Study of collaborative relations through "Daily Maersk" service in China

Han Jingwei[1,2*], Owen Liefung Yue[3]

[1]*Beijing Jiaotong University, No. 3, Shangyuan Village Haidian District, Beijing, China*

[2]*Waterborne Transport Research Institute of Ministry of Transport of PRC, No 8,Xitucheng Road,Haidian District, Beijing, China*

[3]*Hong Kong Logistics Association, LG1, HKPC Building 78 Tat Chee Avenue, Kowloon, Hong Kong*

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Abstract

Maersk Line has recently introduced a daily service in Asia-Europe route. This new service will bring in a revolutionary impact on the current fixed schedule shipping service in China. There are different views from China market on such daily service since the daily Asia-Europe service route calls mainly China's ports. Through the study of the 'daily Maersk' from 5 perspectives, namely shipping market demand, the required basic port infrastructure, relevant Government policies and regulations, operational aspects and low carbon emission, it is possible to reveal a kind of 'collaborative relations' in the China fixed schedule shipping market. The analysis adopts a qualitative approach via a questionnaire survey of selected experts. With the support of a theoretical mathematical model, it is possible to quantify the collaborative relations in different development phases in China. The study concludes that there are 3 broad phases of the development of collaborative relations and the current daily service emerges in the 'new development era' phase. It is because there are sufficient freight and adequate port infrastructure. The daily service outperforms the general industry practice under the "Rotterdam Rules" on carrier's responsibility and liability and injects contemporary logistics management concepts in the industry. Moreover, it is in the same pace of current China's requirements on energy saving and carbon emission reduction targets.

Keywords: 'Maersk', collaboration, collaborative relations, Asia-Europe

1 Introduction

Maersk Line has introduced a new 'daily Maersk' service for the Asia-Europe route starting in Shanghai [1] from November 2011. The daily service borrows the idea of fixed schedule service from air transport service. It allows shippers to have a better control on their delivery schedules. However, there are some concerns about the provision of daily service within the China shipping industry. The port conditions and level of shipping service have not developed evenly in China to support seamless freight flow for foreign trade. Can the Maersk's daily service in China survive in the short and long run? Through the study of the collaborative relations, the feasibility of providing daily service will be assessed by looking into 5 perspectives, namely shipping market demand, calling port infrastructure, Government policies and regulations, shipping operational factors and carbon emission. A mathematical model has been established to assist in the analysis of different phases of collaborative relations development in China. Finally it is possible to conclude that there are general 3 broad phases in the development of collaborative relations in China shipping industry. The introduction of the 'daily Maersk' is subsumed in the third phase and it should be able to survive. Some enhancements for such daily service will be identified and recommended at the end of this study.

2 Concerns about daily service

This daily service involves the 4 calling ports in Asia with three ports in China (Ningbo, Shanghai, Yantian) and one in Malaysia (Tanjung Pelepas) whereas the European ports at Philip Ke Situo (UK), Rotterdam (Netherlands), and Bremen (Germany). For shipment with Maersk Line scheduled service, it is expected to be on-time but the current 50% on-time is common in the China shipping market. The poor service level forces the shippers to adjust their production schedule as well as its supply chain. The daily service changes the operation of the shipping industry and the shippers' inventory planning. It creates a new standard and marks a milestone. Shippers can now benefit from better inventory control and bank finance. At the moment of writing, the booking of the daily service is getting momentum and growing gradually.

However, the concerns are merger of the 'big' players in order to share their resources to strike against this new challenge. For the small and medium shipping companies, they would easily go broke due to high cost of running daily service and possible demurrage. Subsequently, a new wave of merger and takeover could eliminate some existing players but Maersk Line will secure its monopolistic position in the China shipping industry. On the other hand,

[*] ***Corresponding author's e-mail:*** 552186316@qq.com

the Chinese shipping industry is still developing and the level of ancillary service and conditions may not be able to match with Maersk Line's expectation. Can the Maersk's daily survive in the short and long run? The development of Chinese ports and the supporting service could be a critical factor.

