i) contracting; (ii) firm to firm information sharing; (iii) firm to firm competition; (iv) revenue management; (v) shipping securitization; (vi) information sharing and competition with other related ports in the region. 	<p>Area 2</p> <p>Percentage achieved goal of whole project: 100%</p> <p>-----</p> <ul style="list-style-type: none"> (i) 100% (ii) 100% (iii) 100% (iv) 100% (v) 100% (vi) 100% 	
<p>3. Area 3. Hong Kong's Strategic Future Direction:</p> <p>Establish a database and publish research papers on an analysis of GSCs in HK and other related cities in the region, and on various institutional barriers existing in multi-hinterland GSCs. It may include:</p> <ul style="list-style-type: none"> (i) typology of GSCs in Asia 	<p>Area 3</p> <p>Percentage achieved goal of whole project: 100%</p>	

Objectives*	Percentage achieved	Remarks**
(ii) the choice of port and production base by multi-hinterland GSCs (iii) impacts of government policies and regulations on the GSCs in HK and other related cities in the region. (iv) the formation of Asia Free Trade agreements and their impacts on the role of HK and other ports in the region.	----- (i) 100% (ii) 100% (iii) 100% (iv) 100%	
Area 4. Integrated Decision Support System: Function planning and specifications design and develop system infrastructure for a prototype decision support system. (i) Integrate algorithms and models developed for vessel speed optimization, disruption management, contracts analysis, service networks and other container port operations. (ii) Analyze and conduct pilot user acceptance testing of the decision support system (iii) Develop prototype decision support system. (iv) Identify pilot decision support system implementation sites. (v) Implement pilot decision support	Area 4 Percentage achieved goal of whole project: 100% ----- (i) 100% (ii) 100% (iii) 100% (iv) 100% (v) 100%	
5. Train graduate students.	Percentage achieved goal of whole project: 100%	
6. Host two international workshops	Percentage achieved goal of whole project:	

Objectives*	Percentage achieved	Remarks**
	100%	
7. Host an industry forum.	Percentage achieved goal of whole project: 100%	

* Please highlight the approved changes in objectives and quote the date when the RGC granted approval of such changes.

** Please provide reasons for significantly slower rate of progress than originally planned.

6. Research Highlights and Outputs

(Maximum 20 A4 pages for sections 6 to 9, excluding any appendices and attachments)

6.1 What are the most exciting research accomplishments of the project?

(Please list five or more of the team's best research accomplishments, such as journal and conference papers, software codes, research infrastructure, etc. For each item, please clearly justify how it has achieved international excellence (e.g. best paper award, invited presentation, citations, product licensed to industry, etc.))

- i) The research outcome of the project not only extends the classical ocean transport logistics to global supply chain areas, but also significantly strengthens and improves the classical research in ocean terminal operation. For example, the paper coauthored by team members Xu and Lee that has been accepted for publication in *Operations Research*, the flagship journal in the OR field, received excellent comments from referees. The paper provided an innovative approach to solving a classical berth allocation problem, significantly reducing gaps between the lower and upper bounds. In addition, it addressed much larger instances to optimality in significantly less time. Below we cite the referee comments:

Referee comment on the first version

“The authors present an in depth analysis of the considered problem on an extremely profound level of operations research that actually generated a range of novel insights into berth allocation. Such elaborated work is hardly found in this stream of research so far, which makes the contribution of this paper significant to the field...”

Referee comment on R1 version:

“Concerning the revised paper, I confirm that the authors resolved these issues perfectly. Actually, they did much more than requested as they also extended the investigation to a more complicated problem type and by repeating and extending the computational experiments substantially. With all this new material, the contribution of this paper (which was already significant in the original version) is now even larger.”

Furthermore, Mingzhu Yu (Ph.D student) and Professor Xiangtong Qi (Co-PI) studied a space allocation problem at automatic container terminals. With the technology advancement, container ports have been adopting more and more automation equipment in their terminals. At the same time, the ports also face the challenge of redesigning their operations to make full use of the new equipment. The paper of Yu and Qi addressed one of such challenges. Specifically, they proposed a new strategy for storing inbound containers so as to improve the service level to customers. They received First Class Award at the 14th Annual Conference of China Society of Logistics for the paper: M. Yu, X. Qi, “Storage Space Allocation Models for Inbound Containers in an Automatic Container Terminal,” *European Journal of Operational Research*, V.226, 32-45, 2013.

- ii) In addition to numerous conference presentations by all members, we have given (mostly by the PC) more than 10 keynote speeches in international/regional conferences. The PC has also given another 20 invited presentations on the subject of ocean transport logistics in different countries/cities including the United Kingdom, the Netherlands, Denmark, France,

Singapore, Korea, mainland China, Taiwan and Hong Kong. The audience has included academia, government policy makers and numerous industry executives (ocean carriers, terminal operators, shippers, 3PL, supply chain management providers, e-commerce service providers, etc.).

Combining (i) and (ii) above, we believe that our efforts have highlighted and emphasized Hong Kong's ocean transport logistics research, especially the link between maritime and supply chain management.

- iii) Based on our research, one of our Co-PIs Dr James Wang and his team for Area 3, submitted a special report, titled "Prospective of Hong Kong Container Port Industry," to the Central Policy Unit of HKSAR Government in April 2017. The report suggests a relocation of Hong Kong container terminals in order to reduce their negative environmental impact, to increase their connectivity with the airport for the new requirements of global e-commerce, and to increase the catchment areas nearby for more integrated value-added logistics activities. This work provides innovative options for the government's overall strategic plan.
- iv) We have also made significant local impact on industry. By analyzing three years of historical data from OOCL we have accurately estimated the relationship between fuel consumption rate and speed of vessels. Using the learned fuel consumption as the input, combined with models to incorporate on-time probability, randomness of port-time including both waiting time and service time, we have developed a method to design optimal pro-forma for OOCL's SSX line (a company service route operating between Hong Kong, Shenzhen, Kaohsiung, Shanghai and Los Angeles). The method gives a near-optimal pro-forma schedule for vessels to both minimize fuel consumption and guarantee a prescribed service level (e.g., on-time probability). Due to the complexity of this problem, implementing the method using any type of commercial software is impossible. However, we have completed this by utilizing a powerful parallel computing technique to accelerate our algorithm to make it both practical and usable by the company. We have also developed a proof-of-concept prototype which includes interactive and graphical user interfaces. In addition to its high performance and accurate analysis, the prototype can also be extended to multiple service lines if additional data and service information are available. Our computing shows that the near optimal schedule generated by the computer algorithm can result in a 10% saving on fuel consumption for the SSX service route.
- v) The project has successfully trained a number of junior researchers. For example, Tao Lu (Ph.D student 2011-2016) received Best Student Paper Award in International Conference on Logistics and Maritime Systems in Singapore, 2013. He is currently Assistant Professor at Erasmus University Rotterdam. Mingzhu Yu (Ph.D student 2007-2012) with Professor

Xiantong Qi received First Class Award at the 14th Annual Conference of China Society of Logistics, as mentioned in i) above. She is now Associate Professor at Shenzhen University and has received two research grants from NSF China. Chen Li (Ph.D student 2011-2014) published two papers from her thesis in Transportation Science and Transportation Research Part B, the two top journals in the field of transportation. She is now Assistant Professor at Tianjin University and has received one research grant from NSF China.

