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**Analysis on Seaports Overseas Cooperation: the  
Case of CMPort and Djibouti Port**

by

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## **Abstract**

Seaport overseas cooperation is a common phenomenon today, however, the academic research in related topic is limited regardless of quantity or scope. On the other hand, port takes different ways to collaborate with others based on specific objective, however, not all the cooperation could achieve the target due to various reasons such as culture shock, conflict of interest etc. Therefore, we combine both quantitative and qualitative method, such as strategic analysis from perspective of external positioning, internal strength and weakness, to insightfully identify key motivations. Moreover, balance scorecard and grey relational degree method are conducted to measure the collaborative performance and effect in the case of Djibouti port. We expect that our study could enrich the study of inter-regional seaport cooperation.

Through our in-depth study, we find that collaborative reasons are various and can be driven by one factor or several factors simultaneously, such as network expansion, environment protection etc. Besides, Chinese terminal operators leading by COSCO Shipping Port and CMPort are expanding rapidly worldwide in recent years, especially along the maritime route of OBOR. Moreover, the fit between involved parties are essential, especially for joint venture (equity acquisition), as it is the deepest cooperation model that the dependence and risks are higher than other models. In the case of Djibouti port cooperation, which is also joint venture model, the objectives are also complementary in the aspects of know-how input and output, capital support, network expansion, strategic layout, competitiveness enhancement etc. Furthermore, although the project is not mature, short-term results show that the joint venture cooperation indeed benefits each parties in efficiency improvement, market share increase because of acquisition of advanced management and operational skill, high quality port infrastructures and facilities etc. In addition, joint venture model tends to perform well in terms of information communication, which is helpful in target uniformity.

On the other hand, port performance is influenced by comprehensive factors from both politics, policies, mutual benefit etc. in long run. Thus, constantly keeping port vitality, expanding port related activities and hinterland resource, localizing project, unifying objectives are recommended.

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## List of Abbreviations

Ad	Aden Port
APM	APM Terminals
BSC	Balanced Scorecard Method
CA	Concession Agreement
CMG	China Merchants Group
CML	China Merchants Logistics Holding Co., Ltd.
CMPA	China-Malaysia Port Alliance
CMPort	China Merchants Port Holding Company Limited
COMESA	Common Market for Eastern & Southern Africa
COSCO	COSCO Shipping Ports Limited
Da	Dar Es Salaam port
DCT	Doraleh Container Terminal
DDP	Off Dock Depot
Dj	Djibouti Port
DPW	DP World
DMP	Doraleh Multi-purpose Port
ESI	The Environmental Ship Index
EUROGATE	Eurogate GmbH & Co. KGaA, KG
GHG	greenhouse gas emissions
GRA	The Grey Relation Analysis Method
HPH	Hutchison Ports
JOPCA	Japan Overseas Ports Cooperation Association
LCA	Logistics Capacity Assessment
Mo	Mombasa Port
MoU	Memorandum of Understanding
NAPA	The North Adriatic Port Association
OBOR	One Belt One Road
OEC	The Observatory of Economic Complexity
PDA	Product Diversification Analysis
POD	The Old Port of Djibouti
PoR	Port of Rotterdam
PPA	Product Portfolio Analysis
PSA	PSA International Pte Ltd
PSDA	PORT DE DJIBOUTI S.A.
Sa	Salalah Port
SSA	Shift-share analysis
Su	Sudan Port
UNCTAD	The United Nations Conference on Trade and Development
WPSP	The World Ports Sustainability Program



## Chapter 1 Introduction

### *1.1 Background and Objective*

In recent years, as the development of globalization and increasing competition, many seaports are tending to collaborate with others worldwide. However, the collaboration are in various ways in terms of different strategies and objectives. For instance, Antwerp port is collaborating with New York port, Tokyo port, and Shanghai port etc. to strengthen their competitiveness. Besides, leading by China Merchants Port Holding Company Limited (CMPORT) and COSCO Shipping Ports Limited (COSCO), many Chinese ports are also broadly cooperating with more than twenty ports through Joint investment in different countries and areas. The various overseas cooperation make us interested in benefits behind, and whether these cooperation can always achieve their original target. In practical, the collaborative cases are in a huge amount, to insightfully identify motivations and performance, we will choose one representative case - Djibouti port to analyse.

There are several reasons for us to choose Djibouti as representative: first of all, Djibouti, an East African country, is compelling around the world in recent years' economics development, although it is with only 22980 sq.km territory area (Republic of Djibouti) and 0.9 million population (World Bank, 2018). Secondly, Djibouti is a gateway located in one of the important shipping routes and maritime silk route, 'China-Indian Ocean-Africa-Mediterranean Sea', which connects Asia, Africa, and Europe. Thirdly, Djibouti is strategic significance both in economy and military, as it is also one of the key oil and natural gas export channels in the world. Lastly, Djibouti is a substantial transshipment portal for African inland countries, especially for Ethiopia, which has the largest number of population among inland countries and a steadily rebound in industry, agriculture and services (World Bank, 2018). In 2016, the export of Djibouti and Ethiopia are around USD139 million, USD768 million respectively, import are USD707 million, USD3720 million respectively (Trading Economics, 2017).

Figure 1 Geography of Djibouti



Source: Nationalonline

On the other hand, to enhance sustainability growth and against negative impacts due to slowdown global economy, port authorities and Chinese government are implementing various strategies in domestic and abroad. Including but not just limited in port integration, overseas cooperation. Especially, the collaborations along one belt one road (OBOR) are significant and extensive. It brings opportunities and challenges for both Chinese ports and the cooperate partners (W.Huo et al., 2018).

In Feb 2013, China Merchants Port Holdings purchased 23.5% share rate of Djibouti port (PSDA), which started the formal cooperation between the two port companies. In May 2017, the first phase of DMPort has been completed. The total investment of this project is USD580 million, including multi-purpose berths with 6 million dwt throughput capacity, container berth with 1.5 million TEU throughput capacity. Besides of port itself, the union of CMPort, Dalian port, Djibouti port and IZP also invested Free Trade Zone, which is aiming to facilitate regional economic development.

Thereby, we will utilize this case to study the reasons of ports overseas collaboration and analyse its economic and transportation impacts. Basically, port overseas investment should be positive to port development – information & technology communication, increasing efficiency, decreasing logistics cost, promote trading activities etc. However,

the result is affected by many factors – politics, economy, local environment etc., by a further analysis, we will identify how much the cooperation drives the above development. Then, we can also understand whether the overseas investment is worth it or not, which will also be a reference to decision makers.

## *1.2 Research Questions*

Our main study question is: what is the evaluation behind seaport overseas cooperation? To understand this question insightfully, we separate it into two sub-questions so that we can research step by step:

### *1. What are the strategy drivers of international port cooperation?*

In general, it is a substantial decision for port company to conduct overseas collaboration, which is must be leaded by a strategy and masterplan based on their current position and development objective. On the other hand, some enterprise behavior also related by national policy in terms of their economic system. Therefore, we will analyze the driver factors from both national and corporate level, including current competitiveness and connectivity, aggressive strategies etc.

### *2. How is the current cooperation performance?*

In the specific implement progress, collaborative parties probably face various difficulties, such as trust mechanism, administrative organization, value identity etc. Under these situations, it is necessary to evaluate the cooperative performance as it is a key factor to determine the partnership is successful or failed.

Hereby, in chapter 1, we will state the reasons why we raise this question, and the back ground. In chapter 2, we will study the general knowledge and information about seaports cooperation, especially in overseas, the main cooperation patterns, motivation studies, and performance evaluation, as well as the motivation studies and the current seaport collaboration along OBOR. In chapter 3, we will describe research questions and method approach in detail. To understand the cooperation well, we will conduct a case study between CMPort and Djibouti port in chapter 4, where the basic information of Djibouti, the transportation network, Djibouti port, CMPort, and the investment details will be described. In chapter 5, analysis results will be shown, and further explain will be conducted. In chapter 6, conclusion and suggestion will be given.

## Chapter 2 Literature Review

### *2.1 Definition and objectives of Port Overseas Cooperation*

The definition of port cooperation is given by W. Huo based on Oxford dictionary that it is a behaviour or process that port authorities work together to reach to the same end (W. Huo et al., 2018). Look at Antwerp port authority is conducting treaties worldwide by cooperating with ports in different continents, aiming to enhance its international position. The main objectives of collaborations are to improve logistics chain, optimize intermodal transport, and exchange technical information (Port of Antwerp). Japan Overseas Ports Cooperation Association (JOPCA) is also promoting international ports cooperation and friendship between Japanese ports authorities and developing countries by technical assistance, training courses, international conferences (JOPCA). Thus, we believe that the content of port overseas cooperation is that port authorities from different countries and regions work together by various forms to expect to achieve one goal or several goals.

Ports with different growth stages, competitiveness, organizational structures, and supporting industries can strength their competitiveness and connectivity, improve efficiency, share information, obtain resource, realize technical communication, enhance market share and keep sustainability through conducting different types of cooperation. The implement is also based on their strategies and aggressive masterplan, which is related to globalization, advance of technology and increasing competition besides of themselves' positions in the industry. For example, based on a cost and benefit study, collaboration in information exchange among ports or terminals have a competitive advantages in obtaining higher profits and increasing competitiveness (V. Carlan, 2015).

### *2.2 Typologies of Seaport Cooperation*

Port cooperation, aiming to seek a mutual benefits, is diversified into many different types in terms of different perspectives and levels. The most basic type is horizontal and vertical cooperation. Horizontal cooperation happens between two different ports and in most of the cases. Vertical cooperation occurs between the upstream and downstream of port industry (W. Huo et al., 2018). International port collaboration belongs to the former as it must be conducted between different ports.

Similarly, port cooperation is also classified into intra and inter cooperation based on the model conducted by operators, which is aiming to strengthen competitiveness and market share. Intra cooperation is conducted by the terminal operators within one port, and inter cooperation is conducted in different ports (W. Huo et al., 2018). In practical, be different from the basic type, it could happen in the same terminal operator, Such as APM terminal cooperates with Rotterdam Port Authority, as well as APM terminals in other countries and areas.

Furthermore, according to R. Fiedler et al. (2016), type difference is not only refers to the engagement of port authority, but also related to their trade route, port function and location. Therefore, he defines port cooperation into five types: Memorandum of Understanding (MoU) – a basic model for those ports who are on the same trade route and aim to strengthen links to boost cargo throughput; Seaport and inland port cooperation – aiming to improve inland transportation and expand hinterland resource; Port integration – implemented under legal form and can make a close tie between integrated parties, such as joint ventures of Malmo port between Sweden and Denmark; Coopetition – happened between adjacent rival ports; Hub port cooperation – occur between container terminals and carriers to increase business.

International port cooperation can be divided into four categories in terms of the objectives: investment in port infrastructure; investment holding or acquisition; cooperate agreements between sister ports; network collaboration (X. Zhao et al., 2016). International port infrastructure cooperation is usually implemented by port engineering companies (W. Huo et al., 2018). If Chinese overseas port cooperation refers to construction, the project is usually conducted by China Harbour Engineering Company and China Communication Construction Company. For instance, the second phase of Hambantota Port construction, CMPort with Sri Lanka cooperation project, is built by China Harbour Engineering Company. For comprehensive network collaboration, there is no further introduction due to the lack of research information in current stage. (W. Huo et al., 2018).

Investment holding or acquisition is usually carried out under an aggressive masterplan that both parties expect to reinforce competitiveness advantages, market share, obtain more resource, knowledge and skills, and access to the suppliers through it (W. Huo et al., 2018). This modal is normally involved by capital investment in the pattern of equity or option purchasing or exchange, operation right and licensing bidding. The cooperation mode is usually joint venture that they either build a new port or joint manage and upgrade the existing ports. No matter in which kind of joint mode, the cooperative parties share both the financial profits and risks together. Most of these activities are usually leading by port themselves, meanwhile weaken political influence. On the other hand, although this holding or acquisition modal works well in port operating system, it is easily to cause business crisis. Such as, Hambantota port cooperation in Sri Lanka between CMPORT and Sri Lanka government, due to local resistance, the share rate is finally agreed to be reduced from 85% to 65% within a decade (W. Huo et al., 2018). Including the cooperation between CMPort and Djibouti port, which we will give more analysis in the later chapters, by the year of 2017, Chinese port companies have involved in this mode international collaboration around nineteen cases.

Strategic alliance is similar as investment holding or acquisition in some objectives that it is also aiming to add value to service, obtain more resources, strengthen operations and skills, enhance strategic growth, as well as enlarge hinterland regions. They are both long-term partnerships and share risks and benefits to a certain extent, and the relationship can be developed by regular delegation visiting from either governmental level or company representative level. However, strategic alliance does not involve in capital permeation, it usually functions in the forms of informal networks, MOU, sister port agreement or consortia (W. Huo et al., 2018). Among of these types, the most

implemented are MOU and sister port cooperation agreement. And involvement parties can facilitate import and export, speed up customs clearance, share information of hinterland, environmental and security, conduct technological assistance and joint staff training (R.Fiedler et al., 2016). In practical, for example, twelve Chinese ports compose China-Malaysia Port Alliance (CMPA) with ten Malaysia ports successively aim to work together in port information exchange, technical support, freight forwarding, and container transfers etc. (CMPA, 2015).

For the common purpose on environment protection to commit, union and work together worldwide is another mode of cooperation. The World Ports Sustainability Program (WPSP), aiming to improve maritime environment and keep sustainable development, the world's major ports commit to reduce greenhouse gas emissions (GHG) by various measures, such as vary port management structure. Among of those measures, the Environmental Ship Index (ESI) is introduced to ports that it is an index to evaluate the emission of NO<sub>x</sub> and SO<sub>x</sub>. Ports can reward ships who attend this program to promote the implement and participant of ships. Currently 53 ports have participated in the program, including Rotterdam port, Antwerp port etc. (WPSP).

Introduced by M. Dooms et al. (2013) that the forms of signing license agreement, establishing strategic alliance, setting up joint venture companies, or directly invest in a foreign countries are the second and third stages of international strategies for port authorities. And different operate modes are followed by different stages.

According to negligible to high level of inter-organizational dependence, types of collaborative agreement are introduced by E. Haezendonck (2018), such as technical training agreement almost have dependent influence to the partner organizations, marketing service agreement is low level of participation in joint business. However, research partner and equity joint venture belong to middle and high level of engagement of joint business respectively, in this case, the dependence is high.

### *2.3 Practices of cooperative Implementation*

Followed by the classification of M. Dooms et al. (2013), there are several international strategies and cooperation modes, such as aid programs to developing countries, which is usually happened by joint developing constructions to enhance the port's competitiveness of that developing country. One such example is the project conducted in the Democratic Republic of Congo. An expert team is sent by the Antwerp port authority and financed by the Belgian government.

As the largest port in Europe, Rotterdam port is also conducting different levels and types of international collaboration. Hereby, we will introduce their practices in details. By now, port of Rotterdam has involved in more than five overseas cooperation in various modes with different objectives, the major cooperation in recent years are as below (Port of Rotterdam):

- Sohar Port and Freezone (Oman, Middle East)

It is 50/50 joint venture between the Omani government and PoR authority, which is operated in 2002 - 2025 and managed by Sohar Industrial Port Company.

- Porto Central Port (Brazil, South America)  
A joint venture port program between PoR and TPK logistica S/A (a Brazilian company). The agreement is signed in 2014, currently the project is obtaining certificate.
- Pecém Port (Brazil, South America)  
MoU between PoR and Ceará government to joint study joint venture feasibility of Pecém Port.
- Kuala Tanjung Terminal (Indonesia, Asia)  
A joint venture agreement has been signed between PoR and Pelindo 1 (state owned port) to joint develop Kuala Tanjung terminal, currently the terminal is under construction.
- Jakarta Port (Indonesia, Asia)  
MoU among PoR and Pelindo 2 (state owned port company), JakPro (land development company), for expanding project of Jakarta port.
- Four ports cooperation: Antwerp, Mannheim, Strasbourg, Rotterdam  
Joint venture agreement is signed among the four ports and Switzerland to develop LNG project, including cooperative research, promotion, knowledge transfer, infrastructure with the aiming to promote the usage of LNG in inland shipping on Rhine-Main-Danube route.
- Rosmorport (Russia, Eastern Europe)  
MoU signed between PoR and Rosmorport in 2011 to assist the port construction.

## *2.4 Reason Analysis*

For what reason port authorities want to cooperate with others, it is diversified in different ports with various position in the industry and authority. The main motives, M. Dooms et al. (2013), are profit maximization, seeking market opportunities and cheap resource, obtaining professional knowledge and skill, enhancing competitiveness. Besides, network expanding, cargo volume growth and position strengthen is their objectives as well. Furthermore, cost saving and additional revenue is also expected in aboard cooperation.

In the Mediterranean area, F. Gianfranco et al. (2014) indicates that ports are at low competitiveness due to lack of integrated management and intra-port competition policy. The cooperation policy is advocated and expected to change disadvantages and contribute efficiency and competitiveness. Therefore, F. Gianfranco et al. utilize a hierarchical cluster analysis based on the Ward method to look at the result when change the combined input data, which is based on the 34 main Mediterranean container ports.

As a result, it is identified that alternative strategies can overcome serious competition in the same area and in short and medium term, cooperation policy can be formulated.