3 Influential factors

3.1 SHIPPING MARKET DEMAND IN CHINA

Would there be sufficient volume of freight to support the development of the Maersk's daily service? The financial tsunami in 2008 had significant impact on Sino-Europe trade. However, after 3 years of recovery in world economy, the trade volume has rebounded and exceeded the level in 2008. According to the 2008 and 2010 China Customs statistics [3] and the internal data analysis (FOXPRO program) of the China Waterborne Transport Research Institute, the container trade between China and the Europe are summarised as follows:

1. In 2010, the trading level reached the value of US$573.1 billion with the export value of US$355.2 billion and import value US$217.9. When comparing with the 2008 level, the 2010 level increased by 12.2%, 3.6% and 29.6% respectively.
2. The demand for container trade is about a total of 11 million TEUs and export from China to Europe with 8.3 million TEUs and 3.2 million TEUs vice versa. It is a huge imbalance of trade. The major sources of TEUs for the Sino-Europe route are coming from 7 provinces in China (Guangdong, Zhejiang, Jiangsu, Shandong, Fujian, Shanghai and Hebei) counting towards 87% of the total (see Table 1 below).
3. In the Asia-Europe route, Maersk will put in 70 ships in the "daily Maersk' service. The capacity is around 8,500 TEUs to 15,000 TEUs. It carries about 57,000 TEUs per week or about 3 million TEUs per year. According to the above Table 1, the annual demand for container transportation will be about 7.7 million TEUs from China to Europe. The Maersk is sharing about 40 percent of Sino-Europe trade so there should be sufficient freight for 'daily Maersk'. Maersk is taking a strategic move in the vulnerable shipping market (after the financial tsunami) in order to scramble for more market share. Other Chinese shipping companies need not be panic and it is just to make sure that their service level could be improved and reliable, rather than simply competing on price in the sea freight.

TABLE 1 Sources of freight (TEUs) in Sino-Europe container trade

Province	**%**	**Province**	**%**
Guangdong	27%		
Zhejiang	19%		
Jiangsu	16%		
Shandong	9%		
Fujian	7%		
Shanghai	5%		
Hebei	4%		
Sub-total	87%	Others	13%

Source: estimates from 2010 China Customs statistics

4. The unit value of the container trade between China and Europe after financial tsunami has increased as China has undergone structural change in the industry although the container trade volume is decreased (-12.8%) from year 2008 of 225.2TEU / billion U.S. dollars down to year 2010 of 199.6TEU / billion U.S. dollars shown in Table 2. Comparing the year 2010 and 2008, Guangdong, Jiangsu, Zhejiang and Shanghai (municipal) forerun in the adjustment of industrial structure. As long as the world economy is not fluctuated significantly, the demand for container transportation between China and Europe is increasing.

TABLE 2 Sino-Europe container trade in 2008 and 2010

Year	**2008**			**2010**		
	Exp	*Imp*	*Exp-Imp*	*Exp*	*Imp*	*Exp-Imp*
China	2587	1570	2252	2331	1450	1996
Jiangsu	1977	1872	1954	1673	1372	1595
Zhejiang	3406	3023	3354	2540	2034	2459
Shanghai	1290	802	1084	984	534	763
Guangdong	3268	2547	3081	3874	2625	3103
Total	**12528**	**9814**	**11725**	**11402**	**8015**	**9916**

Source: projection from the China Customs data unit: TEU/ Billion US$

3.2 BASIC INFRASTRUCTURE

3.2.1 Shanghai Port

Shanghai Port refers to container terminals located in Yangshan, Waigaoqiao, and Wusong involving a total of 46 container berths, 155 container quay cranes and 463 gantry cranes, and the yard area of 6.34 million m2. All these container terminals are included as the Shanghai Port integrated by sea and land shuttle service and 'daily Maersk' uses Yangshan Container Terminal (Table 3).

TABLE 3 Yangshan container terminal

	Mingdong	Shengdong	Guandong	Total
Quay Length(m)	1110	3000	2600	6710
No. of berths	4	9	7	20
Water depth(m)	–12.8	–16	–17.5	
No. of cranes	16	34	26	76
No. of RTG	48	108	82	238
No. of Stackers	2	5	6	13
Yard area (million m^2)	0.82	1.49	1.42	3.73
Warehouse space (10,000 m^2)	0.95	n.a.	n.a.	0.95
Annual capacity (10,000 TEUs)	70	430	500	1000

Source: website of port of Shanghai at www.portshanghai.com.cn [4]

3.2.2 Ningbo Port

Ningbo Port refers to Beilun, Chuanshan and Daxie container terminals with total 14 berths and quay length of 4,733 meters. The basic infrastructure for these container terminals are summarised in Table 4.