- vi) We have worked hard at disseminating results generated from the project. In particular, for example,
- 1) We hosted the 2015 International Conference on Logistics and Maritime Systems (LOGMS 2015), a very successful conference which attracted 140 participants from 17 countries, including more than 30 senior executives in HK.
 - 2) We conducted two presentations (by Profs. Chung-Yee Lee and James Wang) in an industry workshop format that was co-sponsored by Charter Institute of Logistics and Transport (CILT) in 2016.
 - 3) We hosted a one-day Maritime Logistics Workshop HKUST in October 2016. The workshop focused on not only actual fundamentals of Maritime Logistics, but also the latest research data, future trends and research opportunities. The workshop provided a valuable occasion for team members to network with professors, researchers and postgraduate students.
 - 4) We presented the topic “Opportunities and Challenges for the Hong Kong Port” at the 13th Five Year Plan Forum in Hong Kong as well as in Alibaba (Cainiao Network), Zhejiang Yi-Wu workshop.

We believe that through these efforts, we have accomplished one of our specific goals which was to achieve global excellence. In addition, we have networked extensively and made a number of significant and important contacts within the industry and academia.

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- 6.2 What was the added value of the TRS funding, rather than standard project grant funding?
(For example, could this work have been achieved with other funding scheme, such as the General Research Fund or Collaborative Research Fund? If not, why?)

TRS offers a common theme to bring researchers in the four areas together to concentrate on and thoroughly deliberate the problem from different angles. The collective interaction allowed each of us to adopt a more complete perspective of our own focus. This would not have been possible with other types of funding.

- 6.3 If the project has not met its original objectives, why?

N/A

6.4 (a) Peer-reviewed journal publication(s) arising directly from this project:

(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference. Please mark the symbol "#" next to the publications involving inter-institutional collaborations)

No.	The Latest Status of Publications				Author(s) (denote the corresponding author with an asterisk*)	Title and journal/book (with the volume, pages and other necessary publishing details specified)	Submitted to the RGC (indicate the year ending of the relevant progress report)	Attached to this report (Yes or No)	Acknowledged the support of RGC (Yes or No)	Accessible from the institutional repository (Yes or No)
	Year of publication	Year of acceptance (for paper accepted but not yet published)	Under review	Under preparation (optional)						
1	2012				Qi, X., and D.-P. Song	"Minimising Fuel Emissions by Optimising Vessel Schedules in Liner Shipping with Uncertain Port Times," Transportation Research Part E, v. 48, 2012, pp. 863-880.	2013	Yes	Yes	Yes
2	2013				Yu, M., and X. Qi	"Storage Space Allocation Models for Inbound Containers in an Automatic Container Terminal," European Journal of Operational Research, V. 226, 32-45, 2013.	2013	Yes	Yes	Yes
3	2014				Akyuz, M. H, and C.-Y. Lee	"A mathematical Formulation and Efficient Heuristics for the Dynamic Container Relocation Problem," Naval Research Logistics, 61, (2014), pp. 101-118.	2014	Yes	Yes	Yes
4	2014				Shan, J., M. Yu, and C.-Y. Lee	"An Empirical Investigation of the Seaport's Economic Impact: Evidence from Major Ports in China," Transportation Research, Part E, 69, (2014), pp. 41-53.	2015	Yes	Yes	Yes
5	2015				Wang, J. J., and M. C. B. Cheng	"Mature Hub Ports in the Free Trade Environment, the Way Forward from a Global Supply Chain Perspective: an Asian case", Maritime Policy & Management, 42:5, 436-458.	2013	Yes	Yes	Yes
6	2015				Meng, Q., S. Wang, and C.-Y. Lee	"A Tailored Branch-and-Price Approach for a Joint Tramp Ship Routing and Bunkering Problem," Transportation Research, Part B, 72, (2015), pp. 1-19.	2013	Yes	Yes	Yes
7	2015				Lee, C.-Y., H. Lee, and J. Zhang	"The Impact of Slow Ocean Steaming on Delivery Reliability and Fuel Consumption," Transportation Research, Part E, 76, (2015), pp. 176-190.	2013	Yes	Yes	Yes
8	2015				Yu, M., K. H. Kim, and C.-Y. Lee	"Inbound Container Storage Price Schemes," IIE Transactions, 47, (2015), pp. 800-818.	2013	Yes	Yes	Yes
9	2015				Lee, C.-Y., C. Tang, R. Yin, and J. An	"Fractional Price Matching Policies Arising from the Ocean Freight Service Industry," Production and Operations Management, 24, (2015), pp. 1118-1134.	2013	Yes	Yes	Yes
10	2015				Dong, J., C.-Y., Lee, and D.-P. Song	"Joint Service Capacity Planning and Dynamic Container Routing in Shipping Network with Uncertain Demands," Transportation Research, Part B, 78, (2015), pp.404 – 421.	2015	Yes	Yes	Yes
11	2015				Tao, Y., and C.-Y. Lee	"Joint Planning of Berth and Yard Allocation in Transshipment Terminals Using Multi-cluster Stacking Strategy," Transportation Research Part E, 83, (2015), pp. 34-50.	2015	Yes	Yes	Yes
12	2015				Lee, C.-Y., M. Liu, and C. Chu	"Optimal Algorithm for the General Quay Crane Double-Cycling Problem," Transportation Science, 49, (2015), pp. 957-967.	2015	Yes	Yes	Yes
13	2015				Tsang, H.T. and H.-Y. Mak	"Robust Optimization Approach to Empty Container Repositioning in Liner Shipping," Handbook of Ocean Container Transport Logistics. Springer International Publishing, 2015. 209- 229.	2015	Yes	Yes	Yes
14	2015				L. Li and R.Q. Zhang	"Cooperation through Capacity Sharing between Competing Forwarders," Transportation Research Part E, 75, (2015), pp. 115-131.	2014	Yes	Yes	Yes
15	2015				Hong, L. J., X. Xu and S. Zhang	"Capacity Reservation for Time-Sensitive Service Providers: An Application in Seaport Management," European Journal of Operational Research, v.245, 2015, 470-479.	2013	Yes	Yes	Yes