In European area, R. Fiedler et al. (2016) identify that the cooperation is usually highly related to revenue generation and benefit maximization by analysing port cooperation from types, limitations, practices and potential synergies perspective. In addition, it can function in the field of commerce, engineering, sustainability and IT etc. It is anticipated that cooperation can increase port handling and competitiveness, as well as reduce maintenance cost and obtain a high efficiency of infrastructure planning by sharing equipment usage, allocating manpower, avoiding traffic peak etc. R. Fiedler et al. draw a conclusion that regional level port collaboration instead of national level mitigate regional port competition. However, the analysis is only conducted in qualitative method.

Facing to a huge amount of illegal trash and hazardous waste dumping, track the movement of those waste is necessary. H. Ruessink et al. (2016) recommend that collaborate and set up a port network will be helpful. Coordination has a significant meaning for seaports to resolve environmental problems by detecting and deterring illegal transports and operations from hazardous and electronic waste in any form of information sharing.

In the United States, neighbouring ports are facing fierce competition as well according to T. Yoshitani (2017), such as Seattle port and Tacoma port that they have similar transportation technologies, are located in the same trade lanes and hinterland. To mitigate the competition, cooperative agreement is an option. And T. Yoshitani further introduces the alliance between Seattle port and Tacoma port, the challenges, process, and the cooperation details, including term, governance, manpower, trust mechanism etc. In conclusion, port alliance is supposed to an effective way to keep neighbouring ports who are in competition viable and sustainable.

In Yangtze River Delta of China, J. Li et al. (2010), two largest and neighbouring ports-Shanghai port and Ningbo-Zhoushan port are involving in over competition both domestically and internationally based on the concentration ratio study through HHI index model. The competition is caused not only by the location, but also by each advantages. For example, Ningbo-Zhoushan port has natural advantages in water depth, and Shanghai port is good at finance, container handling. And it is further suggested that the fierce competition is harmful for both ports that cooperation should be conducted to reduce it and realize mutual benefit. For example, cost can be saved of both ports through information, technology and facilities sharing.

Another adjacent port area, the North Adriatic Port Association (NAPA) region, the cooperation is studied by K. Stamatovic et al. (2018). The cooperation matrix of scope and depth based on both port interview and shipping line company interview is conducted. And it is found that the NAPA ports is complementary, but the current cooperation is limited to joint marketing activities and lacking of strategic and commercial cooperation. However, the NAPA ports still can benefit from a joint marketing activities, such as if one container port increases the number of vessel calls, other complementary ports can also increase their calls. Besides, a trend of potential strategic level cooperation is also observed.



## *2.5 Outcome Evaluation*

Most of the seaports cooperation is implemented with one or several aiming of increasing competitiveness, reducing competition, obtaining mutual benefits, reducing cost, acquiring resources, gaining efficiency or expanding networks etc. Practically, under complex condition of management and organization, evaluation mechanism of collaborative validity is needed, so that we will know whether the original objective is reached, and its impact on regional port and shipping industry.

Under the trend of cooperation between seaport and dry port in China, J. Li et al. (2014) conduct cooperative performance evaluation based on balanced score card method and the grey relational degree method, and case study is utilized between Qingdao port (seaport) and Xi'an port (dry port), a benchmark between Zhengzhou port and Lanzhou port is provided as well. Two class layers from customer satisfaction, finance, cooperative relations, and non-market tools separately are used to identify different indicators, including, but not only limited to market share, transport cost, information sharing, facilities and equipment. Furthermore, research data and professional ideas are combined to balance the scale value. As a result, it is found that the collaboration is insufficient in the perspective of customer satisfaction, financial level and non-market tools, and information management is further recommended.

In addition, there is risks comes from the differences of culture, politics, language etc., which will also effect cooperation. W.Huo et al. (2018) give a practical case: in the Hambantota port cooperation between CMPort and Sri Lanka government, although the two sides have already signed a framework agreement to lease the port, the cooperation is considered as threatening national security by local people. As a result, although the cooperation is continued, the share rate is obliged to be reduced as well.

Port integration as one of the forms of collaboration, face more challenges because a new combined management organization will be create in general, which refers to two respects: planning and concession management. M.Ferretti et al. (2018) identify that the opportunities and risks are both exist in the two processes through two Italian seaport merge case studies - Genoa & Savona, and Naples & Salerno, and the key factor is the skills of management of port authorities, including balance shareholders from multiple parties, rationalization of concessions etc.

On the other hand, when port collaboration reduce competition and enhance discourse power, meanwhile, it also might form Cartel, which is harmful for the whole logistics industry as the reduction of competition will also lower vitality. In European area, R. Fiedler et al. (2016) mentioned it from legal aspect that port cooperation might be governed by cartel law when the activities refers to rate fixing, limit of investment, and transfer information etc. Another impact is on infrastructure spending saving that the collaborative construction expense can be supported from fund organization, besides, professional knowledge and technological improvement can be obtained by attending the joint construction projects (R. Fiedler et al., 2016).

## 2.6 Port Cooperation Research and Current Practices along OBOR

One Belt and One Road initiative (OBOR) is proposed by Chinese government to connect Asia, Africa and European continent to facilitate trade activities and regional economy that 34 countries and international groups have signed agreement by 2016. In 2015, the Chinese direct overseas investment refers to 49 countries USD15 billion along the line (Xinhua, 2016). Among these cross-regional cooperation, port related activities, industrial park and railway construction are outstanding.

Based on S. Khan et al. (2017), currently, China has become the main partner of Africa that China has about 4% market share of all the African FDI projects, and the amount is around USD3.4 billion in the year of 2015. Besides, the investment sectors are mostly concentrated on manufacturing industry, which is related to trade that Africa has plentiful natural energy resources to satisfy the consumption of Chinese continuous economic growth.

Leading by CMPort and COSCO Shipping Port, there are already more than twenties ports cooperates along OBOR in different forms by now. W. Huo et al. (2018) study these cooperation from respect of collaborative mode in a descriptive way.

The routes of One Belt One Road Initiative are showed as below (J.Tian, 2016). In maritime silk route, it is preliminary designed to start from South China – the South Sea – the Indian Ocean – Europe.

Figure 2 Routes of One Belt One Road



Source: McKinsey&Company

Shipping industry is responsible for the carriage of about 90% of international trading (ICS). And the Far East – Europe maritime route is one of the three main maritime routes in the world. Chinese maritime silk route is exactly along this route.

*Figure 3 Current Port Cooperation Layout along OBOR*



Source: COSCO, CMPort

For overseas port cooperation, it is mainly led by China Merchant Port and Cosco Shipping Port. Based on our statistics, they have had more than twenty international port collaborations so far. Among these cases, there are fifteen cases along OBOR in terms of their official public information(COSCO, CMPort). The details cooperation are as below that most of them are in the mode of stock right acquisition. The details are as below table:

**Table 1 Information Details of Port Cooperation along OBOR**

No.	Company	Country	Port Name	Mode
1	CMPort	Sri Lanka	Hambantota Port	Concession Agreement (CA) for 99 years, acquire 85% stock right
2			Colombo South Harbor expansion project	Joint venture, possess 85% stock, 35 years build operate.
3		Djibouti	PORT DE DJIBOUTI S.A. (PSDA)	23.5% share acquisition of PSDA

4		Turkey	Kumport Terminal	26% stock right acquisition
5		France, Morocco, Malta etc.	Montoir, Le Havre, Fos, Tangie, Marsaxlokk	49% share acquisition of TL
6	COSCO Shipping Port	Singapore	COSCO-PSA Terminal	Joint venture, owns 49% share rate
7		Abu Dhabi	CSP Abu Dhabi Terminal	CA of 90% share
8		Egypt	Suez Canal Container Terminal	20% share acquisition
9		Greece	Piraeus Container Terminal	100% share acquisition and management right
10		Turkey	Kumport Terminal	26% share acquisition
11		Italy	Vado Reefer Terminal	40% share
12		Spain	Noatum Container Terminal Bilbao	39.78% share acquisition
13			Noatum Container Terminal Valencia	51% share acquisition
14		Belgium	CSP Zeebrugge Terminals	complete 100% share acquisition
15		Belgium	Antwerp Gateway	20% share
16		Netherlands	Euromax container terminal	35% share acquisition, total own 47.5%

Sources: COSCO, CMPort.

## 2.7 Summary

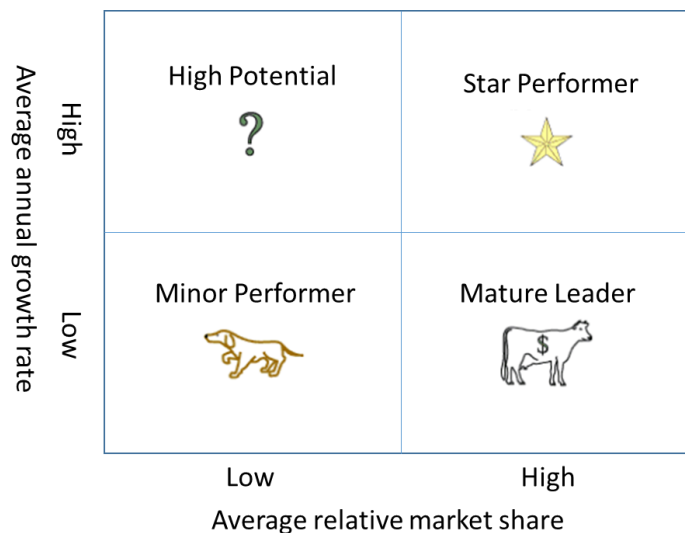
By now, the researches about seaport overseas cooperation is still not abundant, the most studies are limited not only to the number of studies, but also to the topics. Based on literature review, the current limited studies are mainly focus on regional scope (although the collaboration refers to different countries, such as the European area), cooperation modes, motivations, and environment protection in a qualitative way. No matter the quantity or research perspective are not abundant for us to further understand the collaborative reasons and evaluate the result. Therefore, to insightfully know international cooperative strategy and outcomes, in this paper, we will collect a series of data and information, utilize strategy method, evaluation method, and statistics method to analyse from both qualitative and quantitative perspectives to enrich the seaport international collaboration research.

## Chapter 3 Methodology Approach

### 3.1 Strategic Positioning Analysis

Strategic positioning analysis include three parts: product portfolio analysis (PPA), shift-share analysis (SSA), and product diversification analysis (PDA). However, we only analyse the cooperative reason of Djibouti port and CMPort in the later chapter, hereby, we only conduct PPA method to understand their position in the region. PPA, used for external environment in market share and growth is developed by BCG to determine the current position of the business in the industry. It is a growth-share matrix, the X - axis represents market share, Y – axis represents growth rate, which influences prospective market share. E. Haezendonck et al. (2006) utilize it into port positioning. Similar as original matrix, there are four positions: question mark, stars, cash cows and dogs.

Figure 4 Portfolio Matrix for Seaport



- **Question mark** - low market share with high growth rate, the company who is located in this unit normally needs significant investment to increase their market share. In port industry, it means that the port who is in this position is with “High Potential” and high growth rate will account for a higher market share over time (E. Haezendonck et al., 2006).
- **Star** – high market share with high growth rate, when the company obtains investment to improve their market share, they will change their position to this sector. In long term, it is difficult to maintain this position all the time due to complex and quick changing commercial environment. Therefore, it should be called “Star Performer” (E. Haezendonck et al., 2006).

- **Cash cow** – high market share with low growth rate, the company in this unit has ability to generate financial resource, which could reinvest Starts or Question Marks. However, this position does not conform the practical port situation, “Mature Leader” will be a more suitable name to reflect reality (E. Haezendonck et al., 2006).
- **Dog** – low market share with low growth rate, the company in this position has low economic value and ability to generate profit. In this situation, the performance of port should be defined as “Minor Performer” compared to other ports (E. Haezendonck et al., 2006).

According to E. Haezendonck et al. (2006), there are four levels to conduct this methodology:

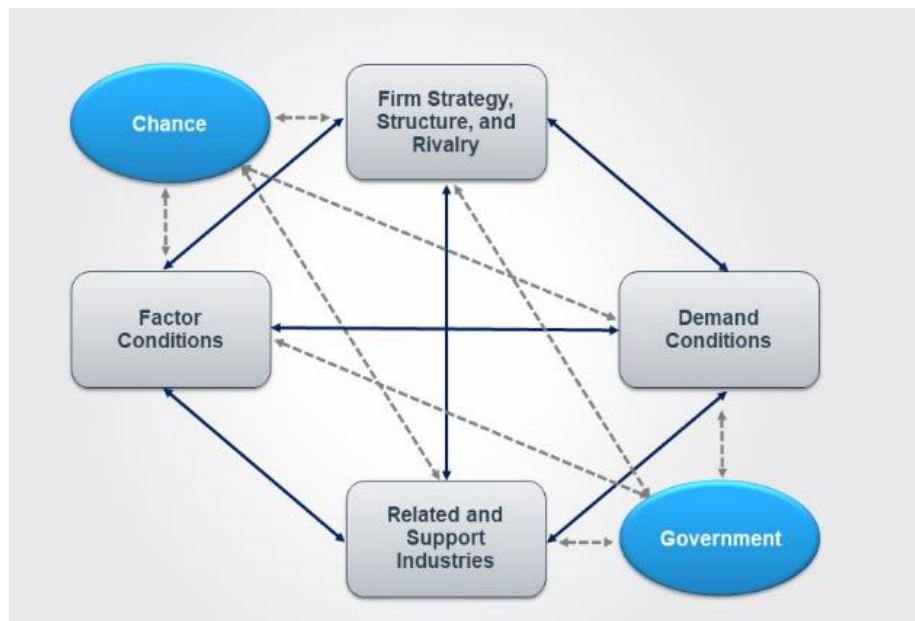
- Level 1 – overall average market share and average growth rate matrix. In this level, the selected port region is considered as a portfolio. Average market share is calculated based on average total throughput of individual port compared to average total throughput of the range ports in the period.
- Level 2 – average share of each cargo categories in individual port and average growth rate matrix. It is the traffic structure in each port in the range. Here, each port is considered as one portfolio.
- Level 3 – average market share in the range and average growth rate matrix. In this level, the portfolio is commodity groups in the port range, therefore, average market share is calculated by each cargo category divided by total volume of the category in the range. Based on this, we can see the position of each commodity of the port in the region.
- Level 4 – average share in port traffic and average growth rate matrix and commodity market share dimension, which represents the share of each type of cargo in individual port, and absolute cargo share in the region at the same time. In this matrix, x-axis is the average share of each type of cargo in the port. Besides, a circle is introduced to represent market share of absolute traffic volume in the selected range. The centre coordination of the circle is defined by growth rate and share rate, the radius is the share rate of absolute commodity volume of total volume in the range.

In addition, weighted analysis is also introduced by E. Haezendonck et al. (2006) to better evaluate value-add for different types of cargos. However, we won't conduct weight analysis and all four levels in our analysis as it is too complicated for our positioning analysis, which is only used to analyse cooperative reasons. However, we will conduct a dynamic position changes to identify whether the industrial position will be improved after the cooperation.

### 3.2 Diamond Model

As we mentioned that PPA is conducted to analyse the external position of the port and company, to understand insight of the competitiveness of the company, we should also know the internal strength and weakness, through combining both internal and external situation, we can analyse whether the overseas cooperation with other seaports is necessary and significance. Hereby, we introduce Porter Diamond Model to identify the internal situation. Porter Diamond Model is originally developed by Michael E. Porter, strategy professor at Harvard Business School, to help company to understand their competitive position. It includes six aspects: factor conditions, related and supporting industries, home demand conditions, strategy and rivalry, government and chance events. These six factors are all key points in the worldwide competition. According to theory, organization can figure out how they convert national advantage into international advantage based on this model. Besides, porter also suggests that national home base plays a significant role as it might create competitive advantages, such as government support, but might also create negative impacts (M. P, 2016).

Figure 5 Porter Diamond Model



Source: Michael Porter, 1990.

- **Factor conditions**  
It includes factors of production, which can create competitive advantages, such as infrastructure, human resources, natural resources etc. (M. P, 2016). For seaport, it is important as port is knowledge, technology, labour and capital intensive, besides, geographic location and the natural resource also contribute competitive advantages.
- **Related and supporting industries**

Regional market relies on industries and suppliers. A competitive industry will also contribute supporting organizations (M. P, 2016). Especially for seaport, it is quite depends on hinterland industries. In an industrial developed area, the performance of seaport is usually well developed too.

- **Home demand conditions**  
In their home country, this factor is related to the size of market, logistics cost and economics of scale. Besides, the factor will also influence the further development direction of the company (M. P, 2016). In seaport, the import volume is directly related to domestic demand, transportation cost and port tariff. Moreover, the cargo volume from the neighbouring country is also closely related to these factors.
- **Strategy, structure and rivalry**  
Competition strategies, objectives and company organization are significant for all the companies. Besides, in this aspect, culture also plays an important role. Because within their own culture, the company only need to consider management, organization and objectives, but if the company is opening a new company in a foreign country, different culture will have a great impact. According to actual situation, it could become advantage or disadvantage (M. P, 2016). For seaport, it is the same that to understand their current strategy and structure so that we could know whether they are suitable ones.
- **Government**  
Government can facilitate the development of industries, improve infrastructure and investment environment, provide financial support, and encourage innovation etc. (M. P, 2016). Port can also benefit from these incentives, as infrastructure construction such as road and railway is extremely important for port.
- **Chance events**  
Market chance provides opportunities for companies to expand or start new businesses (M. P, 2016). For instance, Chinese government conduct OBOR initiatives, which provides a lot of chance for port companies to invest and cooperate abroad.