TABLE 4 Ningbo Port

Container terminal	Berth capacity	Quay length	Berth	Water depth
	(10,000 tonnes)	(m)	(no.)	(m)
Beilun	5~10	2138	7	13.5~15
Chuanshan	10	1785	5	17
Daxie	10	810	2	17.5

Source: website of Ningbo Port at www.nbport.com.cn [5]

3.2.3 Shenzhen Port

Shenzhen Port refers to Shekou, Chiwan and Yantian container terminals with total 44 container berths and a capacity of 18.91 million TEUs.

3.3 GOVERNMENT POLICY AND REGULATIONS

Maersk Line has been keen to maintain close relationship with China Customs to ensure the smooth operation. China Customs is also willing to support Maersk Line via Daxie's Customs which has set up an innovative high-tech regulatory model. The monitoring process is through online data exchange between the Customs and Maersk. Provided that the information is correct, the rebate for the export tax is fast tracked and customs clearance is greatly improved. This is one of the reasons that Maersk Line strategically positions its daily Maersk service in Ningbo Port.

A major possible obstacle in hindering 'daily Maersk' service is the collaboration with different local governments along their voyage when ship replacement is needed. On the other hand, the international regulation "Rotterdam Rules" may have impact on China shipping industry as China has not signed in yet. This does not affect Maersk Line as they have already fixed the demurrage of US$100 per container for delay of first 3 days and US$300 per container for the fourth days or more.

3.4 OPERATIONAL ASPECTS

The ocean container transportation has significantly changed the pattern of world trade. In the past decades, the development of China shipping industry has however no major breakthrough. The unreliable shipment has been a common criticism in the China shipping industry and only 50 percent arriving on time. Every year, China has about a total of 11 million TEUs 'in' and 'out' from/to Europe excluding the transfer of the empty container which adds up to around 15 million TEUs. Maersk Line has offered a fixed schedule daily service in the China shipping market with fixed demurrage. The daily service does not just relieve the pressure of the shippers' inventory control but also enhances the competitiveness of the manufacturing companies in China. This service will change the weakest link in the supply chain into a powerful link. The recent observation is about 95% on-time which projects an average saving between US$200 to US$400 per container.

3.5 ENERGY SAVING AND REDUCTION OF CARBON EMISSION

The trend to change the economic development structure so as to achieve resources saving and carbon emission reduction has been stated in the national policy level since the '11th Five-Year Plan'. The energy consumption in the operation unit of the ship transportation and port throughput fell by 7% and 4% respectively and achieved the related reduction target in energy-saving and carbon emission. In the '12th Five-Year Plan' i.e. the period up to 2015, the proposed energy consumption for the unit of the ship transportation and port throughput to be decreased by 15% and 8% respectively compared to 2005, carbon dioxide emissions would be decreased by 16% and 10% respectively [6].

'Daily Maersk' service is at 13% carbon dioxide emissions lower than the industry average per container with its newly investment in the twenty '3E' class ships to run on the Asia-North Europe route would become the world's most energy-efficient route.

4 Phases of Collaborative Relations

'Collaboration' concept in this study refers to the balancing various needs in the shipping industry via positive and constructive relations. It is a dynamic, interactive and complicated process in order to materialize collaborative relations. The 5 perspectives elaborated in the previous sections would be quantified in a mathematical model below to differentiate the development of collaboration in the China shipping industry at different stage if any. The collaborative relation is therefore quantified through a theoretical mathematical model as follows [7]:

$$F_k = A_k C_k^k \left(X_1,\ X_2,\ \ldots,\ X_i\right) + b, \tag{1}$$

where F_k is the collaborative relations 'k' phase. Collaborative relations phase F_k is directly proportional to the collaborative degree A, which increases as the F_k increases:

$$\begin{cases} F_1 = A_1 C_1 (X_1,\ X_2,\ \ldots, X_i) + b \\ F_2 = F_1 + A_2 C_2^2 (X_1,\ X_2,\ \ldots, X_i) \\ F_3 = F_2 + A_3 C_3^3 (X_1,\ X_2,\ \ldots, X_i) \\ F_4 = F_3 + A_4 C_4^4 (X_1,\ X_2,\ \ldots, X_i) \end{cases}, \tag{2}$$

If $F_1 \leqq F_k < F_2$: the collaborative relations are under an incubation stage;

If $F_2 \leqq F_k < F_3$: collaborative relations in the developing phase;

If $F_3 \leqq F_k < F_4$: collaborative relations in a new era stage where a new business environment emerges:

1) 'A' represents the degree of collaboration subject to factors X_1, X_2, …, X_i (see section 3 above) i.e. different phases when 'A' has developed into different state, then the collaborative relations has evolved into a new environment and new collaborative relation phase; and the value of A_1, A_2, …, A_k can be obtained through a "power function" method:

$$d_i = e^{-e^{\frac{x_i - s}{s-n}}}.$$

When x_i reaches the threshold between the uncoordinated and basic coordination, the A_2 is: d_2=0.3679. When x_i reaches the critical value between the coordination and basic coordination, the A_3 is: d_3=0.6922. So the boundary value of A, that is 0, 0.3679, 0.6922 and 1 respectively, assessments using the Equation (2), calculating the boundary value of F_k when A_i at various degree (A_1=0, A_2=0.3679, A_3=0.6922, A_4=1), 'C' value is 1; and boundary value with no randomness, 'b' = '0' with 'i' factors, therefore:

$$\begin{cases} F_1 = 0 \\ F_2 = F_1 + 0.3679(4i) = 1.4716i \\ F_3 = 1.4716i + 0.6922(8i) = 7.0092i \\ F_4 = 7.0092i + 10i = 17.0092i \end{cases}.$$

2) 'C' represents the degree of collaboration in different phase;

3) 'B' represents the random impact factor; this is to cancel out the random effect of Xi. It can be resolved by curve fitting and i and n are natural number. In order to limit the calibration in this study, the values of C_1, C_2, …, C_k are assumed to be '1' for equal weighting of importance.

5 Expert Assessment on Collaborative Relations

5.1 EXPERTS AND QUESTIONNAIRE

A questionnaire survey to assess the rating of the 5 selected factors was issued to the experts from China Waterborne Transport Research Institute (WTI), China Ocean Shipping Company (COSCO), Tianjin Port (TJ), Shanghai Customs (S Customs), China Maritime Safety Administration (China MSA), Shanghai Maritime University (SMU). The rating provided by the experts were separated in 3 periods within the last 20 years: years 1990~2000 (S1), 2001~2005 (S2), and 2006~2010 (S3); And the feedbacks were summarized in Table 5 below:

TABLE 5 Rating of Experts on the 3 Collaborative Relations

Experts	X_1			X_2			X_3			X_4			X_5		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_1	S_2	S_1	S_2
WTI	2	4	9	1	5	10	0	5	8	0	5	0	5	0	5
COSCO	1	5	8	1	5	8	1	6	8	1	4	1	4	1	4
TJ	2	4	8	1	4	8	2	5	8	1	6	1	6	1	6
S Customs	3	5	10	1	4	9	1	4	8	0	5	0	5	0	5
China MSA	3	5	9	1	4	9	0	4	8	0	4	0	4	0	4
SMU	1	4	8	1	4	9	1	5	8	0	3	0	3	0	3

In Table 5, the experts rated the 5 factors including market demand, basic infrastructure, Government policies and regulation, corporate operational aspect and reduction in carbon emission in the range of '0' to '10' where '10' the highest rating and '0' the lowest relations. In this study, there are 5 factors so i=5, therefore:

$$\begin{aligned} F_1 &= 0 \\ F_2 &= 1.4716 \cdot 5 = 7.358 \\ F_3 &= 7.0092 \cdot 5 = 35.046 \\ F_4 &= 17.0092 \cdot 5 = 85.046 \end{aligned}.$$

The theoretical value of the collaborative relations is calculated by averaging the total expert rating in a period for each factor (Table 6).

$$S_{tvi} = \frac{1}{n}\sum_{k=1}^{n}\frac{\overline{s_{tvki}}}{n}. \quad (3)$$

S_1 period: *WTI* (X_1, X_2, X_3, X_4, X_5)=(2, 1, 0, 0, 0), $S_{tv1} = X_1 + X_2 + X_3 + X_4 + X_5 = 3$, and so on as in Equation (3): S_{tv1} = theoretical value = (3+4+6+5+4+3)/6=4.2

TABLE 6 Theoretical Value of Collaborative Relations at each period

Experts	S_{tvi}		
	S_{tv1}	S_{tv2}	S_{tv3}
WTI	3.0	24.0	43.0
COSCO	4.0	26.0	40.0
TJ	6.0	23.0	40.0
S Customs	5.0	24.0	44.0
China MSA	4.0	22.0	41.0
SMU	3.0	20.0	41.0
Theoretical value	4.2	23.2	41.5