16	2016			Wang, S., Q. Meng and C.-Y. Lee	"Liner Container Assignment Model with Transit-Time- Sensitive Container Shipment Demand and Its Applications," Transportation Research, Part B, 90, (2016), pp. 135-155.	2013	Yes	Yes	Yes
17	2016			Zhang, H., C.-Y. Lee and T. Li	"The Value of Specific Cargo Information for Substitutable Modes of Inland Transport," Transportation Research, Part E, 85, (2016), pp. 23-39.	2015	Yes	Yes	Yes
18	2016			Li, C., X. Qi, and C.-Y. Lee	"Disruption Recovery for A Vessel in Liner Shipping," Transportation Science, 49, (2015), pp. 900-921.	2015	Yes	Yes	Yes
19	2016			Chen, R., J. Dong and C.-Y. Lee	"Pricing and Competition in a Shipping Market with Waste Shipments and Empty Container Repositioning" Transportation Research, Part B, 85, (2016), pp. 32-55.	2015	Yes	Yes	Yes
20	2016			Zhang, Z. Z., and C.-Y. Lee	"Multiobjective Approaches for the Ship Stowage Planning Problem Considering Ship Stability and Container Rehandles," IEEE Transactions on Systems, Man and Cybernetics: Systems. 46, (2016), pp. 1374-1389.	2015	Yes	Yes	Yes
21	2016			Li, C., X. Qi and D. Song	"Real-time Schedule Recovery in Liner Shipping Service with Regular Uncertainties and Disruption Events," Transpotration Research Part B 93,(2016), 762-788.	2014	Yes	Yes	Yes
22	2016			Akyuz, M. H, and C.-Y. Lee	"Service Type Assignment and Container Routing with Transit Time Constraints and Empty Container Repositioning for Liner Shipping Service Networks," Transportation Research, Part B, 88, (2016), pp 46-71.	2017	Yes	Yes	Yes
23	2016			Li, J. Y. , Theo E. Notteboom and James J. Wang	"An Institutional Analysis of the Evolution of Inland Waterway Transport and Inland Ports on the Pearl River," GeoJournal DOI 10.1007/s10708-016-9696-0.	2015	Yes	Yes	Yes
24	2016			Xie, Y., X. Liang, L. Ma and H. Yan	"Inventory Rationing and Markdown Strategy in the Presence of Lead-time Sensitive Customers," Operations Research Letters 44 (2016) 525–531.	2017	Yes	Yes	Yes
25	2016			Cheng, M.C.B. and James J. Wang	"An integrative approach in measuring hub-port supply chain performance: Potential contributions of a logistics and transport data exchange platform," Case Studies on Transport Policy 4 (2016) 150–160	2017	Yes	Yes	Yes
26	2017			Yang, R., X. Gao, and C.-Y. Lee	"A Novel Floating Price Contract from the Ocean Freight Industry," IIEE Transactions. 94, (2017), pp 194-208	2015	Yes	Yes	Yes
27	2017			Liu, M., C.-Y. Lee, Z.Z. Zhang, and C. Chu	"Bi-objective Optimization for the Container Terminal Integrated Planning," Transportation Research Part B, 93, (2016), pp. 720-749.	2017	Yes	Yes	Yes
28	2017			Lee, C.-Y., and D.-P. Song	"Ocean Container Transport in Global Supply Chain: Overview and Research Opportunities," Transportation Research Part B, 95, (2017), pp 442-474.	2017	Yes	Yes	Yes
29	2017			Xie, Y., X. Liang, L. Ma and H. Yan	"Empty Container Management and Coordination in intermodal transport," European Journal of Operational Research 257 (2017) 223–232.	2017	Yes	Yes	Yes
30	2017			Lu, T., J. Fransoo, and C.-Y. Lee	"Carrier Portfolio Management for Shipping Seasonal Products," Operations Research 65(5):1250-1266.	2015	Yes	Yes	Yes
31		2017		Cheon, S. H., C.-Y. Lee and Y. Wang	"Processing Time Ambiguity and Port Competitiveness," Accepted by Production and Operations Management.	2015	Yes	Yes	Yes
32		2017		Xu, Z., and C.-Y. Lee	"New Lower Bound and Exact Method for the Continuous Berth Allocation Problem," accepted by Operations Research,	2015	Yes	Yes	Yes
33		2017		Yu, M., C.-Y. Lee, and J. Wang	"The Regional Port Competition with Different Terminal Competition Intensity," accepted by Flexible Services and Manufacturing.	2017	Yes	Yes	Yes
34		2017		Yang, R., C.-Y. Lee, Q. Liu, and S. Zheng	"A Carrier-shipper Contract under Asymmetric Information in the Ocean Freight Industry," accepted by Annals of Operations Research.	2017	Yes	Yes	Yes
35		2017		Wang, Y. and X. Qi	"Evading Policies for A Vessel Being Chased by Pirate Skiffs", accepted by Naval Research Logistics.	2017	Yes	Yes	Yes
36			2016	Lu, T., C.-Y. Lee, L.-H. Lee,	"Coordinating Pricing and Empty Container Repositioning in Two-Depot Systems: An Analytical Approach," submitted to Transportation Science, under revision.	2015	Yes	Yes	No
37			2016	Zhang, Z. Z., M. Liu, C.-Y. Lee and J. Wang	"The Quay Crane Scheduling Problem with Stability Constraints," submitted to IEEE Transactions on Automation Science and Engineering, under revision.	2017	Yes	Yes	No
38			2016	Grida, M., and C.-Y. Lee	"An Empirical Model for Estimating Berth and Sailing Times of Mega Container Ships," submitted to Maritime Policy and Management, under revision.	2017	Yes	Yes	No
39			2016	Xiao, T., and A. Ha	"Optimal Unloading and Storage Pricing for Inbound Containers", submitted and under Minor revision and resubmission of TRE for publication.	2017	Yes	Yes	No