### *3.3 Cooperation Evaluation*

In practice, the success of cooperation could be influenced by many factors, such as local environment, shareholder's interest, trust mechanism etc. Thus, an evaluation approach is necessary to measure the cooperative performance. By now, there is not so much evaluation methodology for our reference, thereby, the cooperation evaluation approach conducted by J. Li et al. (2014) will be drawn on. We will utilize Balanced Scorecard method and Grey Relational Degree method to measure the current cooperative performance based on expert interview and researches. Be slightly different from the study of J. Li et al. (2014) that we will retain parts of indicators and add some new indicators so that the new indicators could reflect seaport international cooperation objective well.



Balanced Scorecard method (BSC), evaluated as the number fifth widely used management tool by Bain & Co, and selected as one of the most influential business ideas by Harvard Business Review, is initially created by Dr. Robert Kaplan and Dr. David Norton to measure organizational performance. We utilize BSC to measure the port overseas collaboration, not only because the cooperation is reflected in company level, but also as BSC measures KPIs established based on company strategy from four key aspects: finance/stewardship, internal process, customer & stakeholder, and organizational capacity/learning & growth (BSI). Combine researched cooperation objectives and four key aspects, and divide into three layers, the indicator system is designed as table 2.

To further quantify these information, a benchmark in the industry is necessary. The choice should be carefully conducted that it should satisfy the criterion that the benchmark perform optimally in the same industry as research subject with a similar function (J. Li et al., 2014).

Table 2 Cooperative Performance Evaluation System

First-class	Second-class	Indicators
Internal process	Accessibility	Connection lines with railway, road and airport
		Container lines
Organizational capacity/learning & growth	Infrastructure and facilities	Total investments
		The number of terminals
		Total berth length
		The deepest water depth
		Total area
	Information sharing	Rate of information exchange on port management and development
finance / stewardship	Knowhow obtaining	Training programs
		Rate of dependence on technical assistance in port management
	Market share	throughput ratio in the region
		Vessel calls
Customer & stakeholder	Cooperative relations	Average throughput growth rate
		Equity share rate from foreign investor
		Rate of management from foreign party

In general, the original data will be collected from annual report, websites information, and expert interview. We will dedicate the reference details in the calculation later chapter. Once the data are collected, we need to use calculation to quantify the collaboration performance, which is based on the appraised result of each indicator and the relevance between indicator and subject. Here, the Grey Relation Analysis method (GRA), a widely used model in the Grey system theory, is adopted. It is developed by a Chinese professor Deng to give a solution for those imperfect and fuzzy weighted information in the real world (G. Wei et al, 2008). The parameters, formulas and explanation of the model are as below:

Table 3 *Explanation of Parameters*

R	Evaluation results
E	Matrix of appraising indicators
W	Weighted distribution vector
m	Number of indicators
n	Number of subjects
K <sub>max</sub>	The maximum value of standardized indicator, which equal to 9
K <sub>min</sub>	The minimum value of standardized indicator, which equal to 1
K	The raw value of indicator
X	The standardized value of indicator
ξ <sub>j</sub>	Correlation coefficient
ρ	Distinguishing coefficient
W(k)	Index weight

$$R = E * W \quad (\text{Equation 1})$$

$$R = [r_1, r_2 \cdots r_m]^T \quad (\text{Equation 2})$$

$$W = [w_1, w_2 \cdots w_n]^T \quad (\text{Equation 3})$$

$$E = \begin{bmatrix} \xi_1(1) & \cdots & \xi_1(n) \\ \vdots & \ddots & \vdots \\ \xi_m(1) & \cdots & \xi_m(n) \end{bmatrix} \quad (\text{Equation 4})$$

$$R'_i = \begin{bmatrix} r'_1(1) & \cdots & r'_n(1) \\ \vdots & \ddots & \vdots \\ r'_1(m) & \cdots & r'_n(m) \end{bmatrix} \quad (\text{Equation 5})$$

$i = 1, 2, \dots, n$

The basic formula is Equation 1, which is the final appraised result calculated by weight multiply score of indicator. As there are multiple indicators and subjects, matrix of Equation 5 is obtained, it is difficult to measure all the data in various ways, thus, the indicator scale should be unified in the form of integer with the range of 1-9 when we conduct this model. And the formula Equation 6 will be used to unify all the index, then we get a new standardized matrix as Equation 7.

$$X = \frac{(K - K_{min}) * (9-1)}{K_{max} - K_{min}} + 1 \quad (\text{Equation 6})$$

The standardization progress is called “Dimensionless interpolation”, to make a further understand of usage of Equation 6, an example will be given here. For instance, transfer rate of a port is 50%, and the highest transfer rate is 80% and lowest is 30% based on the comparison with benchmarks. Then we will set 80% as 9, 30% as 1, then we can calculate 50% transfer rate equal to 4.2 by Equation 6.

$$(r_0, r_1, \dots, r_n) = \begin{bmatrix} r_0(1) & \cdots & r_n(1) \\ \vdots & \ddots & \vdots \\ r_0(m) & \cdots & r_n(m) \end{bmatrix} \quad (\text{Equation 7})$$

Here, we need give the optimal value in terms of study subject and benchmark, the optimal value should also be standardized to the integer in the range of 1-9. Then the absolute value of difference between standardized subject indicators and standardized optimal value indicators is calculated with the formula of Equation 8.

$$|r_0(k) - r_i(k)| \quad (\text{Equation 8})$$

$$\xi_i(k) = \frac{\min_i \min_k |r_0(k) - r_i(k)| + \rho * \max_i \max_k |r_0(k) - r_i(k)|}{|r_0(k) - r_i(k)| + \rho * \max_i \max_k |r_0(k) - r_i(k)|} \quad (\text{Equation 9})$$

$$r_i = \sum_{k=1}^n W(k) * \xi_i(k) \quad (\text{Equation 10})$$

$i = 1, 2, \dots, n$

$k = 1, 2, \dots, m$

$\rho \in [0, 1]$

After determine the minimum value and maximum value of the absolute value of difference supplied by Equation 8, correlation coefficient  $\xi_i$  can be calculated by the formula Equation 9. Here, we generally use 0.5 as the value of  $\rho$ , and  $\xi_i$  is normally less

than 1. When the result of each correlation coefficient is get, the final appraise result can be further calculated with formula Equation 10 according to the index weight.

## Chapter 4 Case Study

### *4.1 Cooperation Introduction between CMPORT and Djibouti Port*

#### *4.1.1 Strategic Significance of Djibouti*

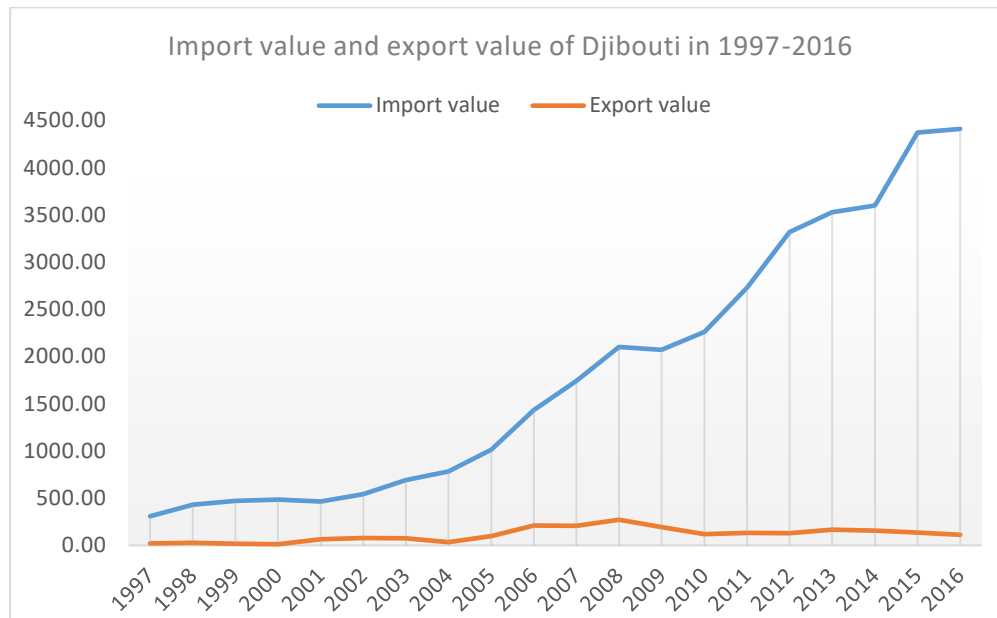
Djibouti currently has approximate 1 million population, GDP is 3.3 billion with 6.5% growth, unemployment rate is 6.6%, FDI flow is USD160 million. Its economy is mainly driven by service industry, which is concentrated on port activities and military bases. Especially the port related activities account for the largest part of state's income, employment and economic growth. Djibouti is lack of natural resources and highly relies on import. Because of its special geographical location that the gateway to the Suez Canal and to the Red Sea along one the main shipping route, it functions as an essential transshipment role. In addition, Djibouti is the Southeast horn to African landlock – Ethiopia, South Sudan, Mali etc. Especially for Ethiopia, who owns 91.2 million population with 10.2% GDP growth rate and aim to transform from an agricultural country into a manufacturing hub, as well as the second largest country in population in Africa and grows quite fast recent years, Djibouti undertakes almost 95% of its import (Economic Freedom, 2018).

The location advantages of Djibouti not only benefits its economy, but also act an important role in military. Currently, Djibouti hosts several military bases and presences, including America, France, Japan, Germany, Italy and China (Economic Freedom, 2018). For China, the Indian Ocean is a significant lifeline, because China transports energy and other important resources through it and Chinese needs to set up a military base at Djibouti to secure the safety of this route (W. Xi, 2018).

#### *4.1.2 Trade Situation of Djibouti and Ethiopia*

Djibouti is an import-oriented country that the import value is USD4.41 billion and the export value is USD112.1 million in the year of 2016 based on the statistical data of UN Comtrade Database. The details of main import and export cargo value from 1997 to 2016 are as below:

Figure 6 Trade Value of Djibouti in 1997-2016



Source: UN Comtrade (Unit: USD million)

Further information in terms of Observatory of Economic Complexity that the major import goods are: raw sugar, palm oil, delivery trucks, mineral/fertilizers, and cars. About 70% of import cargos mainly come from China, India, the United Arab Emirates, Indonesia, and Saudi Arabia. Among which, import value from China are around 50%. The major export goods are wood charcoal, coffee, gold, animal blood, and oily seeds. The main destinations are Saudi Arabia, the United Arab Emirates, Belgium-Luxembourg, Spain, and the UK (OEC). Meanwhile, Djibouti is a transshipment and re-export country that transshipment accounts for almost 20% of port activities (COMESA) and re-export contributes approximate 80% of total export value (ITC). According to the research conducted by Jovago.com, considering the location of Djibouti and those trading partners, these cargos are more than 90% transported by sea (BusinessTech, 2015).

Ethiopia, similar to Djibouti, is also an import-oriented country. In 2016, the import value is 19.12 billion and export value is 1.72 billion based on the statistical data of UN Comtrade Database. In the year of 2014 and 2015, the trade value is even much higher than 2016, which is 21.91 billion and 25.82 billion respectively in import, and 5.67 billion and 5.03 billion respectively in export. The details of main import and export cargo value from 1997 to 2016 are as below:

Figure 7 Trade Value of Ethiopia in 1997-2016



Source: UN Comtrade (Unit: USD million)

They primarily import refined petroleum, planes, helicopters/space craft, packaged medicaments, delivery trucks, and mineral/fertilizers from China, the US, India, Kuwait, Japan and Italy, which contribute more than 60% of the total import value. On the other hand, Ethiopia mainly export coffee, oily seeds, gold, dried legumes, and cut flowers to USA, Saudi Arabia, Germany, Switzerland, China and United Arab Emirates, which contribute approximate 46% of the total export value (OEC).

According to the information of PVT Group that 85% of the external trade of Ethiopia is handled by the port of Djibouti (K. Stifter, 2018). Based on another information from The Conversation that Djibouti port accounts for 95% of Ethiopia's import and export (B.J. Cannon, 2018). No matter which information, the import and export of Ethiopia is highly relying on Djibouti port apparently.

#### 4.1.3 Logistics Access of Djibouti Port

The trade activities of Ethiopia and Djibouti are highly related to each other, nevertheless, poor logistics condition makes transport difficult. In road sector, according to Logistics Capacity Assessment (LCAs), roads in Djibouti are not in good condition that many roads are often narrow and old with poorly lit, many secondary roads are even washed-out. Currently RN1 is the only road for heavy trucks to transport from Djibouti port to other locations, including to Addis Ababa of Ethiopia. However, Djibouti has built a new weight bridge which connects with RN1, but is not used due to lack of relevant law. In fact, the inland transport is limited not only by weak transport capacity, but also by monopoly (participation of government to prevent competitors come in and willing to control transport industry), high transport rates, and lack of knowledge and resource to manage transport activity (C.Trigona, 2018).

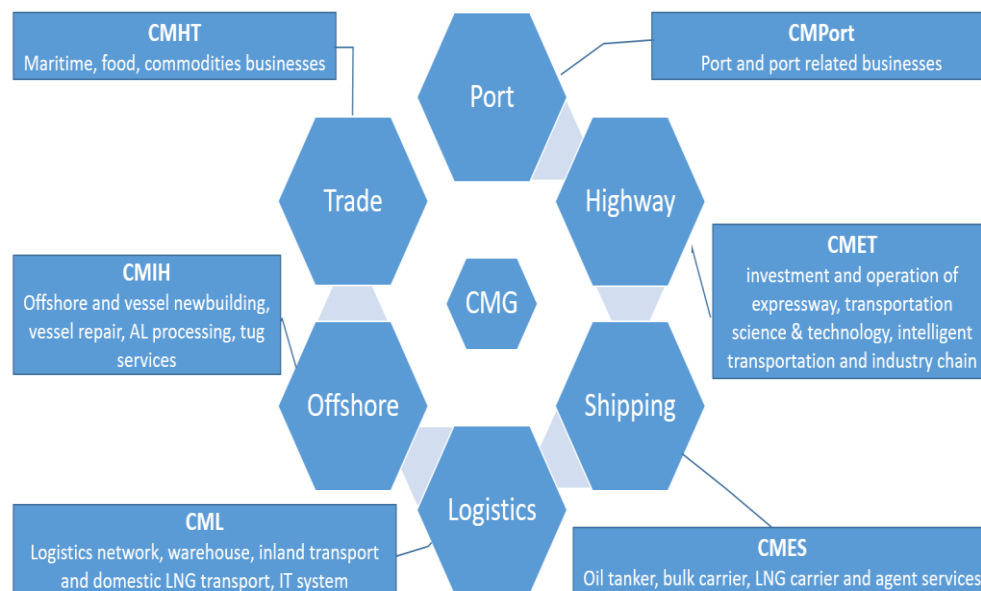
In railway sector, there was an old railway between the capital of Ethiopia and Djibouti Doraleh port with only 240,000 tons average transport capacity and almost defunct even Djibouti government tries to repair and upgrade it activity (C.Trigona, 2018). A new modern electric railway with high standard, Addis Ababa-Djibouti railway, started its commission since October of 2016 and officially opened in January 2018, which will improve transport efficiency with only one night instead of three days before. It is expected that the cargos which almost 100% rely on truck will change to railway at 70% level (H. Zhong, 2016).

## 4.2 Introduction of Djibouti Port and CMPort

### 4.2.1 Introduction of CMPort

China Merchants Port Holdings Company Limited (CMPort), an essential subsidiary of China Merchants Group (CMG), is a world's leading port development, investment and operator. Its mother company, CMG, is owned by the state and directly supervised by central government. Their headquarters is located in Hong Kong. Transportation, finance and real estate are their three core businesses. Major business of transportation sector including, but not limited to: port, shipping, logistics, offshore, highway, trade.

Figure 8 Major Business of CMG Transportation Sector



Source:CMG

The network of CMPort spreads over most important domestic ports, South Asia, Africa, Europe and South America. By December 2017, CMPort has directly and indirectly invested 32 ports (CMPort).



Figure 9 Global Port Layout of CMPort



Source: CMPort

CMPort's businesses are divided into two categories: port business and port related business, and it is further divided into three parts in port business: domestic, overseas, Hongkong and Taiwan. The major recent overseas cooperation is followed as below table.

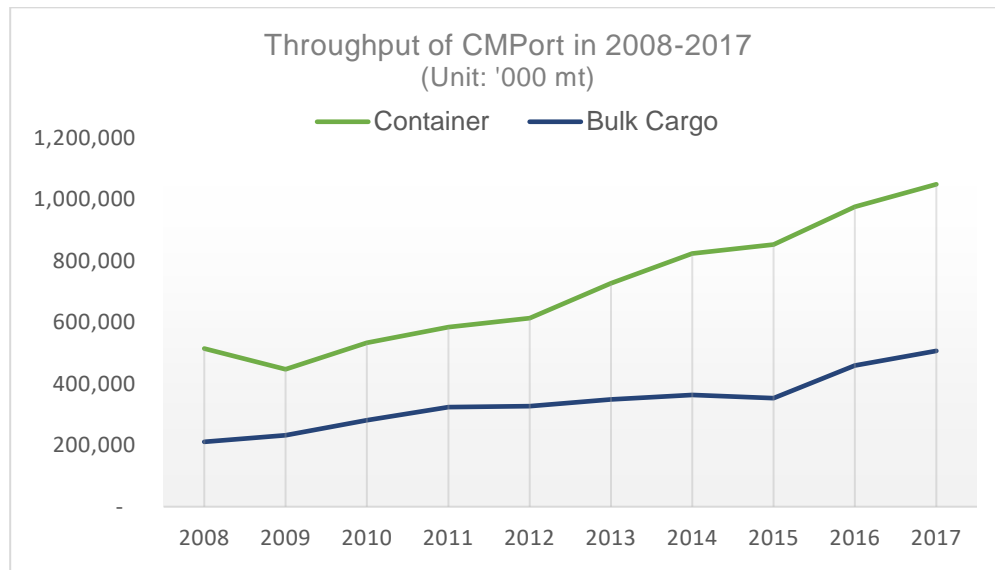
Table 4 Main Overseas Port Layout of CMPort

Countries	Port Name	Start Time	Collaborate Mode	Total Investment	Project Brief
Sri Lanka	Hambantota Port	Jul2017	Concession Agreement (CA), acquire 85% stock right of HIPG	USD974 million	99 years lease. So far, phase 1 & phase 2 completed with 10 berths. Aiming to be comprehensive deep water hub in South Asia.
	Colombo South Harbor expansion	Dec2011	Joint venture (JV), possess 85% stock	USD500 million	35 years BOT agreement. Deep water terminal, currently the only one can berth 19000TEU container ships in South Asia.
Nigeria	Tin-can Island Container Terminal (TICT)	Nov2010	28.5% equity acquisition of TICT	USD154 million	Lease period is to 2026. Currently has 3 berths with 0.4m TEUs designed capacity, the largest container terminal in Tin-can Island, and the 2nd largest one in Lagos.