5.2 THREE PHASES OF COLLABORATIVE RELATIONS

1. In 1990~2000, S_{tv1}=4.2, $F_1 < S_{tv1} < F_2$, the collaborative relations is under an incubation stage. It is the beginning of the container transport market and just receiving attention. The market demand is not strong whereas the container transport infrastructure was poor. The Government policies and regulations did not provide support and there was little effective operation concept. The requirement was basically 'shipped' service since China was in the economic development stage and had little attention on energy saving and environmental protection. It is therefore the expert assessment were in the lowest range '0' for all factors X_1, X_2, …, X_i.
2. In 2001~2005, S_{tv2}=23.2, $F_2 < S_{tv2} < F_3$ collaborative relations in the developing phase together with the rapid development in China's economy and foreign trade (import and export), and the improvement in container transport security, the popularity of using container transport was gaining momentum. Subsequently container transport facilities and infrastructures as well as the Government policies and regulation were gradually matching with the development of container transportation. Furthermore, the introduction of contemporary logistics concepts, national concerns in energy saving and environmental protecttion etc, has put container transport under the spot light. The shippers required more and requested 'shipped well' service. In this phase, the experts rated the factors, X_1, X_2, …, X_i around the mid way 5 points. In this stage, the shipping companies began with strategic alliances to share the capacity among themselves and offer new services in order to reduce the risk. Therefore, this is the developing stage.
3. In 2006~2010, S_{tv3}=41.5, $F_3 < S_{tv3} < F_4$, collaborative relations in a new development era phase where a new business environment emerges. Under this phase, the industrial structure has been adjusted and the economy has recovered from the financial turmoil. There is growing demand in container transport in the foreign trade so the port facilities have also been improved accordingly in particular the improvement in the efficiency of the Customs so as to support the foreign trade. The "Rotterdam rules" gradually attracted the worldwide attention even the shippers require not only "shipped" but "shipped well" so as to achieve environmental benefits. The International Maritime Organization (IMO) adopted the MARPOL 73/78 Convention, marking the official commencement of the low-carbon era. It is therefore the experts rated the factors X_1, X_2, …, Xi for 8 points and more in most cases.

6 Conclusions and Suggestions

6.1 CONCLUSIONS

The three phases of collaborative relations were identified through a mathematical model. It highlighted that the 'Daily Maserk' would definitely bring in a breakthrough in the China fixed schedule shipping service. It is certainly a new standard of service for the shipping industry and raises the level of service to record high. According to the analysis of the collaborative relations, it is concluded that Maersk has launched the 'daily Maersk' service in China's third phase of collaborative relations (new development era phase) so:

1) It has sufficient freight from China calling ports.
2) It has some calling ports with adequate port infrastructure.
3) It can outperform China's requirement in the carrier's responsibility and liability ("Rotterdam Rules").
4) It can inject contemporary logistics concepts into the China ship management practice.
5) It can keep up with the same pace of China's energy saving and reduction of carbon emission.

6.2 SUGGESTIONS

The study reveals that the demand for Sino-Europe route is 11.5 million TEUs in 2010 in which 8.3 million TEUs from China to Europe and 3.2 million vice versa. This serious imbalance generates five million empty containers to be reshuffled. The Maersk operation management should pay attention to this imbalance.

'Daily Maersk' can handle about 3 million TEUs in the Asia-Europe route each year. There is a strong demand on road distribution which may bring in a heavy traffic pressure on the calling ports and creating pollution problem therein. Although a carbon emission of "Daily Maersk" service at its sea link is low, there are more carbon emissions in the upstream of the road transportation chain. Would it be beneficial to use more river fee-

der service? On the other hand, it is recommended that 'daily Maersk' service could be extended to the Taicang Port and Nanjing Port so as to reduce urban traffic and exhaust pollution in Shanghai, as well as to provide shippers in Jiangsu Province with direct service.

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Authors

Jingwei Han, born in November 1979, China.

Current position, grades: associate researcher.
University studies: Beijing Jiaotong University.
Scientific interests: water transportation strategy and regulation; water transportation; modern logistics.
Publications: 15.
Experience: Waterborne Transport Research Institute of Ministry of Transport of PRC since 2001.

Owen Liefung Yue, born in November 1956, Australia.

Current position: Chief Town Planner, PhD, MSc., MTCP, MMgt, FHKIP, FHKLA, MHKIE.
Scientific interests: land use and transport modelling; supply chain.
Publications: 9.
Scientific interests: land use and transport planning, supply chain management consultancy.
Experience: Planning Department, HKSAR Government (1998-2013). Henderson Land Development Company Limited since 2014.