40			2017	Yu, M., J C. Fransoo, and C.-Y. Lee	"The Detention Decisions for Empty Containers in the Hinterland Transportation System" submitted to Transportation Research Part B, under revision	2017	Yes	Yes	No
41			2017	Lu, .M., S, Sethi, Y. Xie, and H. Yan	"Profit Allocation, Decision Sequence and Compliance Aspects of Coordinating Contracts: A Retrospect" Submitted to Production and Operations Management, under revision.	2017	Yes	Yes	No
42			2017	Chee, G., Pedrielli, L.H. Lee, E. P. Chew, and C.-Y. Lee	"Revenue-based Empty Container Repositioning(RECR): A Two-stage Integrated Approach"submitted for publication.	2017	Yes	Yes	No
43			2017	Lu, T., Y.-J. Chen, J. Fansoo and C.-Y. Lee	"Shipping to Heterogeneous Customers with Competing Carriers," submitted for publication.	2017	Yes	Yes	No
44			2017	Qiu X. and C.-Y. Lee	"Quantity Discount Pricing for Rail Transport in a Dry Port System"submitted for publication.	2017	Yes	Yes	No
45			2017	Xiao, T. and A. Ha,	"Alliance Formation among Ocean Container Carriers" working paper.	2017	Yes	Yes	No
46			2017	Lee,C.-Y., M. Liu, T. Lu and C. Teo	"Berth Scheduling Under Uncertainty: A Distribution-Free Framework" working paper	2017	Yes	Yes	No
47			2017	Chen, R., Y-J Chen and C.-Y. Lee	"Cost sharing in a shipping market with empty container repositioning" working paper	2017	Yes	Yes	No

6.4 (b) Recognised international conference(s) in which paper(s) related to this project was/were delivered:							
	Month/Year/	Title	Conference name	Submitted to the RGC (indicate the year ending of the relevant progress)	Attached to this report (Yes or No)	Acknowledged the support of the RGC (Yes or No)	Accessible from the institutional repository (Yes or No)
No.	Place						
1	April, 2012, Chicago, USA	Yu, M. , and X. Qi, "Storage Space Allocation Models for Inbound Containers in an Automatic Container Terminal"	The 2012 POMS Annual Conference	2013	Yes	Yes	Yes
2	August 2012, Bremen, Germany	Lee, C.-Y. , and M. Yu, "The Cooperation and Competition in the Dual Gateway-Port System"	The 2012 International Conference on Logistics and Maritime Systems	2013	Yes	Yes	Yes
3	June 2013, California, USA	Xu, Z., and C.-Y. Lee, "A New Branch-and-Bound Algorithm for the Continuous Berth Allocation Problem"	TSL Workshop 2013, Pacific Grove	2013	Yes	Yes	Yes
4	May 2013, Denver, U.S.A	Xie, Y.Y., and H. Yan, "Empty Container Management and Coordination for Intermodal Transportation"	The 24th POMS Annual Conference	2013	Yes	Yes	Yes
5	October 2013, Minneapolis, USA	Li, C., Li, J.B., and X. Qi, "On the Fuel Consumption Function for a Vessel under Changing Sailing Conditions"	INFORMS Annual Meeting	2014	Yes	Yes	Yes
6	December 2013, Hong Kong	Tsang, H.T. and H.-Y. Mak, "Robust Optimization Approach to Empty Container Repositioning in Liner Shipping"	The 18th International Conference of the Hong Kong Society for Transportation Studies	2014	Yes	Yes	Yes
7	Januray 2014, Hong Kong	Zhang, H.T., C.-Y. Lee, T. Li , "The Value of Sharing Specific Cargo Information between a Carrier and a Terminal Operator"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
8	Januray 2014, Hong Kong	Lee, C.-Y., Q. Liu, and S. Zheng, "A Novel Capacity Allocation Contract in the Ocean Freight Industry"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
9	Januray 2014, Hong Kong	Yang, R. , M. Yu , and C.-Y. Lee, "Contracting in the Sea-cargo Supply Chain in the Presence of a Spot Market under Asymmetric Information"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
10	Januray 2014, Hong Kong	Lu, T. , Jan C. Fransoo, and C.-Y. Lee, "On Benefits of Diversification in Liner Shipping"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
11	Januray 2014, Hong Kong	Yu, M. , Kap H.K., and C.-Y. Lee "Inbound Container Storage Pricing Schemes for Ocean Carriers"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
12	Januray 2014, Hong Kong	Xu, Z. and C.-Y. Lee "A New Branch and Bound Algorithm for Berth Allocations"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
13	Januray 2014, Hong Kong	Gao X. , C.-Y. Lee and H.-Y. Mak, "Coordination Mechanisms for Empty Container Repositioning"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
14	Januray 2014, Hong Kong	Li. L., and R.Q.Zhang "Cooperation through Capacity Sharing between Competing Forwarders"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
15	Januray 2014, Hong Kong	Wang, Y. , and X. Qi , "Evading the Chasing from a Pirate Ship"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
16	Januray 2014, Hong Kong	Tsang, H.T., and H.-Y. Mak, "Robust Optimization Approach to Empty Container Repositioning in Liner Shipping"	The Fifth POMS-HK International Conference	2014	Yes	Yes	Yes
17	March 2014, Hong Kong	Akyuz, H., and C.-Y. Lee, "Service Level Assignment and Container Routing for Liner Shipping Service Networks"	The International MultiConference of Engineers and Computer Scientists 2014	2014	Yes	Yes	Yes
18	July 2014, Singapore	Yu, W., and X. Qi, "Vessel Speeding Decisions under the Chasing of a Pirate Boat"	POMS-Singapore International Conference	2015	Yes	Yes	Yes
19	July 2014, Singapore	Chen, R., H.-Q. Ye and C.-Y. Lee, "A Study of Freight Rate in Dry Bulk Shipping"	POMS-Singapore International Conference	2015	Yes	Yes	Yes
20	July 2014, Singapore	Xu, Z. and C.-Y. Lee, "New Lower Bound, Heuristic and Exact Algorithm for Berth Allocation"	POMS-Singapore International Conference	2015	Yes	Yes	Yes
21	July 2014, Singapore	Lu, T., J. Fransoo and C.-Y. Lee, "Carrier Portfolio Management in Liner Shipping"	POMS-Singapore International Conference	2015	Yes	Yes	Yes
22	August, 2014, Rotterdam, Netherlands	Lee, C.-Y., Qian Liu and S. Zheng "A Novel Capacity Allocation Contract in the Ocean Freight Industry"	4th International Conference on Logistics and Maritime Systems (LOGMS 2014)	2015	Yes	Yes	Yes
23	August, 2014, Rotterdam, Netherlands	Wang, Y., and Qi, X. "Vessel and Container Scheduling for Feeder Lines"	4th International Conference on Logistics and Maritime Systems (LOGMS 2014)	2015	Yes	Yes	Yes
24	August, 2014, Rotterdam, Netherlands	Xu, Z. and C.Y. Lee, "New Solution Methods for the Continuous Berth Allocation Problem"	4th International Conference on Logistics and Maritime Systems (LOGMS 2014)	2015	Yes	Yes	Yes
25	November 2014, San Francisco, USA	Lee, C.-Y , M. Liu, and C. Chu, "Optimal Algorithm for the General Quay Crane Double-cycling Problem"	INFORMS Annual Meeting 2014	2015	Yes	Yes	Yes