Togo	Lomé Container Terminal (LCT)	Oct2014	50% stock right acquisition of TML	Approx. USD175 million	45 years CA, has completed 3 berths with 2.2 m handle capacity, the only port on the West African coast with natural water depth of 14m, and will serve as a transshipment hub.
Djibouti	PORT DE DJIBOUTI S.A. (PSDA)	Feb2013	23.5% share acquisition of PSDA	USD185 million	Joint build DMP phases I and joint management, plan to upgrade old port.
Turkey	Kumport Terminal	Sep2015	26% stock right acquisition	USD376 million	The 3rd largest terminal and gateway in Turkey, aiming to upgraded machinery park and terminal automation systems to provide more benefits.
France	TL companies in the United States	Jun2013	49% share acquisition of Terminal Link	Approx. USD467 million	Obtain franchise of 15 terminals through this acquisition.
Brazil	Paranaguá Container Terminal (TCP)	Feb2018	The 1st Merger & Acquisition in mature port assets overseas with 90% share control	Approx. USD 740 million	CA to 2048. It is the 2nd largest container terminal and the largest reefer terminal with 3 container berths and 1.5 m TEU capacity. It handles 1/10 container cargo volume in Brazil.
Australia	Port of Newcastle	Jun2018	acquire 50% of the total interest	Approx. USD 450 million	CA with 98 years management right and land lease right since 2014. It is the world's largest coal export port with 21 berths, including 9 coal berths. It is the only gateway port for Hunter Valley coalfields and handles about 40% export of coal of Australia.

The throughput details from the year of 2008 to the year of 2017 is as below:

Figure 10 Throughput of CMPort 2008-2017



Source: CMPort

Strategically, CMG is a state-owned company that it carries not only enterprise itself growth, but also social responsibility and national economic development. Therefore, CMG integrates corporate strategy into national strategy: follow OBOR initiative, construct bonded area etc. to become world-class enterprise (CMG). “Connect through China and link up with the world” is the vision of transportation sector.

Figure 11 Shipping Global Lines of CMG



Source: CMP

Principal prospect and strategies of CMPort is to be “a World Class Comprehensive Port Service Provider” through implementation of domestic, overseas and innovation strategies. The prospect is further divided into five objectives (CMPort, 2018):

- Investment strategy – focus on regional hub ports, because these regions have ability to attract a large number of foreign investment, strong economic and trade growth momentum.
- Become essential gateway for Chinese trade, be committed to providing timely and high-efficient port and maritime logistics service to clients through the expansion of global port portfolio. Meanwhile, expand port value chain by investing bonded logistics business, and create more value for shareholders by leveraging the synergies of terminal networks.
- Be well-known in the industry by providing excellent and reliable, high-quality engineering management, and modern integrated logistics solutions. Moreover, research and develop the world's leading terminal operation system, import and export integrated logistics management platform, comprehensive maritime logistics support system.
- Become the world-class level in terms of global port container throughput, market share, comprehensive income, operation and management level, optimization of resource utilization, labour productivity and brand etc.

Furthermore, there are five directions to implement the strategy and objectives: home base port development, ports consolidation, overseas expansion, integration of industry with elements of finance, and business innovation (CMPort, 2018). The contents are followed as below:

- Home base port development  
Domestic home port - Shenzhen, keep promoting integration, accelerate the improvement of the hardware and software environment. Overseas home port – Sri Lanka's, still under construction, need to differentiated competitiveness between different projects and play strategic fulcrum role in the future.
- Domestic ports consolidation  
Continue to seek integration and cooperation opportunities from the five major port clusters: Bohai sea region, the Yangtze River Delta, the Pearl River Delta, the southeast coast and the southwest coast. Further expand and improve domestic port network.
- Overseas expansion  
Follow OBOR initiative to dispose overseas port network, positively promote the construction of Sri Lanka's overseas home port and make it into overseas regional headquarter.
- Integration of industry with elements of finance  
Elevate to integrated service provider instead of only terminal operator, vigorously promote "Port-Park-City" model and implement it in the projects in East Africa and

South Asia. Here, “Port-Park-City” model is integrating forehand port operation, intermedial industrial park development, and rear city construction.

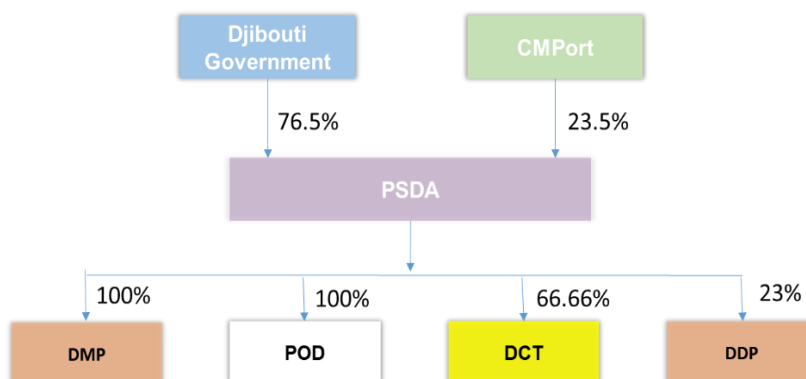
- Business innovation  
Formulate medium and long-term capital operation plan, promote capital operation to normalization, diversification and pilotization. Propel integration of industry and finance in multi-levels to enhance productivity.

#### 4.2.2 Introduction of Djibouti Port

The geographical location of PSDA is substantial from both economic aspect and military aspect that it is located at the intersected area of major trade corridors and shipping lines of Asia, Africa and Europe. It is at the southern entrance from Gulf of Aden to the Red Sea and provides a secure regional hub for transshipment (Port De Djibouti). In addition, based on the information of Djibouti port, it has been handling the entire maritime cargos of Ethiopia since 1998. Those goods are transported by road and rail to arrive at Djibouti port. Especially along with the new high speed railway, Addis Abba - Djibouti Railway was opened, it is expected that the cargo volume will further increase. PSDA not only provides maritime operation for import and export of Ethiopia, but also services the whole Common Market for Eastern and Southern Africa (COMESA), which link approximate 19 countries and 380 million populations.

Port De Djibouti S.A. (PSDA), is 76.5% owned by Djibouti government, the other 23.5% stock right is owned by CMPort through acquisition in 2013. According to the organization structure provide by CMPort that PSDA 100% controls the Port of Djibouti (POD), 66.66% owns Doraleh Container Terminal (DCT), and 23% owns off dock depot (DDP), as well as fully owning the newly built Doraleh Multi-purpose Port (DMP). Old port, DCT and DMP are three major terminal areas.

Figure 12 Organization Structure of PSDA



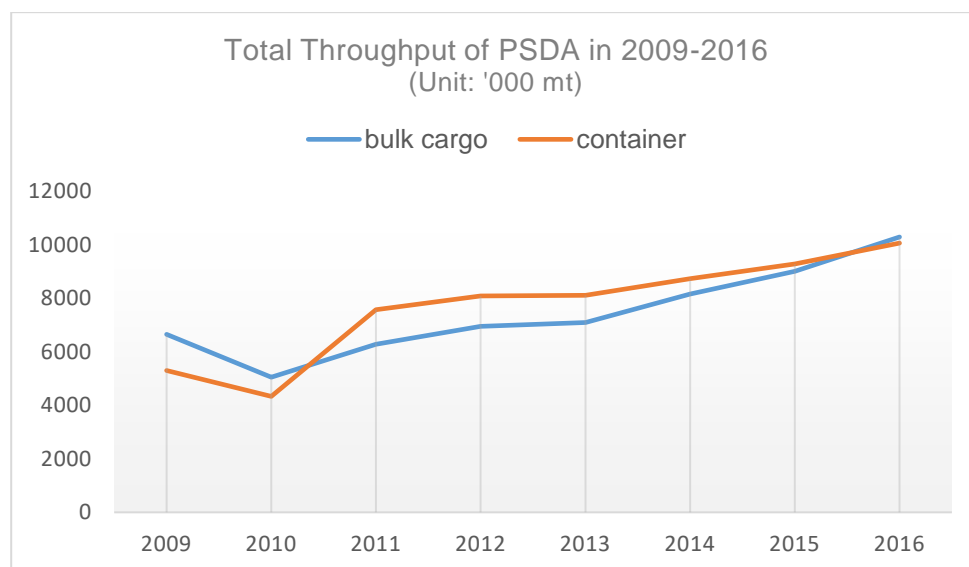
Source: Djibouti Port

The business details of the main terminals, including cooperation project-DMP:

- **Old Port**  
Annual capacity is 6.2 m tons, total length is 3.2 km, berth depth 9m -12.5m, and 15 berths. Integrated function: contain handle (0.35m TEUs capacity, 22ha, 2 berths with 400m long, 9.5m draft and 12m draft respectively), RoRo (7000 units storage capacity), and bulk (3 quays to handle wheat, fertilizer, coal etc. Has wheat and fertilizer silo with 30000t capacity, and 40000t capacity.). But will transfer the function to DMP in the near future. Old port will be business area.
- **DCT**  
Designed capacity is 1.5m TEUs, 3 professional container operating berths with 1050m length and 18m – 20m depth, 79 ha terminal area. Terminal was opened in 2008 and operated by DP World (35 years concession). There is an oil jetty in this area, which was completed in 2005 with 1 berth. It can handle 50,000 DWT vessel.
- **DMP-I**  
Designed capacity is 8.2m tons per year with 6 berths. 1200 meters of quay length with 15.3m water depth and 690 hectares of yard area, which can operate 100,000 DWT size vessel.

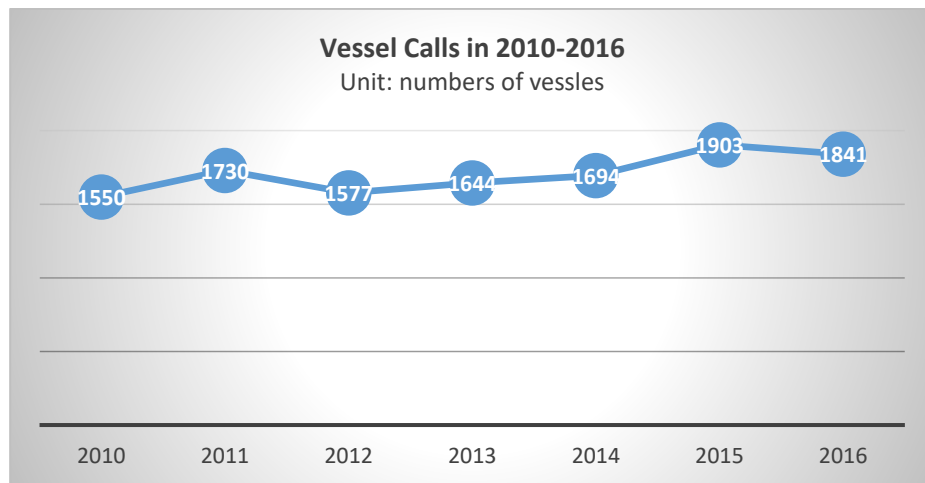
Based on the data of Djibouti port, the container throughput and bulk cargo throughput during 2009 to 2016 is as below. Before 2017, all the bulk cargo volume is contributed by old port. In 2017, the bulk cargo throughput is 5.28 million tonnes. In addition, more than 92% container cargos are contributed by DCT. In 2017, the total container throughput is 928,000 TEUs, and DCT operated 866,000 TEUs.

Figure 13 Throughput of Djibouti Port in 2009-2016



Furthermore, according to the information of Ministry of Commerce of China that the throughput of liquid bulk terminal is 3.77 million tons in the year of 2016 (Ministry of Commerce People's Republic of China, 2017). Currently, there are approximate 90% of Ethiopia's imports pass by Djibouti and most of the container cargos are handled by DCT, which is managed by DP World. These cargos contribute around 70% of the total volume for the ports. Therefore, it is expected that newly built DMP will have a great impact on increasing the transshipment cargo volume from Ethiopia (P. Smith, 2017).

Figure 14 Vessel Calls of Djibouti Port in 2010-2016



Source: Djibouti Port

In 2010 - 2016, vessel calls in Djibouti port is fluctuated that in the year of 2012, it has 1730 vessel calls, but decreased almost 10% in the year of 2013. Then from 2013 to 2015, the vessel calls increased continuously and arrived 1903 in 2015. But dropped about 3% in the year of 2016.

Before the cooperation with CMPort, the old port of Djibouti was quite inefficient as it was in built hundred year ago that the facilities were aging and the operation management extensive. Although they were operated in landlord model, the port authority just subcontracted the terminal loading and unloading operations to local subcontractors, which was lack of unified management and scheduling. It severely restricted the development of the port (J. Wang, 2017).

To upgrade the port and become competitive and sustainable, port authority makes an ambitious strategy and master plan: be profit from strategic location to become global hub port and international shipping center. Become multipurpose, efficient, competitive, safe and sustainable port (PSDA). To become a modernized, efficient and reliable port in both regional area and the globe, port authorities are implementing a long term measures:

- Dedicate in technology innovation positively, escalate port facilities and infrastructures to obtain constant increase of cargo throughput.

- Encourage private investments and outsource businesses, as a result, new gain terminal, fertilizer terminal, oil terminal, another container terminal and free tax industrial park were constructed and developed.
- Service customers for the purpose, provide high-quality services for clients by improving service standard to international level, add value through expanding logistics chain, networks and clusters.

#### 4.3 Cooperative Details

Djibouti project is significance for both CMG and CMPort that it is the first overseas project along OBOR. It will be a demonstration between China and Africa' cooperation (CMG, 2017). As we mentioned that in February 2013, CMPort acquired 23.5% shares of PSDA with the amount of USD185 million through wholly owned subsidiary- China Merchants Holdings Djibouti (FZE), and expects to engage in the construction of Djibouti port. The rest of 76.5% shares are owned by Djibouti government (P.Smith, 2017). Consequently, the port governance model is changing from landlord port to "operation port". The geography of DMP-I is marked in below figure.

Figure 15 Geography of DMP-I



Until now, DMP is treated as a key project, which total contract is USD580 million for phases I. A concessional loan is provided by China Exim Bank, and both the construction and port facilities are provided by Chinese companies. In May of 2017, DMP is officially opened. Currently, DMP is the most advantage port in technical level in Africa (Sohu, 2017). The detail data of DMP ports are followed by the below table:



Table 5 Details of DMP-I

Quay length	1200 meters
Water depth	15.3 meters
Total area	690 hectares
Berth No.	6 multi-functional berths for 100,000 ton vessels
Designed annual capacity	8.2 million tons
Container handling capacity	220.000 TEU
Cranes	12 quay cranes for general cargo, 4 quay cranes of 50 Tons each for containers
	2 RMG of 40 Tons each
Steackers	7 reach stackers of 45 tons
Vehicle slot	40 thousand vehicles slots
Efficiency	1 Ship unloaded with 600 tons per hour, 8 bags line for Grain with 300 tons /hour/line, 6 Bags line for Fertilizer with 300 tons/hour/line
Bagging machine	6 Mobile bagging machines
Silo	1 Silo with 85,000 tons Grain, 1 Silo with 145 000 tons Fertilizer

Source: Djibouti Port

In daily operation, they implement localization management that CMPort only appoints three managements and twelve crane drivers to support the preliminary work. To secure the normal daily operation, CMG provides six months professional trainings in Shenzhen for the managements and drivers from Djibouti (CMG, 2017).

For the reason why CMPort chooses Djibouti, according to the deputy chairman, Mr. Hu Jianhua of CMPort that “we are port company, which services for the shipping company. Therefore, where is the liner route, where is our layout choice. Especially there is a huge hinterland behind. Djibouti, fortress of the Gulf of Aden, the gateway of Northeast African continent and the necessary way for Asia-Europe shipping has a largest and direct hinterland - Ethiopia, which is a booming country with more than 100 million populations, as well as Somalia, South Sudan and Uganda. The labor cost is very low there, and I trust that a new round of industrialization will start from here. Just like 30 years ago, the same situation and development as Shekou of China.” (J. Gao, 2016) In addition, revenue from overseas project is higher than domestic projects.

Besides of cooperative development of Djibouti port, CMPort will promote Shekou model - “Port-Park-City” as well in Djibouti, Djibouti International Free Trade Zone (DIFTZ) which is opened in July 2018. This project cost USD3.5 billion with 4800 hectares area, and will become the largest free trade zone in Africa. It is joint invested by Djibouti Port, Free zone authority, CMG, Dalian Port Group etc. The first phase includes commercial and trade logistics park, export processing zone and supporting area (J. Crabtree, 2018).