26	November 2014, San Francisco, USA	Zhang, J. , C.-Y. Lee, Hau Lee, "The Impact of Slow Ocean Steaming on Delivery Reliability and Fuel Consumption"	INFORMS Annual Meeting 2014	2015	Yes	Yes	Yes
27	November 2014, San Francisco, USA	Xu, Z. and C.-Y. Lee, "New Solution Methods for the Continuous Berth Allocation Problem"	INFORMS Annual Meeting 2014	2015	Yes	Yes	Yes
28	November 2014, San Francisco, USA	Qi, X. , and An Zhang, "Disruption Recovery for Berth Allocation"	INFORMS Annual Meeting 2014	2015	Yes	Yes	Yes
29	January 2015,Guangzhou, China	Ha, A. and T. Xiao, "Alliance Formation among Ocean Container Carriers"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
30	January 2015,Guangzhou, China	Chen, R., J. Dong and C.-Y. Lee, "Pricing in a Shipping Market with Waste Shipments and Empty Container Repositioning"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
31	January 2015,Guangzhou, China	Tsang, H.T. and H.-Y. Mak, "Robust Optimization Approach to Empty Container Repositioning in Liner Shipping"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
32	January 2015,Guangzhou, China	Gao, X. , C.-Y. Lee and R. Yang, "Floating Price Contracting with Heterogeneous Shippers in the Ocean Freight Industry"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
33	January 2015,Guangzhou, China	Lee, C.-Y., Q. Liu and X. Yao, "Does a Port Drive the Host City and its Hinterland's Economy?"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
34	January 2015,Guangzhou, China	Wang, Y. and X. Qi, "Vessel and Containing Scheduling for Feeder Lines"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
35	January 2015,Guangzhou, China	Zhang, Z. and C.-Y. Lee, "Multiobjective Approaches for the Ship Stowage Planning Problem Considering Ship Stability and Container Rehandles"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
36	January 2015,Guangzhou, China	Li, C. , X. Qi and D. Song, "Real-time Scheduling and Rescheduling in Liner Shipping Service with Regular Uncertainties and Disruption Events"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
37	January 2015,Guangzhou, China	Tao, Y., and C.-Y. Lee, "Integrated Planning of Berth and Yard Allocation in Transshipment Terminals Using Multi-Cluster Stacking Strategy"	The Sixth POMS-HK International Conference	2015	Yes	Yes	Yes
38	August 2015, Hong Kong, China	Yu, M. , C.-Y. Lee , and James J.Wang, "Two-level Game-theoretic Models for Regional Port Competition"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
39	August 2015, Hong Kong, China	Li, C. , X. Qi and D. Song, "Real-time Scheduling and Rescheduling in Liner Shipping Service with Regular Uncertainties and Disruption Events"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
40	August 2015, Hong Kong, China	Wang, Y., and X. Qi , "Evading Strategies for A Vessel Being Chased By Pirate Skiffs"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
41	August 2015, Hong Kong, China	Lu, T., C.-Y. Lee, L.-H. Lee, "Coordinating Pricing and Empty Container Repositioning: An analysis of Two-Depot Shipping Systems"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
42	August 2015, Hong Kong, China	Chen, R., J. Dong and C.-Y. Lee, "Pricing and Competition in a Shipping Market with Waste Shipments and Empty Container Repositioning"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
43	August 2015, Hong Kong, China	Zhang, Z. Z., M. Liu, C.-Y. Lee and J. Wang, "The Quay Crane Scheduling Problem with Stability Constraints"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
44	August 2015, Hong Kong, China	Yang, R., X. Gao, and C.-Y. Lee, "A Floating Price Contract for the Ocean Freight Industry"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
45	August 2015, Hong Kong, China	Lee,C.-Y., M. Liu, T. Lu and C. Teo, "Berth Scheduling with Limited Distributional Information"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes
46	August 2015, Hong Kong, China	Ha, A. and T. Xiao, "Alliance Formation among Ocean Container Carriers"	5th International Conference on Logistics and Maritime Systems (LOGMS 2015)	2015	Yes	Yes	Yes

(c) RGC funding should have been acknowledged in all publication(s)/conference papers listed in (a) and (b) above. If no acknowledgement has been made in any of the publications/ papers, please indicate and provide explanations.

N/A

6.5 To what extent this project has strengthened inter-institutional collaborations and other partnerships?

We have collaborated with different institutions in several countries as mentioned in Section 6.1 This project has built strong partnerships , not only among institutions in Hong Kong but also with scholars in the UK, the Netherlands, Demark, France, Singapore, Korea, Egypt, Turkey, the United States, mainland China and Taiwan.

6.6 Research students trained (registration/awards):

Name	Degree registered for	Date of registration	Date of thesis submission/ graduation	Awards
Mingzhu YU	Ph.D	August 2007	August 2012	First Class Award at the 14th China Society of Logistics Best Paper Awards
Li LI	Ph.D.	August 2010	August 2014	
Chen LI	Ph.D.	August 2011	August 2014	
Tao LU	Ph.D.	August 2011	August 2016	Student Paper Award in LOGMS 2013
Xi LI	Mphil	August 2011	August 2013	
Rongying CHEN	Ph.D.	August 2012	August 2016	
Xiaochen GAO	Mphil	August 2012	August 2014	
Yu WANG	Ph.D.	August 2012	August 2016	
Le YU	MPhil	August 2013	August 2015	

Jun LUO	Ph.D.	August 2009	August 2013	
Jin FANG	Ph.D.	August 2011	August 2015	
Weiwei FAN	Ph.D.	August 2011	August 2015	
Huanhuan YANG	MPhil	August 2013	August 2015	
Hongchi LU	MPhil	August 2012	August 2014	
Jicheng XING	MPhil	August 2012	August 2014	
Yang WU	MPhil	August 2011	August 2013	
Song ZHENG	Postdoc	September 2012	August 2013	

6.7 Specific products (e.g. software or netware, instruments or equipment developed):

N/A

6.8 Other education activities and/or training programmes developed:

Prof. Chung-Yee Lee, the project coordinator, has co-edited (with Q. Meng) the Handbook of Ocean Container Transport Logistics—Making Global Supply Chain Effective, Springer Publishing, December 2014, New York, USA. In addition to Prof. Lee, other team members have also made significant contributions to some five chapters in the book.

Prof. Lee has also published a paper that surveys the extant research in the field of ocean container transport. A wide range of issues is discussed including strategic planning, tactical planning and operations management issues, which are categorized into six research areas. The relationships among these research areas are discussed and the relevant literature is reviewed. Representative models are selected or modified to provide a flavor of their functions and application context, and used to explain current shipping practices. Future research opportunities bearing in mind the emerging phenomena in the field are discussed.

We have also hosted a research workshop to provide tutorial lectures particularly for junior researchers, and have also supervised several undergraduate final year projects in the area of shipping and ocean transport.

6.9 Please highlight any deliverables indicated in the project implementation timetable endorsed by the RGC which have not been covered or achieved as per sections 6.1 to 6.8 above, and explain/ elaborate.

N/A

Project Management

6.10 Please elaborate how the PC has played his/her role in coordinating and managing the project.

Prof. Chung-Yee Lee, the project coordinator, has been extremely active in facilitating the exchange of ideas between team members and industry advisors. Team members have further strengthened internal and external collaboration by co-supervising PG students and RAs. In the process, we have directed part of our research effort toward interfaces between Area 2 and the other areas. This has led to interesting new directions and enabled those team members originally focusing on other areas to contribute to Area 2. For example, publication [41] provides a theoretical framework to allocate profit, and design decision sequences and compliance of coordinating contracts. The research was motivated by contract theory research developed in Area 2. This can also be seen from several papers that are related to Area 2 yet were co-authored by members in this and other areas.

The four research area coordinators have held numerous management committee meetings to coordinate the research in the four areas. We have also held two retreat meetings for the entire team. The management team is also in active communication with the Industry Advisory Board (IAB). Through these efforts, the management team has been directing and encouraging the pursuit of research collaboration between team members and industry partners, as well as the recruitment of PhD students and research assistants. All activities incurred in this project are the outcome of the decisive and determined effort made by the management team.

Furthermore, the PC has made special efforts to link our academic research to industry practice to strengthen our impacts on industry. Many activities took place during the project duration period, for example, i) visiting HPH, OOCL, Rotterdam Port, Singapore Port, Denmark, etc., ii) meeting with executives from companies such as HIT, OCCL or Sinotrans to discuss our research problems and obtain feedback on our modelling assumptions and share our findings with them, iii) inviting CEOs to conduct lectures in undergraduate class to disseminate knowledge, etc.

7. Awards and Recognition

7.1 Have any research grants been awarded that are directly attributable to the results obtained from this project?

1. Chung-Yee Lee (Co-PI), Research Grants Council of Hong Kong, “Managing Shipping Emission Control Areas (ECAs): Minimizing Local Sulfur Oxide and Global Carbon Dioxide Emissions,” (Project Number: 15200817) Amount HK\$506,447. Jan. 2018 – Dec. 2020.
 2. James Wang (PI) , Central Policy Unit of HK SAR Government “香港貨櫃碼頭業前景” Amount HK\$ 57,500. 2017.
 3. Mingzhu Yu (PI); “Multidimensional game for the two-level co-opetition in the regional port system”, 01/2014/-12/2016, National Natural Science Foundation of China (grant #71302109), RMB 190,000.
 4. Mingzhu Yu (PI); “The container terminal operation in the low-carbon economy”, 2015.01-2020.12, Natural Science Foundation of SZU, RMB 1,800,000.
 5. Mingzhu Yu (PI); The yard space allocation and the yard crane scheduling in the automatic container terminals, 2018.01-2021.12, National Natural Science Foundation of China (grant # 71771154), RMB 470,000.
 6. Li Chen (PI) ; “基於合作博弈的多碼頭聯盟策略研究”, 2018.1.1-2020.12.31, National Natural Science Foundation of China, Project No. 71701148, RMB 190,000.
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7.2 Have any project team members participated as invited speakers in or organisers of international conferences as a result of this project?

Invited Talks at International Conferences:

Prof. Chung-Yee Lee gave 14 keynote/featured speeches on topics related to this project at international conferences and forums:

- i) The Spring Research Conference on Systems Engineering and Management Science 2013, Shenzhen, 2013.
- ii) The Supply Chain Workshop of the 2013 International Conference on Logistics and Maritime Systems in Singapore, 2013.
- iii) 院士校園行名師講壇 at Beijing Jiaotong University, Beijing, 2013.
- iv) The Forum on Global Logistics Management, National Taiwan Normal University, Taiwan, 2013.
- v) The International Forum on Shipping, Ports and Airports (IFSPA), Hong Kong, 2014.
- vi) The 15th Asia Pacific Industrial Engineering and Management Systems Conference, Jeju, Korea, 2014.
- vii) The 2014 Symposium on Research Project Reports of the Industrial Engineering and Management Program of Ministry of Science and Technology (MOST), Taiwan, 2014.
- viii) The Supply Chain Management Workshop, School of Management, Xiamen University, Xiamen, 2014.

- ix) The Sixth Annual Workshop on Operations Research and Management Science, Hsinchu, Taiwan, 2014.
- x) The Sixth POMS-HK International Conference, Guangzhou, 2015.
- xi) The Second International Workshop in Supply Chain Management, Shanghai, June 2015.
- xii) Global Supply Chain Management Summit, Zhejiang, July 2016.
- xiii) Academia-Industry Collaboration: Cainiao Network Algorithm Final Contest, Hong Kong, Sept. 2016.
- xiv) Opportunities and Challenges for the Hong Kong Port the 13-th Five-Year Plan Forum: Sheraton Hotel, HK, Nov. 2016.

Prof. James Wang was invited to speak at various international conferences:

- i) Present a seminar at Chartered Institute of Logistics and Transport (Hong Kong) on “Development Strategies of the Hong Kong Container Port”, July 24, 2012.
- ii) Invited to give a talk in Chinese Academy of Urban Planning and Design (Shanghai), Jan 23, 2013.
- iii) Present a talk on “Hong Kong: Smart in a transition from a gateway port to a global supply chain management center” at 14th World Conference Cities and Ports in Durban, South Africa, 3-6 Nov, 2014
- iv) Keynote speaker “The development opportunities of Bao-an district of Shenzhen as a hub for ecommerce-based cross-border logistics”, at The Forum of PRD Bay Area Economy in Shenzhen, China, April 19, 2015.