Moreover, free trade is currently a hot topic in Africa that 49 out of 55 members of the African Union have signed African Union's Free Trade Agreement in July of 2018 to promote borderless trade (J.Crabtree, 2018).

#### *4.4 Summary*

Djibouti, located at the horn of East Africa and Far East-Europe shipping line, has an outstanding geographic advantage. Therefore, it has become a strategic base for many countries. In the perspective of import and export, Djibouti port are not only responsible for their own national maritime import and export, but also service for around 85% import and export for Ethiopia. Besides, both of the two countries are import oriented countries, their major import cargos are wheat, trucks, cement, mineral/fertilizers, refined petroleum, palm oil, sugar etc. In Djibouti port, more than 92% containers are mainly operated by DCT, bulk cargos are handled by old port, and liquid bulk is operated by a professional oil wharf. Transshipment rate is around 20% of total port throughput. However, the old port needs to be upgraded to improve their competitiveness, as well as logistics access and single hinterland structure. Currently, major import areas of Djibouti and Ethiopia are: Asia, Middle East, North America, and Europe. Among of these areas, China is their biggest import country. Major export areas of Djibouti and Ethiopia are: North America, Europe, Asia, and Middle East. Most of the areas are along the shipping line of the Far East – Europe, and Africa – North America.

CMPort is a business sector of CMG, a state-owned enterprise. Besides port business, CMG also has related business, such as shipping and logistics etc. It is necessary and significant for a comprehensive maritime enterprise to expand more port layout worldwide, as port act a substantial role in the whole maritime industry, such as provide loading and unloading services, transshipment, and replenishment services etc. The port expansion exactly match CMG's objective that link up with the world. In actual implementation, CMPort started expand from domestic and spread over overseas in recent years. As a terminal operator, the global port expansion not only builds network for the whole group, but also enhance their industrial position by rapid throughput growth and capital investment.

## Chapter 5 In-depth Strategic Analysis and Cooperation Evaluation

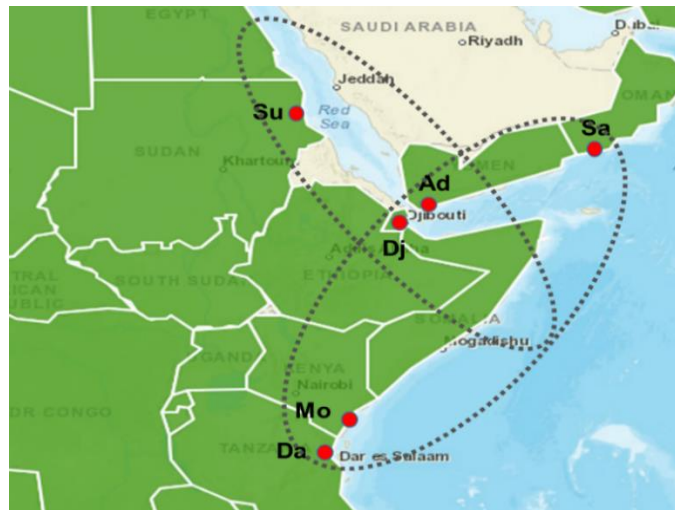
### 5.1 Strategic Analysis of PSDA

To answer the drivers of seaport cooperation, we need to know their positions in the region, and their own weaknesses and strengths. Therefore, in this sub-chapter, we will conduct an insightful portfolio analysis and port diamond model to analyse both internal and external environment of CMPort and PSDA, so that we will get clues of the cooperative reasons.

#### 5.1.1 Product Portfolio Analysis on Djibouti Port

Djibouti port is a traditional seaport located in the horn of the East Africa, the most function of the port is import, export and transshipment. Its direct hinterland is Djibouti itself and Ethiopia. Besides, considering its geographic location, it also provide transshipment and replenishment service for the vessels pass the Suez Canal. Therefore, based on both hinterland and transshipment function, a regional port cluster is chosen as below.

Figure 16 Port Cluster around Djibouti Port



In the cluster, Mombasa port of Kenya is current the largest port in the East Africa and it is also neighbouring country of Ethiopia. Dar es Salaam port of Tanzania is a strong competitor of Mombasa port in hinterland resources, such as Uganda, Congo etc. (N. Muchira et al., 2017). Sudan port is a competitor for both transshipment and hinterland resource. Aden port is a strong transshipment competitor due to location reason if the politics becomes stable. Salalah port of Oman is another transshipment competitor. Actually, Jeddah port of Saudi Arabia, Massawa port and Assab port of Eritrea, and Berbera port and Bossaso port of Somalia are also should be concluded in this cluster, as we are lack of their throughput data, we only conduct these 6 ports analysis. The abbreviation of port name is shown as table 6.

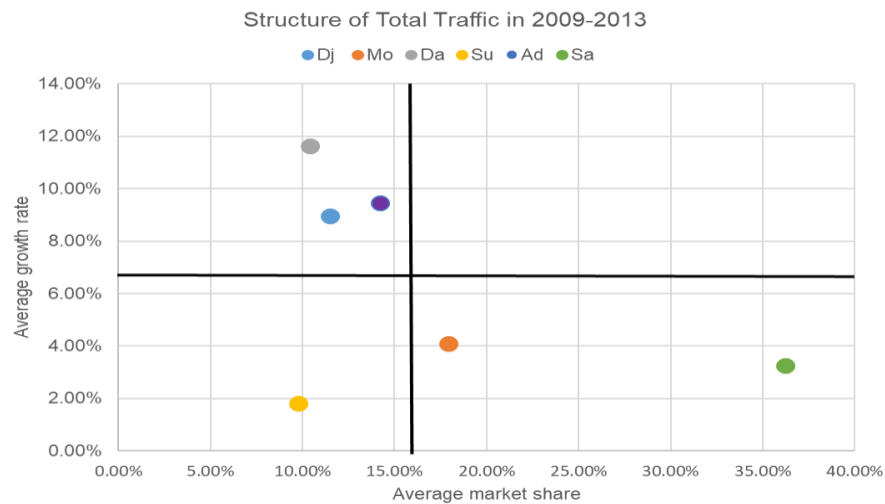
Table 6 Port Names of Cluster

NO.	Port Name
1	Djibouti port of Djibouti (Dj)
2	Mombasa port of Kenya (Mo)
3	Dar Es Salaam port of Tanzania (Da)
4	Sudan port of Sudan (Su)
5	Aden of Yemen (Ad)
6	Salalah port of Oman (Sa)

Here, we only divide the cargos into two categories due to the limited data sources: container and non-container. Data is basically collected from 2009 to 2016, but we will divide it into two groups to analyze: the first group is from 2009-2013 as we want to know the reason why Djibouti authority decide to cooperate with CMPort. The second group is from 2013-2016. We will compare the results of two groups to know whether there is any position changes after the cooperation. The data are collected from: Port De Djibouti S.A. online statistics and company internal statistics (2009-2016), Port of Aden statistics (2009 – 2016), Salalah Port Annual Report (2010, 2015 and 2017), J.O. Nyarandi's report from Kenya Ports Authority, Performance report of Kenya Port Authority (2015), Port Sudan report for the Year (2013, 2016), CEIC. In addition, we need to mention that there are six data estimated, the detail number please reference appendices: the liquid bulk of Djibouti port in 2015, the liquid bulk of Aden port 2015-2016, non-container cargo of Sudan port 2014-2016.

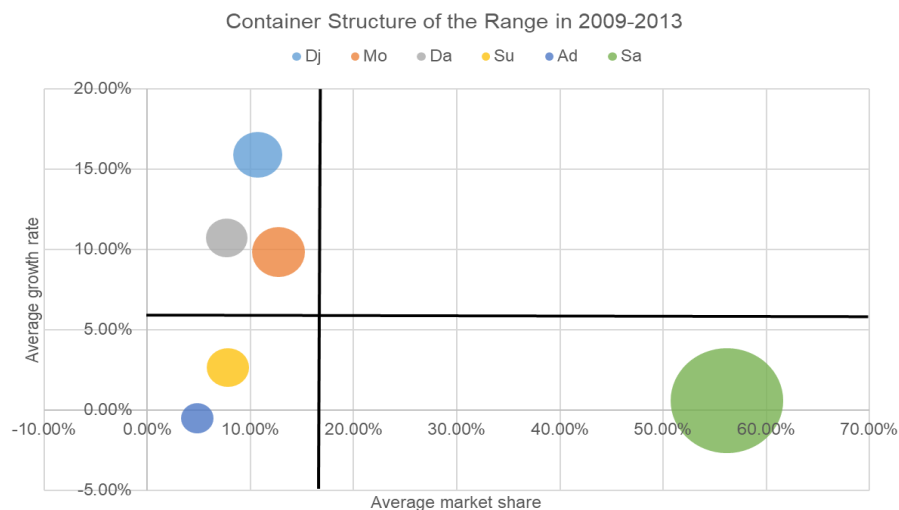
In data processing, as we cannot find all the standard data, we standardized all the data into the form what we need. For total throughput portfolio analysis, we convert TEU units into metric ton with the calculation of  $TEU \times 17 \times 0.6$ . This conversion is according to online conversion tool that one TEU of twenty-foot container equals to 17 times of the weight calculated in metric ton under ideal condition. However, in practical, considering that the average weight of each container cannot reach to the perfect condition, we calculate the gap between conversion data and actual data of Mombasa port, Sohar port and Piraeus port (we can find original container cargo data both in the unit of TEU and metric ton), and we find that the actual data is approximate 60% of conversion data. In container traffic portfolio analysis and non-container traffic portfolio analysis, we use TEU and metric tons as unit respectively, as it is more precise. According to approach we introduced in chapter three, we get below figures.

Figure 17 Portfolio Analysis of Total Throughput



In the range, the average market share of total throughput is 16.67%, the average annual growth rate is 6.52%. The market share and growth rate of Djibouti is 11.48% and 8.95% respectively, which is lower than average market share and higher than average growth rate. Therefore, Djibouti is “High Potential” in the region according to our seaport portfolio analysis matrix. The port who is in this position belongs to growth company that it can obtain larger market share by large amount of investment, which usually can stimulate a continuous growth in some extent.

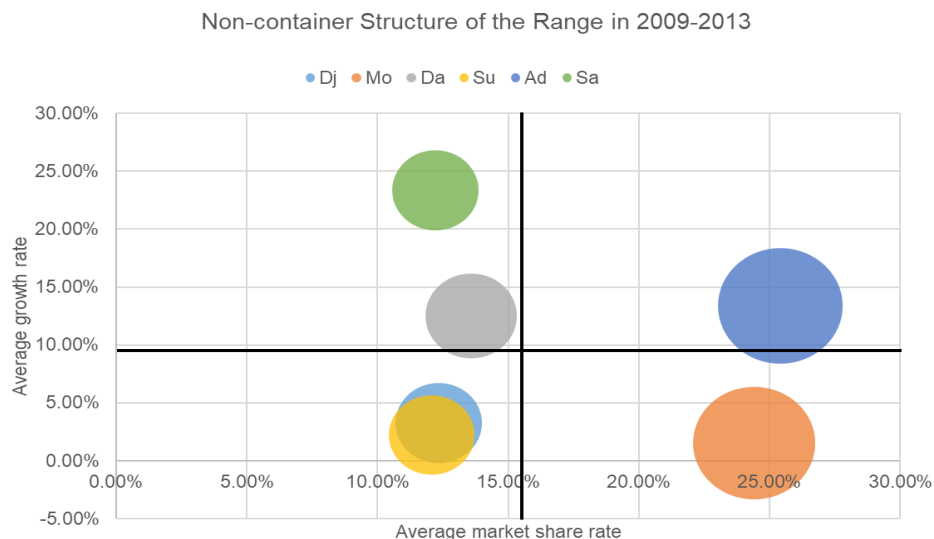
Figure 18 Portfolio Analysis of Container in the Cluster



Container is a major cargo in the region, in Djibouti, it contributes more than 60% cargo volume in the total throughput according to the collecting data. The size of circle

represents the average market share in the cluster. In 2009-2013, Mombasa has the largest average market share in cluster, and Djibouti is the third in the range. The average market share of container throughput is also 16.67%, the average annual growth rate is 6.52%. And the market share and growth rate of Djibouti is 10.74% and 15.88% respectively. The same as total throughput that the position of container is located at “High Potential” that Djibouti port can occupy more market share and obtain profit by continuous huge investment. What's more, the growth rate of Djibouti port is the fastest in the area, which explains that container cargo is a high development potential cargo. However, we need to notice that the major contribution comes from DCT, which is newly built and operated by DP World. The contribution of PSDA in the year of 2013 is only around 6%. From the analysis that we identify that Djibouti port should upgrade the container terminal of PSDA or build a new container terminal. On one hand, it will lower the risk that Djibouti is over dependent on only one container terminal. On the other hand, new company will bring in activity, new resources and networks etc., which will have positive impact on the development to Djibouti port.

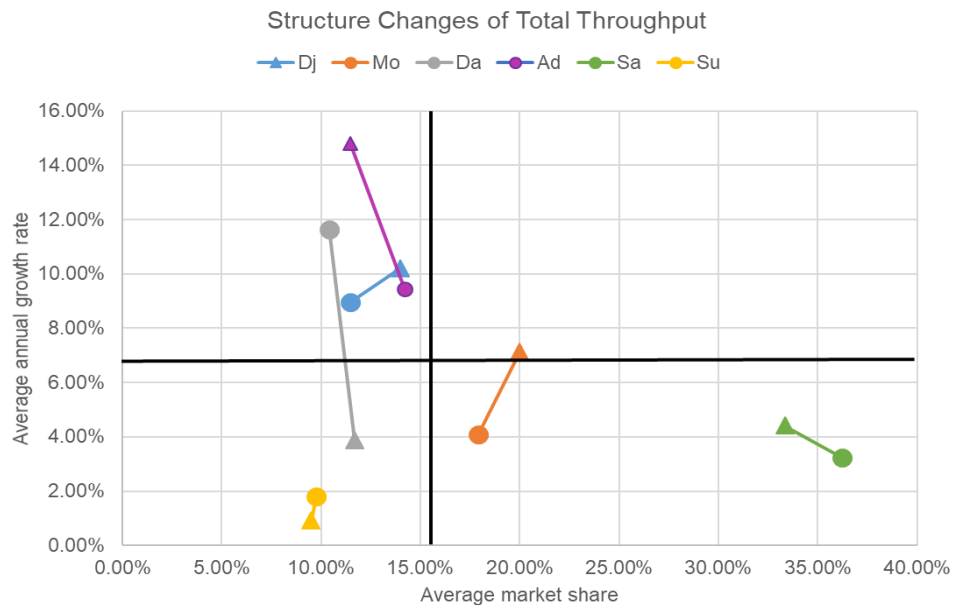
Figure 19 *Portfolio Analysis of Bulk Cargo in the Cluster*



For bulk cargo, the size of circle represents the average market share in the region. Be different from container, Aden port has the largest average market share, and followed by Mombasa port, the rest four ports have similar market share. The average market share of total throughput is 16.67%, and the average annual growth rate is 9.38%. In this sector, Djibouti port is in the position of “Minor Performer”, as the average market share and growth rate of Djibouti port is 12.33% and 3.27% respectively, both indicators are lower than the average level in the cluster. It reflects a low ability of generating revenue, and this part of business is operated by old terminal and oil terminal. It shows the hinterland resource might be insufficient on one hand, and the old port and oil terminal probably need to be improved in operational efficiency on the other hand, such like building higher standard infrastructure, training staffs, utilizing new IT systems etc.

In the below figure, we will show and analyze dynamic position changes before cooperation and after cooperation. The round symbol represents the original position in 2009-2013, the triangle symbol represents the new position during 2013-2016, after cooperation. In the new period, the average market share and growth rate is of Djibouti port increased 2.49% and 1.47% respectively. In the cluster, the overall competitiveness is enhancing. However, it is still in the “High Potential” matrix that the Djibouti port can further obtain market share increase through more investment.