Organizing conference, clusters and sessions

- i) We were invited to organize and host the 2015 International Conference on Logistics and Maritime Systems (LOGMS). The conference was very successful and has attracted 140 participants from 17 countries, including more than 30 senior executives in HK.
- ii) The project team organized two sessions with nine papers (listed below) presented at the Fifth POMS-HK International Conference held in Guangzhou on 3-4 January, 2015. (Chair: Prof. Qian Liu)
 - Session One: Pricing and Economics in Ocean Transport Logistics
 - i) A. Ha and T. Xiao, Alliance Formation among Ocean Container Carriers,” ii) R. Chen, J. Dong and C.-Y. Lee, “Pricing in a Shipping Market with Waste Shipments and Empty Container Repositioning,” iii) H. T. Tsang and H.-Y. Mak, “Robust Optimization Approach to Empty Container Repositioning in Liner Shipping,” iv) X. Gao, C.-Y. Lee and R. Yang “Floating Price Contracting with Heterogeneous Shippers in the Ocean Freight Industry,” and v) C.-Y. Lee, Q. Liu and X. Yao, “Does a Port Drive the Host City and its Hinterland’s Economy?”
 - Session Two: Ocean Container Transport Logistics

- i) Y. Wang and X. Qi, “Vessel and Containing Scheduling for Feeder Lines,” ii) Z. Z. and C.-Y. Lee, “Multiobjective Approaches for the Ship Stowage Planning Problem Considering Ship Stability and Container Rehandles,” iii) C. Li, X. Qi and D. Song, “Real-time Scheduling and Rescheduling in Liner Shipping Service with Regular Uncertainties and Disruption Events,” and iv) Y. Tao and C.-Y. Lee, “Integrated Planning of Berth and Yard Allocation in Transshipment Terminals Using Multi-Cluster Stacking Strategy”
- iii) The project team organized one session named “Scheduling in Maritime Logistics” with four papers (listed below) presented at the INFORMS Annual Meeting held in San Francisco on 9-12 November, 2014. (Chair: Prof. Xiangtong Qi)
- i) C.-Y. Lee, M. Liu, C. Chu, "Optimal Algorithm for the General Quay Crane Double-cycling Problem," ii) J. Zhang, C.-Y. Lee, Hau Lee, "The Impact of Slow Ocean Steaming on Delivery Reliability and Fuel Consumption," iii) Z. Xu and C.-Y. Lee, “New Solution Methods for the Continuous Berth Allocation Problem,” and iv) X. Qi, An Zhang, "Disruption Recovery for Berth Allocation"
- iv) The project team organized one session entitled “Ocean Transport Logistics” with four papers presented at the POMS-Singapore International Conference held in Singapore on 21-23 July, 2014. (Chair: Prof. Chung-Yee Lee)
- i) Yu W., and X. Qi, “Vessel Speeding Decisions under the Chasing of a Pirate Boat,” ii) R. Chen, H.-Q. Ye and C.-Y. Lee, “A Study of Freight Rate in Dry Bulk Shipping,” iii) Z. Xu and C.-Y. Lee, "New Lower Bound, Heuristic and Exact Algorithm for Berth Allocation," and iv) T. Lu, J. Fransoo and C.-Y. Lee, "Carrier Portfolio Management in Liner Shipping"
- v) The project team organized one session entitled “Ocean Container Transport Logistics” with three papers presented at the 4th International Conference on Logistics and Maritime Systems (LOGMS 2014) held in Rotterdam on 27-29 August, 2014. (Chair: Prof. Xiangtong Qi)
- i) C.-Y. Lee, Qian Liu and S. Zheng “A Novel Capacity Allocation Contract in the Ocean Freight Industry,” ii) X. Qi “Vessel and Container Scheduling for Feeder Lines,” and iii) Z. Xu and C.-Y. Lee, “New Solution Methods for the Continuous Berth Allocation Problem”
- vi) The project team organized three sessions with ten papers (listed below) presented at the Fifth POMS-HK International Conference, January, 2014.
- i) Zhang, H.T., C.-Y. Lee, T. Li “The Value of Sharing Specific Cargo Information between a Carrier and a Terminal Operator”, ii) Lee, C.-Y., Q. Liu, and S. Zheng “A Novel Capacity Allocation Contract in the Ocean Freight Industry, iii) Yang, R., M. Yu, and C.-Y. Lee “Contracting in the Sea-cargo Supply Chain in the Presence of a Spot Market under Asymmetric Information”, iv) Lu, T. , Jan C. Fransoo, and C.-Y. Lee “On Benefits of Diversification in Liner Shipping”, v) Yu, M. , Kap H.K., C.-Y. Lee “Inbound Container

Storage Pricing Schemes for Ocean Carriers”, vi) Xu, Z. and C.-Y. Lee “A New Branch and Bound Algorithm for Berth Allocations”, vii) Gao X., C.-Y. Lee and H.-Y. Mak, “Coordination Mechanisms for Empty Container Repositioning”, viii) Li. L., R.Q.Zhang “Cooperation through Capacity Sharing between Competing Forwarders”, ix) Wang, Y. , X. Qi “Evading the Chasing from a Pirate Ship”, x) Tsang, H.T. and H.-Y. Mak, “Robust Optimization Approach to Empty Container Repositioning in Liner Shipping”

7.3 Have any project team members taken leadership positions in editorial boards, scientific and professional organisations?

Albert Ha	Department editor of <i>Production and Operations Management</i> , Associate Editor of <i>Management Science</i> , <i>Operations Research</i> , <i>Manufacturing and Service Operations Management</i> .
Jeff Hong	Associate Editor of <i>Operations Research</i> , <i>ACM Transactions on Modeling and Computer Simulation</i> , <i>Naval Research Logistics</i> .
Chung-Yee Lee	Associate Editor of <i>Operations Research</i> , <i>Naval Research Logistics</i> , <i>Flexible Services and Manufacturing Journal</i> Senior Editor of <i>Production and Operations Management</i> .
Xiangtong Qi	Associate Editor of <i>IIE Transactions</i> , <i>IEEE Transactions on Automation Science and Engineering</i> , <i>Asia-Pacific Journal of Operational Research</i> .
Rachel Zhang	Associate Editor of <i>IIE Transactions</i> , Senior Editor of <i>Production and Operations Management</i>
Hongtao Zhang	Senior Editor of <i>Production and Operations Management</i>
Ho-Yin Mak	Associate Editor of the journal <i>Transportmetrica B: Transport Dynamics</i> Associate Editor of the journal <i>Travel Behaviour and Society</i>

7.4 Any documentary proof of the application of technologies arising directly from this project?

N/A

7.5 Other awards and recognitions as a result of this project (please specify):

First Class Award at the 14th Annual Conference of China Society of Logistics for the paper: M. Yu, X. Qi, “Storage Space Allocation Models for Inbound Containers in an Automatic Container Terminal,” *European Journal of Operational Research*, V.226, 32-45, 2013.