Figure 20 Dynamic Changes of Total Throughput in 2009-2016



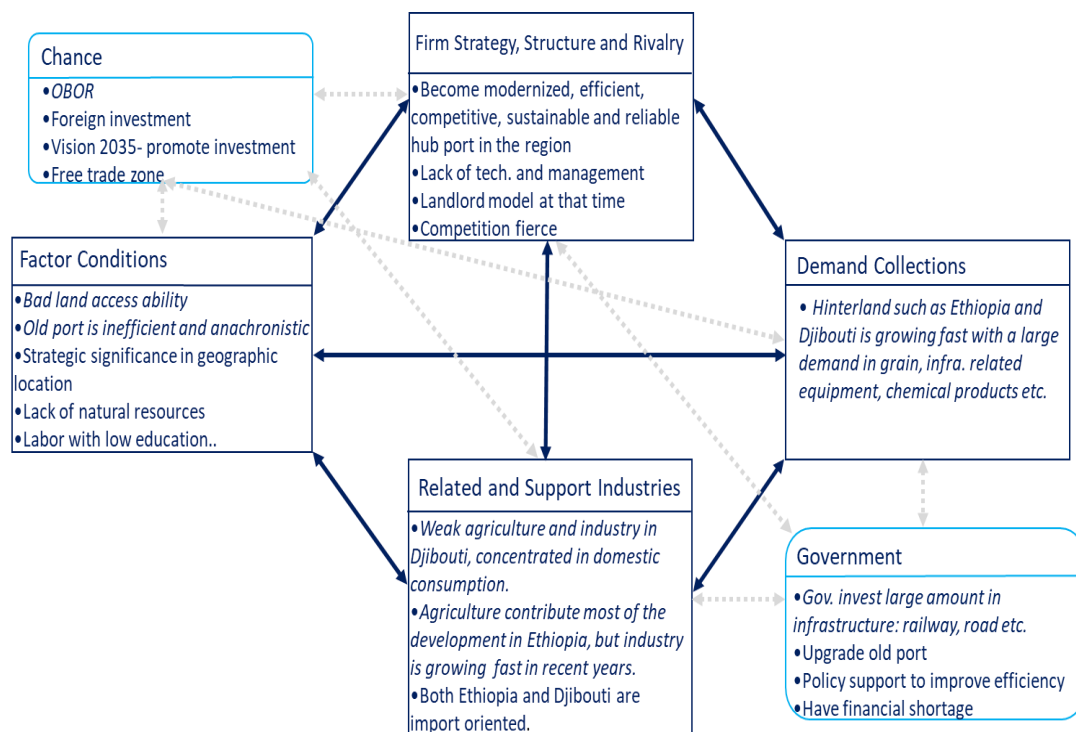
In the subdivision of container cargo, Djibouti port is still in the area of “High Potential”, but it has 3.12% growth in average market share, meanwhile, the growth rate is slowing down 8.4% than the former period. It well explain that in the early stage, new container port investment could trigger a relatively rapid growth in market share. After some period, if there is no new investment, the growth rate of market share will slow down until the terminal is saturated.

For bulk cargo, in the new period, the position changes into “High Potential” with 14% market share and 13% growth rate, increasing 1.68% and 9.92% respectively than the former period. In the new period, the average growth rate of cluster is 9.92%. It illustrates the theory that port can obtain growth by new investment. However, the new terminal DMP-I haven’t opened yet in 2013-2016, it might be explain from perspective of improvement of management and operation etc. As three management from CMPort are sent to PSDA in charge of operation, finance and business promotion. Professional labor training in management, operation, security etc. is also conducted. Therefore, it is possible that the efficiency is improved in PSDA in recent years.

### 5.1.2 Diamond Model Analysis on Djibouti Port

An insightfully strategic analysis will help ports to identify their industrial positions, and their own advantages and disadvantages, thus, they could take positive measures to change unfavourable position, increase competitiveness, convert external opportunities into internal advantages, and avoid risks and so on. In this sector, we will take key information from the introduction of Djibouti and Djibouti port in chapter 4, combine the approach explanation in chapter 3, as well as new hinterland, industry, national development strategy etc. related information from Oxford business report to give a further analyse. The same as portfolio analysis that we will focus on the situation before the year of 2013 to identify the cooperative reasons. In the following part, a brief will be summarized will be given according to six sectors analysis.

Figure 21 Diamond Analysis for PSDA



- **Factor conditions**  
Djibouti is a small country that are extremely lack of natural resource, and the education level is generally low and unskilled (Republic of Djibouti).

In logistics access, although there are one road and one railway connect with port, the condition is not good due to shortage of maintenance. Besides, road transportation plays an essential role for transportation from port to Ethiopia or other area. According to Oxford Business report that more than 90% trade are handled on roads. However, the congestion problem is serious. In railway, the transportation capacity was limited and almost disused until the new Addis Ababa-



Djibouti railway was built. The limited logistics access leads to a difficulty in goods transportation between Ethiopia and Djibouti port.

In addition, except for the Doraleh Container Terminal (DCT), Djibouti only had an old port, which was built a hundred years ago and have limited capacity that it couldn't satisfy the needs of transshipment, import and export.

Nevertheless, the geographic location of Djibouti possesses a natural advantage: the gateway of land lock of Africa, fortress of Suez Canal.

- **Related and supporting industries**  
Industry and agriculture in Djibouti are weak currently that they only have around 30 large scale manufacturing companies concentrated in production of construction material, industrial gas and plastic etc., and most are consumed domestically (Oxford Business Group, 2016).

As the largest hinterland of Djibouti, agriculture in Ethiopia contributes a large part of economic growth. Until 2010, the industry contribution of Ethiopia was growing but still not strong. The manufacturing scale is small and are focus on food, furniture, fabricated metal, textile, and chemicals etc. (M. Gebreyesus, 2016).

Moreover, both Djibouti and Ethiopia are import oriented country that the import cargo value is 4.41 billion and 19.12 billion in the year of 2016. And 80%-90% import cargo of Ethiopia is through Djibouti.

- **Home demand conditions**  
In recent years, the economy in Djibouti and Ethiopia are growing rapidly. According to the World Bank, 2009-2012, the annual GDP growth rate is more than 9% because of the investment (World Bank).

In the similar way, the economy growth in Ethiopia is strong, the average growth rate is around 10% from 2010 – 2016. Public investment, construction, services and agriculture contribute most of the increase (the World Bank).

In addition, in 2013-2016, the annual GDP growth of Djibouti is more than 6.5%, and it is estimated that the increasing rate will be kept around 7% in the next decade due to the investment, import and export service (the World Bank).

- **Strategy, structure and rivalry**  
PSDA is aiming to be a modernized, efficient, competitive, sustainable, reliable and multipurpose hub port worldwide. However, their skill, management knowledge is not enough to support their strategy (M. Juhel, 2017). At that time, their business model is landlord model, most of developed countries adopted, but it generated management confusion (J. Wang, 2017). Besides, the fierce competition comes from surrounding ports such as Jeddah port, Aden port, Mombasa port, Sudan port etc.

- **Government**  
Djibouti government is carrying out a huge number of investment in infrastructure, such as railway, road, airport and free trade zone etc. Among of them, Ethiopia government and Djibouti government decide to invest a new high standard railway around 2011-2012 from Addis Abba, the capital of Ethiopia, to Doraleh port. The new railway will not only cut down transportation time, but also increase transportation capacity to 6 million per year, it will solve the railway transportation problems. Meanwhile, Djibouti government is also planning upgrade their old port. However, these large scale construction brings big national fiscal pressure as the projects are mainly leaded by government (Oxford Business Group). Besides, policies related to improve custom efficiency is also conducted (Oxford Business Group).
- **Chance events**  
OBOR initiative brings opportunities for the countries and companies along the maritime route. In the port sector, Chinese government encourage overseas port cooperation and investment.

As the gateway of East Africa, foreign investment is increasing, not just from China, but also from Turkey etc., which leading to a development of manufacturing in Djibouti (Oxford Business Group).

Djibouti's National Investment Promotion Agency (NIPA) initiate a master plan of "Vision 2035" to stimulate industrial development by improving investment environment and cooperating with private investor, as well as energy supply. In Vision 2035, logistics platform building is key strategy. But this strategy is actually implemented from 2014. Moreover, the development of free trade zone will also provide opportunities for industry development, and expand hinterland to COMESA and GCC members (Oxford Business Group).

## *5.2 Strategic Analysis on CMPort*

CMPort is more like a port investor and operator rather than a traditional port or port company, although it has a home base port in Shenzhen. Moreover, it is state owned company that it shoulders the development of both country and enterprise. Thereby, we analyse the cooperation reason from national strategic level and enterprise strategic level.

### *5.2.1 National Strategic Analysis*

In national strategic perspective, to facilitate national economic development, break American economic blockade, Chinese government decided to develop silk roads on land and on the sea. The sea way connects China, Europe and countries along the route. It is strategically significant (Q. Liu, 2015):

- **International industrial transfer** - China has already had the ability to export technologies and industries. According to statistics, at the end of 2014, Chinese foreign investment has exceeded 100 billion US dollars and has become a net

capital exporter. With the implementation of the OBOR strategy, some of Chinese high-quality surplus industries will be transferred to other countries and regions, allowing developing countries and regions along the route to share the fruits of China's development.

- Breaking the economic blockade – OBOR strategy can circumvent the industrial setback caused by the economic barriers of developed countries. In addition, it is closely linked to the China Free Trade Area Strategy. At present, China is building a free trade zone involving 32 countries and regions. Most of the free trade zones under construction are located along OBOR.
- Meet the economic structural transformation and infrastructure construction needs of some developing countries along the route. Help these countries and regions to carry out infrastructure construction such as roads, bridges, ports, etc., and develop industries such as textiles and clothing, home appliances, and even automobile manufacturing, steel, and electric power to improve their economic development level and production capacity.

Overseas port investment and cooperation along OBOR has important strategic significance that it is the carrier and link for the construction of OBOR. It embodies in the construction of transportation infrastructure, building a uniform coordination mechanism, push port cooperation and information cooperation in sea way transportation sector etc. (China.org.cn, 2015). For China, Djibouti has a special significance and is the fulcrum of Chinese influence in East Africa for a long time. Port of Djibouti, Gwadar Port of Pakistan and Hambantota Port of Sri Lanka etc., string together the 21st Century Maritime Silk Road. As Djibouti's defends the Mandab Strait, it is critical to the success of the Maritime Silk Road. China exports around \$1 billion cargos to Europe every day, most of the vessels pass through the Suez Canal in the Gulf of Aden (L. Wang, 2016). Moreover, around 90% import and export of Ethiopia (worth around USD 26 million) pass through Djibouti, China is one of the biggest trade partners. Therefore, as state-owned maritime company, it is necessary for the cooperation between CMPort and Djibouti port to promote vessel replenishment, transshipment, network building, in-depth cooperation in the East Africa.

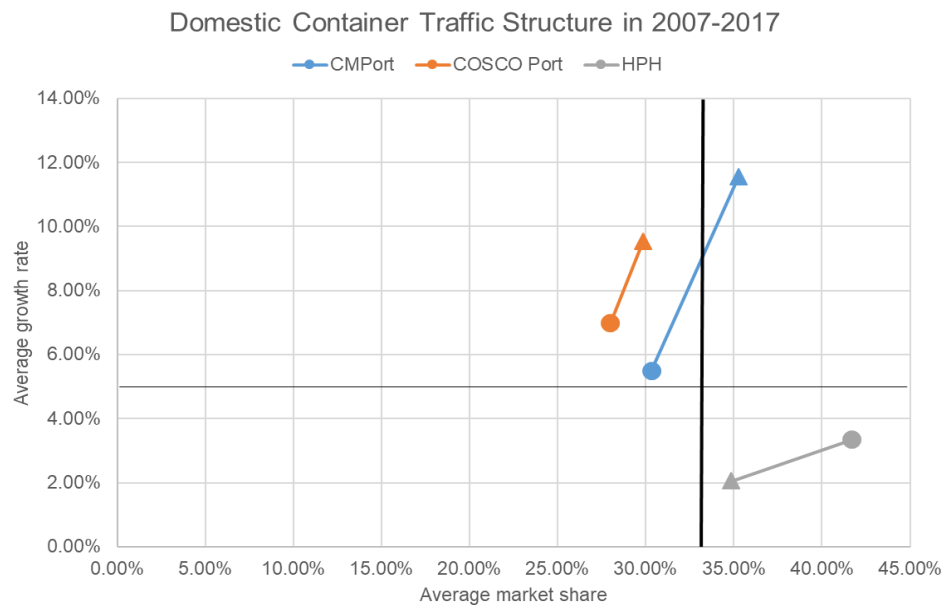
### *5.2.2 Portfolio Positioning Analysis*

CMPort is not only a sole port company, but also one business sector of CMG, and port investor and operator. Hence, be different from the positioning analysis of Djibouti port, we will conduct portfolio analysis from the perspective of total container terminal throughput to understand CMPort's position and competitiveness in the industry, so that we could know whether the overseas cooperation with Djibouti is imperative.

Based on the report of UNCTAD (2017), before 2002, Chinese global terminal operations, including CMPort, are quite limited. Until 2007, the overseas investment or cooperation is still limited but have an increase in domestic port operation. By now, the operation had a sharp increases both at abroad and domestic since the year of 2012, and CMPort is playing an important role in terminal investment and operation in the world. In domestic

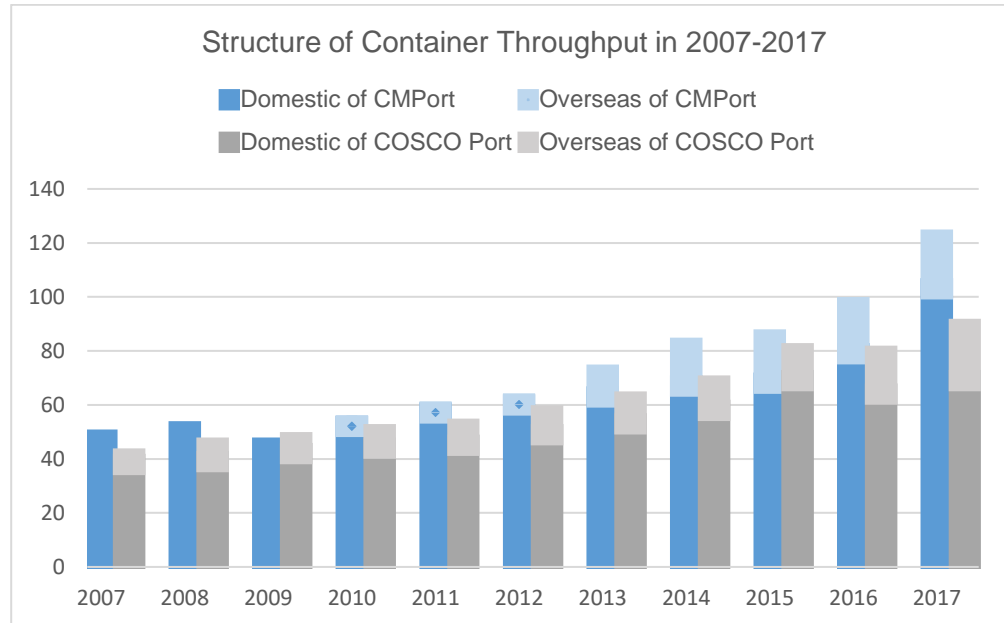
level, the major terminal investor and operator are: CMPort, COSCO Shipping Ports, and Hutchison Ports (HPH). Besides, we divided the years into two groups: 2007-2012, and 2012-2017. From the dynamic changes, we will know how the positioning changes in the period. The round points represents the positioning in 2007-2012, the triangle represents the positioning during 2012-2017. Furthermore, the average market share and average annual growth rate is defined by the three enterprises. In addition, data are collected from the annual throughput statistics and annual reports of each port companies.

Figure 22 Portfolio Analysis in Domestic Container Market



According to this graph, before 2012, CMPort is in the position of “High Potential”. Through several years’ development, it has changed the position to “Star Performer”, which has both high market share and high annual growth rate. The dynamic changes match the theory that the port company who is in “High Potential” can obtain more market share by expanding investment. CMPort started investing and cooperating broadly with both domestic ports and overseas ports, which contributes a large number of throughput increase. The below table shows how many volume comes from domestic and abroad separately in the total container throughput of CMPort and COSCO Port.

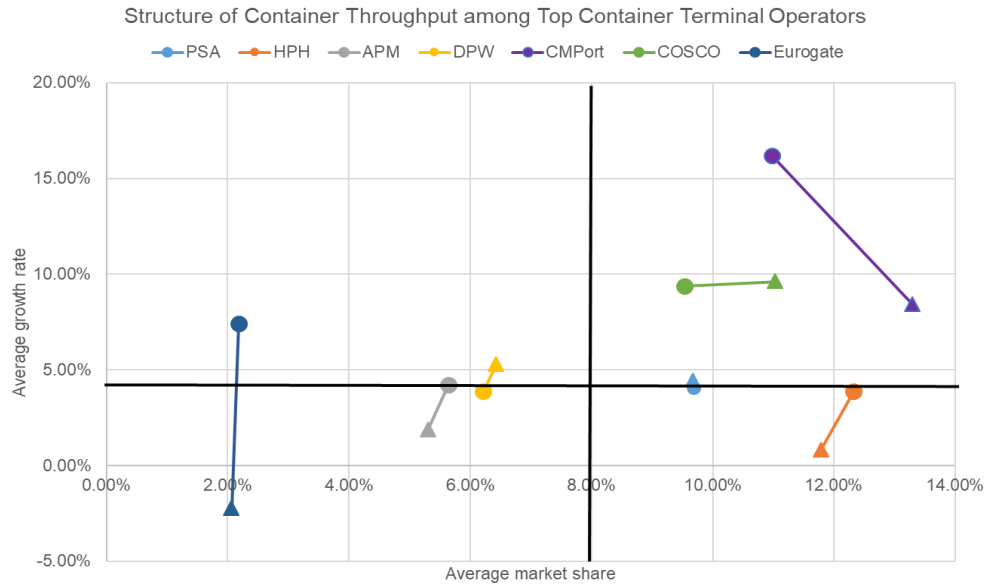
Figure 23 Domestic and Abroad Container Throughput of CMPort and COSCO



For CMPort, the overseas container volume contributed from 2010 with 0.06 million TEU and 0.12% contribution rate. To 2013, the overseas contribution has arrived to 8 million TEU and 11.27%. In the year of 2017, the overseas container volume contribution is 18 million TEU and the rate is 17.48%. The similar situation is happened to COSCO Port, but it started foreign port investment and cooperation earlier than CMPort. From this, it is clear that the overseas investment and cooperation is playing an important role for enhancing company's position and increasing throughput.

In global scope, the dynamic portfolio changes of leading terminal operators is as below diagram. Here, including CMPort, seven major companies are compared and the period is chosen from 2012 to 2017 based on the ranking by T. Notteboom et al., and the overseas container volume contribution for CMPort is boomed from 2013. The period from 2012-2017 can explain CMPort's positioning changes better. In this period, according to UNCTAD, the world's average growth rate is 4%, and the average market share of these seven companies is 8%. Container throughput data is collected from Statista for PSA International and APM, throughput announcements of DP World, press release of Eurogate.

Figure 24 Portfolio Analysis of Global Main Terminal Operators

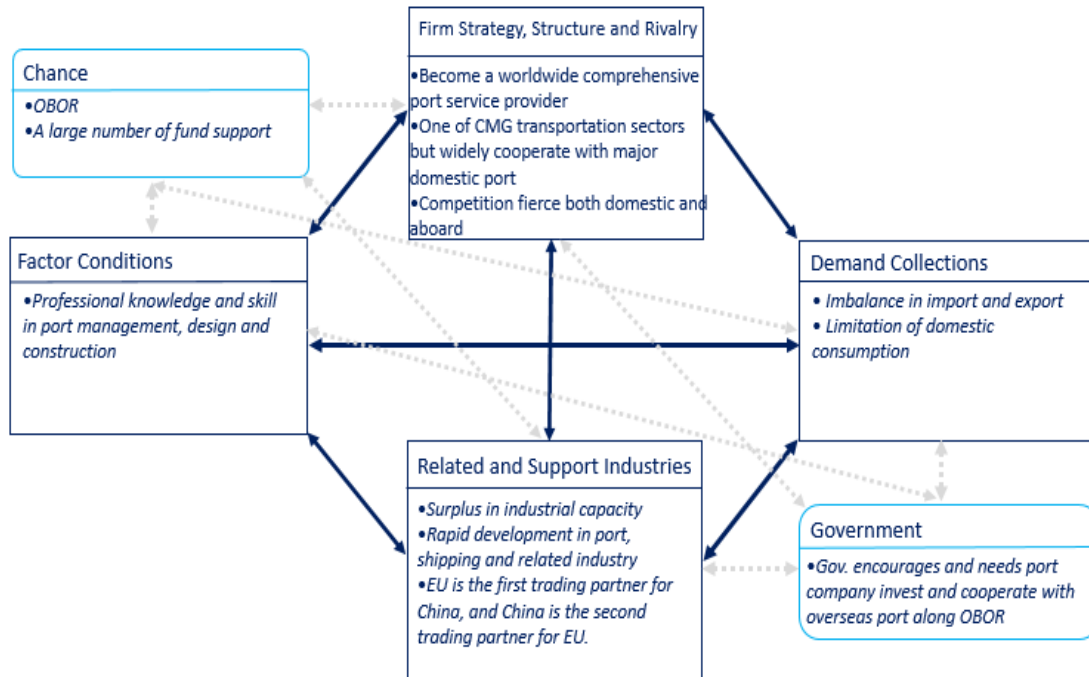


According to the container throughput data from CMPort, it is in the position of “Star Performer” in this period. However, the average growth rate is slowed down from 16% to 8%. On the other hand, the average market share is improved from 11% to 13%. It explains that the overseas expansion indeed strengthen company’s competitiveness.

### 5.2.3 Diamond Model Analysis on CMPort

In this subchapter, key points will be taken from introduction of CMPort and CMG in chapter 4, CML, European Commission, and UNTACD. The same as information utilization in diamond analysis for PSDA, we will also focus on the situation of CMPort before 2013. And the matrix will be summarized based on each factor’s analysis.

Figure 25 Diamond Analysis for CMPort



- Factor conditions**

CMPort is a listed and well developed company in port industry, the base port of Shekou and its industrial business model is mature (CML). It also broadly invested and cooperate with main ports domestically. Therefore, whether management knowledge or construction technology is professional, and have the ability to export know-how.
- Related and supporting industries**

Currently, China is overcapacity in some industries, which needs to expand more new market. As a key development industry, port and shipping industry is growing fast recent years. Facing to trade globalization, the shipping network also need to follow development of trade. Port as a key factor in maritime shipping industry, global layout is necessary. Moreover, EU has become the first trade partner of China, and China has been the second partner of EU(European Commission), as well as African countries, which is developing fast recent years and in the future, therefore, the trade volume and the potential market on this route is huge.
- Home demand conditions**

The import and export is not balanced in China, which causes imbalance in maritime transport outwards and inwards. Besides, the domestic consumption is limited, therefore, new market development is necessary.
- Strategy, structure and rivalry**

The target of CMPort is to become a world-level comprehensive port service provider. Currently, in container port sector, CMPort is in top10 but not yet in the overall ranking (UNCTAD, 2017)

- **Government**  
From state strategic perspective, overseas port cooperation and investment along maritime silk route is needed. On one hand, port cooperation will lay the foundation for more extensive cooperation in the future. On the other hand, the port area around Suez Canal is strategic significance for its geographic location. The vessels along the route also needs replenishment and transshipment.
- **Chance events**  
Here, although state-owned company should cooperate government policy, on the other hand, OBOR initiative indeed take lot of opportunities for CMPort to expand their overseas network and become more globalization. A huge amount of Fund support is also provided.

### *5.3 Fit Analysis*

We analyse PSDA and CMPort from both internal and external environment respectively in the above subchapter, and identify several reasons behind the two parties to cooperate. Thus, we find that the fit between PSDA and CMPort are relatively high as they can provide the needs for each other in the aspect of know-how, capital, development concept, network, strategic location layout, competitiveness enhancement etc. What's more, a significant point is that the cooperation is not only relevant to the solely project, but also related to two national strategic cooperation.

- **Know-how**  
Initially, Djibouti port is lacking of professional knowledge and skills in port management and operation, high standard construction ability, which can be provided by CMPort. On the other hand, CMPort is searching for this kind of collaboration to export their know-how. In fact, a training centre for DMP is set up by CMPort in Shenzhen West home port to provide technical and management training, a support team from CMPort is also sent to Djibouti to coach local staffs (J. Wang, 2017). Besides, an intelligent operating system, designed by CMPort is adopted by DMP as well (CMPort, 2017). However, CMPort needs to face a relatively high labour cost because they need to pay much attention to train the unskilled labour, and it is expensive and difficult for foreign labour to enter in Djibouti labour market (D. Sun et al., 2018).
- **Capital**  
A large number of infrastructure is invested by Djibouti government, which causes a shortage in capital and fiscal pressure. Cooperating with Chinese enterprises such like CMPort, Djibouti can get new capital injection and loan from the Export-Import Bank of China. Actually, as deeply cooperation, CMPort also cooperate with Djibouti Treasury Department to set up Silkroad International Bank in Djibouti and has become a major bank of Djibouti government in income and expenditure



(J. Wang, 2017). However, on the other hand, it is risky for Chinese company due to Djibouti's high debt and low repayment ability (D. Sun et al., 2018).

- **Development concept**  
In Djibouti, the old port need to be upgraded due to old infrastructure, small scale, low efficiency and management problem. On the other hand, "Port-Park-City" model of CMG is successful and mature in China - it not only develop port area, but also build industrial park and drive the development of the rear city. According to the business model, CMG proposed a suggestion that build a new port and operate it in the model of operation instead of landlord, construct free trade zone to develop supporting industries, rebuild old port into a commercial and residential centre. The home base of CMPort in Shekou of Shenzhen shows a successful case for Djibouti government, and it is attractive for them (J. Wang, 2017). We can also find clues in two years later 'Vision 2035', which is officially implemented in 2014, that logistics transportation and free trade zone are both recommended as strategic priorities (World Bank Group, 2014).
- **Network**  
According to our analysis, the hinterland of Djibouti is limited, meanwhile, under fierce competition, Djibouti port should expand their network to active port and logistics activities. The collaboration with CMPort will probably attract more Chinese vessel replenishment, as well as logistics activities (D. Sun et al., 2018). On the other hand, under the circumstance that China need to expand and develop more trade partners, CMPort will focus on investing in regional hub ports to increase their position in global port industry, and providing high efficient service for Chinese trade through global expansion based on CMPort's strategy. China is major trading partner of Djibouti and Ethiopia in both import and export, and Africa is a potential market in the future, therefore, it is helpful for CMPort to build network in the East Africa through the cooperation.
- **Strategic location layout**  
Africa is on the route of OBOR, Djibouti is located at the horn of East Africa, and the fortress of the Red Sea and the Suez Canal, an essential maritime route for the seaborne trade of China. Compared to Yemen, Somalia, Sudan and Eritrea, Djibouti has a relatively stable political situation and liberalized trade policy. Djibouti has development potential and they expect to develop into 'Shipping Centre of East Africa'. It is attractive for China and CMPort (D. Sun et al., 2018). Meanwhile, it is necessary for Chinese government to keep vessels and projects away from terrorism around the area (D. Sun et al., 2018). Therefore, no matter from military and economics respect, the Djibouti layout is essential for CMPort and Chinese government from strategic level.
- **Competitiveness enhancement**  
In the perspective of enterprise, international cooperation is helpful to strengthen competitiveness in various ways. By portfolio analysis, we find that both Djibouti port and CMPort need to improve their industrial position and keep continuous

growth. Therefore, collaboration is a good choice, actually, in current stage, they indeed have improved their position based on our analysis.

In addition, there are several cooperative ways for PSDA and CMPort to choose, and they conduct the deepest one - the joint venture and stock right acquisition, which could bring high benefit for both parties but also with high risks. For CMPort, it is a demonstration project in overseas cooperation. For Djibouti port, although 'Port-Park-City' is successful in China, it is still inconclusive whether the model is also suitable for Djibouti.

## *5.4 Cooperation Performance Evaluation*

### *5.4.1 Benchmark Selection*

There are a large number of cooperation project in various way worldwide. In consideration of the scale of DMP, as well as the criteria of benchmark, we choose Sohar port and Piraeus port as our benchmark. The major reasons are:

- Sohar port is a cooperative project between Rotterdam port and Oman government. The project is formally started from the year of 2004 and it has become relatively mature and is performing well through decade development that we can know more and clearly about the cooperative effects. In addition, Rotterdam port as a quite developed and high efficient port in both operation and business model worldwide, it has professional consultant department to make customize master plan for Sohar port. Therefore, it possess an important feature of benchmark in the field of seaport overseas cooperation. Meanwhile, similar as Djibouti, Oman is also a small country with only 4.6 million population and 120 sq m area, but has a quite geographic advantages in the region. What's more, the type of port is also gateway, import and export oriented. However, there is still some differences in the business model that Sohar port is landlord model, which is the former business model of Djibouti port. In the cooperation with CMPort, Djibouti port authority has decided to change it into operation port.
- Piraeus port, is another seaport overseas cooperative project between COSCO shipping port and Piraeus port authority. Piraeus port is the largest container port in Greece, and it has passed several years since COSCO obtained 35 years concession in 2008, and acquired another 67% stock right in 2016. The port has gained 68.6% net income increase in 2017 compared to 2016 (PPA, 2018). Besides, Piraeus port owns a strategic geographic location as well, it not only possesses hinterland with strong industries in Middle and East Europe, but also an important transshipment port on the Asia-Europe maritime shipping route. What's more, the project is located along OBOR as well. Thus, it is another good example as our benchmark. However, in the type of cooperation, it is different from the case of PSDA that it is port privatization and current container port operation is managed by Chinese party.

### *5.4.2 Calculation and Explanation*

In this sector, score of indicators are divided into objectivity (80%) and subjectivity (20%). The objective scores are given according to each port information online site, such as total investment, water depth etc. Subjective score of PSDA and Sohar port are evaluated based on expert survey: former operation supervisor of PSDA and consultant of International department of Rotterdam port. However, the subjective indicators of Piraeus port are graded by the author based on online information, as we cannot find any expert in Piraeus port. We need mention that here PSDA include DMP-I and old terminal because CMPort obtained 23.5% share right of the whole PSDA, they also sent three managers to manage both PSDA and DMP. We exclude DCT as it is operated by DP World.

To calculate the final result, we need to uniform the original data to a new range of numbers (1 to 9) based on the formula Equation 6. Both original data and unified data are shown in table 7.

Table 7 Evaluation Indicators

	Original Data				Standardized Data		
Indicators	PSDA	Sohar Port	Piraeus Port	Optimal Values	PSDA'	Sohar Port'	Piraeus Port'
Connection lines with railway, road and airport	2	3	5	5	1	4	9
Container lines	8	10	24	24	1	2	9
Total investments (USD million)	580	1700	5060	5060	1	3	9
The number of terminals	2	8	3	8	1	9	2
Total berth length (meter)	4400	5047	1150	5047	8	9	1
The deepest water depth (meter)	15.3	19	18	19	1	9	7
Total area (hectares)	705	2500	3900	3900	1	6	9
Rate of information exchange on port management and development (%)	95	92	98	98	5	1	9
Professional Training level	8	7	5	8	9	6	1

Rate of dependence on technical assistance in port management (%)	90	60	40	90	9	4	1
Throughput ratio in the region (%)	15	37	17	37	1	9	2
Vessel calls	1705	2359	6000	6000	1	2	9
Average throughput growth rate (%)	13	6.5	58	58	2	1	9
Equity share rate from foreign investor (%)	23.5	50	51	51	1	9	9
Rate of management from foreign party (%)	43	22	60	60	5	1	9

According to the Equation 8 and Equation 9, we can further calculate each indicator score. Normally, the value correlation of  $\rho$  is equal to 0.5, and we use this normal value in our calculation, then the detail score of each indicator are obtained.

Table 8 Preliminary Result of Evaluation

$\xi_i(i)$	PDSA	Sohar Port	Piraeus Port
$\xi_i(1)$	0.333	0.429	1.000
$\xi_i(2)$	0.333	0.364	1.000
$\xi_i(3)$	0.333	0.400	1.000
$\xi_i(4)$	0.333	1.000	0.375
$\xi_i(5)$	0.751	1.000	0.333
$\xi_i(6)$	0.333	1.000	0.649
$\xi_i(7)$	0.334	0.533	1.000
$\xi_i(8)$	0.500	0.333	1.000
$\xi_i(9)$	1.000	0.600	0.333
$\xi_i(10)$	1.000	0.455	0.333
$\xi_i(11)$	0.333	1.000	0.355
$\xi_i(12)$	0.333	0.371	1.000
$\xi_i(13)$	0.364	0.333	1.000
$\xi_i(14)$	0.333	0.932	1.000
$\xi_i(15)$	0.528	0.333	1.000

We assume that the weight of each index is equal, based on the formula of Equation 10, we obtain  $r_1 = 0.476$ ,  $r_2 = 0.604$ ,  $r_3 = 0.759$ , which are the final evaluation score of PSDA, Sohar port, and Piraeus port respectively.

From this group of data, it is obviously that the cooperative performances of the two benchmark ports are better than the performance of Djibouti port. The currently scale of Djibouti port is still small, but for DMP, it is only in the stage of phase I. Besides, CMPort and Djibouti port are planning to upgrade old port and develop livestock port. Therefore, we trust that Djibouti port will expand its scale size in the long term. Nevertheless, Djibouti port still perform well in the perspectives of information exchange, know-how training, and capital input. Moreover, the final results evaluate the collaborative situation and the development of joint project are correlated to many factors:

- Length of cooperative time. The cooperation in Djibouti port is just started and the project still needs time to develop, as the first cooperative project – phase I of DMP is only formally opened in May of 2017. Relatively, cooperation in Sohar port and Piraeus port has developed more years than in Djibouti port. It make sense that the comprehensive performance in Djibouti is not as good as benchmark ports.
- Natural condition. Most area of Djibouti is located in the desert that the natural environment is tough and lack of natural resource. However, the two benchmark ports are located at Oman and Greece respectively that the natural condition there are much better than Djibouti. Nevertheless, the geographic location of Djibouti port has relatively advantage that it is the gateway of land lock of East Africa, and a must pass through Suez Canal.
- Local economy and politics. In addition to lack of natural resources, the industries in Djibouti is weak. Besides, the politics is not as stable as Greece and Oman. Port activities is highly relevant to import and export, the weak economy can't support trade activities well. However, Djibouti government, CMPort and relevant parties are joint together to build free trade zone, aiming to develop port related activities.
- Hinterland. The current hinterland of Djibouti port is relatively simple that approximately 70% of port import and export cargo volume comes from Ethiopia (95% inbound trade). Under fierce area competition and the willingness that Ethiopia plans to diversify their trade routes, there is a risk that cargo volume might be shunted to Sudan port and Lamu port in the future (Portstrategy, 2018). Djibouti port need to develop more hinterland resources and transshipment activities. Djibouti government has realized the limitation and are building industry zone, improving investment environment and upgrading logistics access. In long run, these actions will probably benefit Djibouti port.
- Logistics access. Inland transportation network is important for port activities in some extent. Especially in Djibouti, the railway is almost lost the ability or enough ability to transport cargos between Ethiopia and Djibouti port, and most of the

transportation was rely on road. Currently, a new high standard railway has been opened from Addis Ababa. It is expected that the railway would further increase cargo volume and transportation efficiency. On the other hand, the newly built high standard DMP is also expected to increase the transshipment volume to other ports in South Africa.

- Cooperation model. Different cooperation model has different effects, in short term, it is hard to say which one is better. In the case of Djibouti port, Chinese party purchases 23.5% stock right of PSDA, output know-how, and joint operate DMP, which is the model of operation port. In Sohar port, the business model is landlord port, which is quite similar as Rotterdam port. In this case, the share rate of Rotterdam port is 50%, and they joint develop port industrial area with local government, as well as infrastructure concession and output professional knowledge and skills. However, it is different in Piraeus port, COSCO Shipping Port obtained operational concession of part of container terminals, and purchases 67% share rate later on and put the port into privatization. In this case, as one party absolutely dominates in port operation, in the perspective of management and information sharing is better than the former two cases in some extent.