Lu Tao received the Best Student Paper award at the International Conference on Logistics and Maritime Systems in Singapore, 2013.

8. Impacts

8.1 What are the current and expected impacts of the project on the long-term development of Hong Kong (social or economic development, e.g. patent, technology transfer, collaboration with external organisations, etc.)?

We have created an accurate and precise body of research findings that are relevant to industry practice in Hong Kong. The impact of these findings on the long-term development of Hong Kong will grow significantly as we continue to transfer the knowledge to practitioners.

8.2 Others (please specify):

N/A

9. Sustainability of the Project

9.1 Whether there are new ideas evolved directly from this project?

Ocean transport logistics is a part of the global supply chain. Within global supply management, every country or company has to fully comprehend the overall dynamics of each situation and then to position itself in supply chains according to its core competence. Our research, together with the latest advances in the container shipping industry, demonstrates that the world is entering an era in which shipping and its related logistics are becoming more intermodal and more regional. For the former, cross-border e-commerce closes the gap between air transport and shipping. For the latter, we see regional grouping of ports by provincial governments along the Chinese coast. For example, ports in Guangdong are grouped into companies, which may seriously affect the role of Hong Kong as a major international port. This implies that government intervention is inevitable in regional transport systems in general, and in ports in particular. How this can be systematically achieved and managed to respond to the regime and paradigm shift in regional and intermodal supply chains is something that the HKSAR Government needs to think about.

Our project has trained a number of junior researchers in the area. They will continue their research effort in this area and assist further in implementing the research agenda.

9.2 Whether there are new projects evolved directly from this project?

1. Chung-Yee Lee (Co-PI), Research Grants Council of Hong Kong, “Managing Shipping Emission Control Areas (ECAs): Minimizing Local Sulfur Oxide and Global Carbon Dioxide Emissions,” (Project Number: 15200817) Amount HK\$506,447. Jan. 2018 – Dec. 2020.
2. James Wang (PI), Central Policy Unit of HK SAR Government “香港貨櫃碼頭業前景” Amount HK\$ 57,500. 2017.
3. Mingzhu Yu (PI); “Multidimensional game for the two-level co-opetition in the regional port system”, 01/2014/-12/2016, National Natural Science Foundation of China (grant #71302109), RMB 190,000.
4. Mingzhu Yu (PI); “The container terminal operation in the low-carbon economy”, 2015.01-2020.12, Natural Science Foundation of SZU, RMB 1,800,000.
5. Mingzhu Yu (PI); The yard space allocation and the yard crane scheduling in the automatic container terminals, 2018.01-2021.12, National Natural Science Foundation of China (grant # 71771154), RMB 470,000.
6. Li Chen (PI); “基於合作博弈的多碼頭聯盟策略研究”, 2018.1.1-2020.12.31, National Natural Science Foundation of China, Project No. 71701148, RMB 190,000.

9.3 Whether there are new collaborations developed directly from this project?

After presenting some of the project outcomes at the 2012 International Conference on Logistics and Maritime Systems (LOGMS), Prof. Lee was invited to join the steering committee of LOGMS and to give a keynote speech at LOGMS 2013. Later we were invited to organize and host LOGMS 2015 and co-edit a special issue of Ocean transport logistics in *Flexible Service and Manufacturing*. The steering committee of LOGMS comprises leading scholars in important port countries/cities such as the Netherlands, Hong Kong, Singapore, Korea and Australia. Through these commitments, we have created an excellent opportunity for Hong Kong to play an important role in this field.

Prof. Lee has also built solid relationships with the industry through conducting invited seminars, site visits and idea exchange. In addition, new partnerships have been formed through our students' career placement. For example, several PhD students who were heavily involved in the project are now teaching in significant port cities. For example, Tao Lu is now teaching in Erasmus University Rotterdam, Mingzhu Yu in Shenzhen University, and Chen Li in Tianjin University. This has resulted in additional alliances.

9.4 Please give details on how much money and from which sources has been obtained/requested for the specific purpose of continuing the work started under this project.

N/A

Project Title: Transforming Hong Kong's Ocean Container Transport Logistics Network
Project Coordinator: Prof Chung-yee Lee (HKUST)

Summary

As a port city, Hong Kong has always relied on its port for economic development and prosperity. In recent years, it has been facing ever-increasing competition from other ports in mainland China. Many people have started to doubt its future as a logistics center. From our point of view, Hong Kong and Shenzhen's ports serve as a single node in the global supply chain network. This unique feature distinguishes Hong Kong from other port cities around the world. The logistics industry will continue to serve and promote Hong Kong as a regional and international financial and service hub. Ocean container logistics, the lifeline of almost any global supply chain, functions as a solid foundation for old and new businesses alike. If developed along a reliable set of guidelines, ocean container logistics will continue to attract new opportunities to other important business sectors in Hong Kong.

This project has promoted the research on maritime logistics and supply chain management in Hong Kong. Our project team consists of scholars from four local universities and two overseas universities. We have investigated global supply chain networks for ocean container transport comprehensively. The results provide guidance on how to enhance operating efficiency and improve business models. The team has published more than 40 papers on ocean container logistics networks in prestigious journals and one book targeting academics. The project has thus made a substantial impact on the research and practice of maritime logistics.

Our project is closely connected to the industry. For example, an industrial advisory board supported the project by providing valuable feedback and advice. We also took advantage of a number of channels to disseminate the research to the industry. We conducted seminars for members of the Chartered Institute of Logistics and Transport in Hong Kong as part of their professional development. We organized the 5th International Conference on Logistics and Maritime Systems, which attracted more than 30 senior executives from Hong Kong and overseas to come and exchange ideas for research and practice.

We have extended our impact to public policy-making. In April 2017, we submitted a special report on the future prospects of the Hong Kong container port industry to the Central Policy Unit of HKSAR Government. This report provides innovative options for the government's overall strategic plan. The project has also successfully trained a number of junior researchers. Many of them have found faculty positions in prestigious universities such as Erasmus University Rotterdam, Shenzhen University, and Tianjin University.

**The above summary is written mainly by the project team. The views expressed in the summary do not necessarily represent those of the University Grants Committee/ Research Grants Council.*