### *5.5 Summary*

From deep strategic analysis, we find that before cooperation, Djibouti port had a potential growing market in container sector, but low growth ability in bulk cargo business. It related to old port facilities and operational efficiency, therefore, cooperation in port upgrading, advanced and professional management knowledge and operational skill obtaining, and new IT system setting etc. are necessary. Moreover, PSDA was facing fierce competition from port clusters of East Africa and parts of Middle East, but with weak industrial support and logistics access ability. Port related industries are needed, as well as improvement of infrastructure and capital. Despite this, the advantage of geographic location makes Djibouti port attractive in recent years. Hence, to become more influential port in the area, it is benefit for Djibouti port to increase investment and cooperate with CMPort. As this cooperation is also CMPort expected in terms of strategic layout at East Africa, over production capacity transfer, and network expansion etc.

In fact, after cooperation, PSDA has indeed improved their position in bulk cargo sector according to Product Portfolio Analysis. Although current scale of new terminal is small, the cooperation is smooth in current stage. In long run, a better performance is expected because of the effort in improving investment environment, infrastructure, and attempt in new development model.

## Chapter 6 Conclusion

### *6.1 Research Contributions and Suggestions*

Our research is aiming to identify motivations and evaluate performance of international seaport cooperation. To understand insightfully, a number of literatures about cooperative types, motivations, and performance evaluation method are studied, as well as the practices of Rotterdam port and Chinese ports along OBOR. Furthermore, a cooperative case between Djibouti Port and CMPort in joint venture model is studied through strategic positioning analysis, diamond model analysis, balanced scorecard method, and grey relational degree method.

Based on these qualitative studies, we find that there are many different types of cooperation, but horizontal and vertical are the basic category method. People also can differentiate cooperation in terms of operation model, port authority and trade route, union commit, objectives etc. However, the choice of cooperative model is correlated to objectives and collaborative depth, although cooperation can be sort to different types. Currently, the major types of current seaport international cooperation are: infrastructure investment, equity acquisition, cooperate agreement, and network collaboration.

In practice, some cooperation happened in developing countries might be aid programs, aiming to strengthen port competitiveness. Rotterdam port as the largest port in Europe is positively involving in collaboration in the area of Middle East, South America, South Asia and European range with the models of joint venture or MoU based on different purposes. Among of them, Sohar port is a relatively mature project and it is also utilized as a benchmark in the later performance evaluation. On the other hand, the global expansion of Chinese terminal operators and ports is fast in recent years, especially along maritime silk road. Among these companies, COSCO Shipping Port and CMPort are the leading operators, as well as HPH. DMP is one of the collaborative case between China and Africa along OBOR in the joint venture model.

Furthermore, cooperation is motivated by various reasons and objectives, but mainly focus on: profit maximization, market expansion, cheap resource obtaining, know-how acquisition, competitiveness enhancement, network expansion, cost saving, environment protection, efficiency improvement, competition mitigation, joint marketing activities, national strategic needs, financial support. Besides, one cooperation project can be motivated by one reason or several reasons simultaneously. In general, the cooperation is happened when the involved parties reach relatively high fit and be complementary, especially for the model of equity acquisition due to its high dependence and risks.

It is difficult to measure whether it is successful of existing collaborative projects so far due to complex situations. Nevertheless, BSC method and GRD method are conducted to evaluate performance of DMP-I case, which is expected to provide references for later studies. In short run, we find that the cooperation project still can achieve parts of objectives even the scale is small and project is not mature. And under the model of

equity acquisition, the level of management engagement, information exchange, business promotion and know-how training tend to perform well. In long run, there are a lot of risks and uncertainties as the cooperation will be influenced by multi-factors, such as shareholder's interest, trust mechanism, stability of politics, competition of hinterland resource from other ports, continuous vitality, and business promotion etc.

Therefore, according to the Djibouti port cooperative case study, we suggest that shareholders should unify development objective, intensify business promotion and develop more hinterland resource on the basis of trust to make the cooperation port to be a modern port with industrial support and multiple hinterland resources. Meanwhile, strengthen its know-how, combining with new technologies to make it into an efficient hub in the area. Moreover, localization is also significant for cooperative projects, as it could promote friendship between local citizens and foreign companies.

In addition, it is important for seaports to find an appropriate way when facing different situation and objectives, because every collaboration has its own advantages and disadvantages. For instance, under joint venture (equity acquisition) model, the involvement ports can cooperate deeply in many aspects, the risks, however, is also higher than other models.

## *6.2 Limitations and Further Research*

Although we have insightfully analysed the motivation and evaluate performance, we still have limitations in our thesis:

- The sample of cases - not abundant enough, which causes the result limited.
- Information of case port - most of our information is obtained by online and expert interview, therefore, it might have some deficiencies in the perspective of accuracy.
- Performance evaluation - fifteen indicators cannot reflect the overall situation; the interviewed expert number is limited; the cooperative time is still short; all these factors might influence the accuracy of results.
- Scope of port cluster – in the process of performance evaluation, Jeddah port, ports of Eritrea and Somalia should also be included, the current port cluster we defined is small due to the limitation of the data resource;

Therefore, in the future, more collaborative cases should be included to enrich the motivations and performance studies. Besides, further evaluation research in long term is recommended, which should include: dynamic industrial position changes, cooperative performance appraise, as well as impact on regional economy and transportation. As port throughput is an essential indicator to measure competitiveness, we can identify whether cooperation benefit port throughput growth compared to other ports in the cluster from regional position changes. However, further analysis is needed as the increase in throughput might be the result of multiple factors. What's more, the cooperation project



will become relatively mature and stable in long term, it will be more worthy and easy to measure the performance. Finally, in order to integrate the impact evaluation, how much the cooperation in Djibouti port has positive impact on regional economy and seaborne transportation should be analysed. In different countries and regions, the development of ports has different contributions to regional economy. Nevertheless, Z. Munim et al. (2018) in their thesis find that in developing countries higher quality of port infrastructure can indirectly facilitate regional economic growth, which provide some clues for further study.

## Bibliography

Apostolos Dedousis (2016). The impact of Piraeus' port privatization on port performance and port competition in the Mediterranean Sea. MSc in Maritime Economics & Logistics.

Balanced Scorecard Institute. Balanced Scorecard Basics:  
<http://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard>

Brendon J. Cannon (Mar 2018). How an Ethiopia-backed port is changing power dynamics in the Horn of Africa. The Conversation: <http://theconversation.com/how-an-ethiopia-backed-port-is-changing-power-dynamics-in-the-horn-of-africa-93308>

BusinessTech (Mar 2015). Africa's biggest shipping ports:  
<https://businesstech.co.za/news/general/81995/africas-biggest-shipping-ports/>

Camilla Trigona (May 2018). Djibouti Road Network, Logistics Capacity Assessment:  
<http://dlca.logcluster.org/display/public/DLCA/2.3+Djibouti+Road+Network>

CEIC. Kenya Container Port Throughput 2008- 2016:  
<https://www.ceicdata.com/en/indicator/kenya/container-port-throughput>

CEIC. Sudan Container Port Throughput 2012 – 2016:  
<https://www.ceicdata.com/en/indicator/sudan/container-port-throughput>

China Merchants Port Holding Company Limited. Annual Report 2017:  
<http://www.cmport.com.hk/UpFiles/bpic/2018-04/20180426042934273.pdf>

China Merchants Port Holdings Company Limited:  
<http://www.cmport.com.hk/EN/about/Profile.aspx?from=2>

China Merchants Port. Annual Report 2007-2017:  
<http://www.cmport.com.hk/EN/investor/Reports.aspx?p=2>

China Merchants Port. Throughput Volume 2008 – 2017:  
<http://www.cmport.com.hk/EN/investor/Operation.aspx?p=6>

China Merchants Port (May 2017). The grand opening ceremony of Djibouti Doraleh Multi-Purpose Port: <http://www.cmport.com.hk/EN/news/Detail.aspx?id=10007272>

China.org.cn (Sep 2015). Vision and actions on jointly building Belt and Road:  
[http://www.china.org.cn/chinese/2015-09/15/content\\_36591064\\_7.htm](http://www.china.org.cn/chinese/2015-09/15/content_36591064_7.htm)

CMG 145<sup>th</sup> Anniversary: <http://www.cmhk.com/main/xwzx/ztbd/145znzt/index.shtml>

CML. Group Profile: [https://www.cml-1872.com/en/gsjj/index\\_29.aspx](https://www.cml-1872.com/en/gsjj/index_29.aspx)

CMPA 2015, China-Malaysia Port Alliance.

Common Market for Eastern and Southern Africa (COMESA), Djibouti:

<http://www.comesa.int/republic-of-djibouti/>

Conversion Center. Convert TEU to measurement ton:

[http://www.conversioncenter.net/volume-conversion/from-TEU-\(4.25-ft-height\)-to-measurement-ton-\(MTON\)](http://www.conversioncenter.net/volume-conversion/from-TEU-(4.25-ft-height)-to-measurement-ton-(MTON))

COSCO Shipping Ports Limited. Container Throughput 2007- 2017:

<https://ports.coscoshipping.com/en/Businesses/MonthlyThroughput/>

COSCO Shipping Ports Limited. Overseas Terminals:

<https://ports.coscoshipping.com/en/Businesses/Portfolio/#OverseasTerminals>

Deena Kamel (Jun 2018). DP World denies out-of-court settlement in Djibouti port dispute. Business: <https://www.thenational.ae/business/economy/dp-world-denies-out-of-court-settlement-in-djibouti-port-dispute-1.740785>

Degang Sun, Xinxi Bai (Apr 2018). Current situation and prospect of Chinese participation in the construction of the port of Djibouti. Contemporary World:

[https://mp.weixin.qq.com/s?\\_\\_biz=MzI2NTE0NDI1OQ==&mid=2650034100&idx=1&sn=6b07724fd84359cafd711678d8d39c7f&chksm=f2a13d18c5d6b40e7b3a212970ed2b4358ef252e3196e955a8fe96df3b3103b7f6085aa23bc4&mpshare=1&scene=1&srcid=0504fb0Di90CVp09QGBpDbD3](https://mp.weixin.qq.com/s?__biz=MzI2NTE0NDI1OQ==&mid=2650034100&idx=1&sn=6b07724fd84359cafd711678d8d39c7f&chksm=f2a13d18c5d6b40e7b3a212970ed2b4358ef252e3196e955a8fe96df3b3103b7f6085aa23bc4&mpshare=1&scene=1&srcid=0504fb0Di90CVp09QGBpDbD3)

Djibouti, 2018 Index of Economic Freedom:

<https://www.heritage.org/index/country/djibouti>

Djibouti, International Trade Centre: <http://www.intracen.org/country/djibouti/>

DP World. Throughput Announcements 2012-2017: <http://web.dpworld.com/investor-centre/throughput-announcements/>

Elvira Haezendonck (2018). Port competitiveness & strategy.

Eurogate. Container Throughput Press Release 2011-2012:

<http://www1.eurogate.de/en/About-us/Press/Press-release/JPK-2013>

Eurogate. Container Throughput Press Release 2013-2014:

<http://www1.eurogate.de/en/About-us/Press/Press-release/Mega-container-ships-generate-higher-handling-volumes>

Eurogate. Container Throughput Press Release 2015-2016:

<http://www1.eurogate.de/hu/About-us/Press/Press-release/Container-handling-volumes-hold-up-well>

Eurogate. Container Throughput Press Release 2016-2017:  
<http://www1.eurogate.de/en/About-us/Press/Press-release/Gratifying-net-profit-despite-difficult-environment>

European Commission. Trade. China: <http://ec.europa.eu/trade/policy/countries-and-regions/countries/china/>

Fancello Gianfrance, Pani Claudia, Serra Patrizia, Fadda Paolo (2014). Port Cooperation Policies in the Mediterranean Basin: an Experimental Approach using Cluster Analysis. Transportation Research Procedia 3 (2014) 700-709. ScienceDirect.

Port Technology (Feb 2018). Djibouti Gov Denies Illegal DPW Terminal Seizure Claims: [https://www.porttechnology.org/news/djibouti\\_gov\\_denies\\_illegal\\_dpw\\_terminal\\_seizure\\_claims](https://www.porttechnology.org/news/djibouti_gov_denies_illegal_dpw_terminal_seizure_claims)

Guiwu Wei, Wende Yi (Jul 2008). Grey relational analysis method for multiple attribute decision making with incomplete weight information in intuitionistic fuzzy setting. 2008 Chines Control and Decision Conference.

H. Ruessink, D. Kopsick, R. Heiss, M.R. Koparova (2016). Port-to-Port collaboration. Environmental Crime and Collaborative State Intervention.

Hehui, Zhong (Oct 2016). Addis Ababa-Djibouti Railway open to traffic: China-Africa production capacity cooperation achieves significant early results. FOCAC:  
<http://www.focac.org/eng/zxxx/t1405999.htm>  
<https://www.toolshero.com/strategy/porter-diamond-model/>

Hutchison Ports. Annual Throughput: <https://hutchisonports.com/en/about-us/throughput/>

ITC (2009), Djibouti Trade Map:  
[https://www.trademap.org/\(X\(1\)S\(bfkgc0b5pxxsrf45losffs45\)\)/countrymap/Country\\_SelfProductCountry\\_TS\\_Map.aspx?nvpm=1|262|||4402|||4|1|1|4|2|1|2|1|1](https://www.trademap.org/(X(1)S(bfkgc0b5pxxsrf45losffs45))/countrymap/Country_SelfProductCountry_TS_Map.aspx?nvpm=1|262|||4402|||4|1|1|4|2|1|2|1|1)

J.O.Nyarandi. Way Forward for the Port of Mombasa. Kenya Port Authority:  
[https://www.jica.go.jp/information/seminar/2014/ku57pq00001zhohc-att/20140717\\_01\\_04kpa.pdf](https://www.jica.go.jp/information/seminar/2014/ku57pq00001zhohc-att/20140717_01_04kpa.pdf)

Jiabin Li, Yongsik Oh (Jun 2010). A research on competition and cooperation between Shanghai port and Ningbo-Zhoushan port. The Asian Journal of Shipping and Logistics, pp.067-092.

Jian Li, Bao Jian (Dec 2014). Cooperation performance evaluation between seaport and dry port case of Qingdao port and Xi'an port. International Journal of e-Navigation and Maritime Economy 99-109. ScienceDirect.

Jianghong.Gao (Sep 2016) China Merchants Group's layout of the global port city and pushes the "Port-Park-City" model. 21<sup>st</sup> Century Business Herald:  
<http://money.163.com/16/0919/05/C1A6TM9E002580SL.html>

Jinchen, Tian (July 2016). 'One Belt and One Road': Connecting China and the world. Macinsey&Compay: <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/one-belt-and-one-road-connecting-china-and-the-world>

JOPCA. About JOPCA: <http://www.jopca.org/en/about.html#01>

Jupeng Wang (Aug 2017). The story between China Merchants Group and Djibouti. ce.cn: [http://www.ce.cn/xwzx/gnsz/gdxw/201708/10/t20170810\\_24917912.shtml](http://www.ce.cn/xwzx/gnsz/gdxw/201708/10/t20170810_24917912.shtml)

Justina Crabtree (July 2018). While China slaps tariffs on the US, it's also championing free trade in Africa: <https://www.cnbc.com/2018/07/06/china-and-djibouti-open-free-trade-zone-in-africa.html>

Kenya Ports Authority. Performance Report. Annual Review and Bulletin of Statistics 2015: <https://www.kpa.co.ke/InforCenter/Pages/Performance-Report.aspx>

Kristijan Stamatovic, Peter de Langen, Ales Groznik (Mar 2018). Port cooperation in the North Adriatic ports. Research in transportation Business & Management 109-121. ScienceDirect.

Kristina Stifter (April 2018). Djibouti – the logistic hub of the Horn of Africa. PVT Group: <http://compass.ptvgroup.com/2018/04/djibouti-the-logistic-hub-of-the-horn-of-africa/?lang=en>

Lei Wang (Jul 2016). Seeing China and the United States competing in Africa from Djibouti. Pit.ifeng.com: [https://pit.ifeng.com/a/20160705/49297427\\_0.shtml](https://pit.ifeng.com/a/20160705/49297427_0.shtml)

Marc H. Juhel (Jun 2017). Container Terminal Concession Guidelines. SSATP. The World Bank.

Marco Ferretti, Francesco Parola, Marcello Risitano, Iolanda Vitiello (Mar 2018). Planning and concession management under port co-operation schemes: A multiple case study of Italian port mergers. Research in Transportation Business & Management 26 (2018) 5-13. ScienceDirect.

Michael Dooms, Larissa van der Lugt, Peter W. De Langen (Jun 2013). International strategies of port authorities: The case of the Port of Rotterdam Authority. Research in Transportation Business & Management 8 (2013) 148-157. ScienceDirect.

Ministry of Commerce People's Republic of China (May 2017). Main operational indicators of Djibouti Port in 2016: <http://www.mofcom.gov.cn/article/i/dxfw/gzzd/201705/20170502577191.shtml>

Mulder. P (2016). Porter Diamond Model. Toolshero: <https://www.toolshero.com/strategy/porter-diamond-model/>

Mulu Gebreeyesus (2016). Industrial Policy and Development in Ethiopia. Manufacturing Transformation: Comparative Studies of Industrial Development in Africa and Emerging Asia. DOI:10.1093/acprof:oso/9780198776987.003.0002

Njiraini Muchira, Allan Olingo (Sep 2017). Mombasa port transit cargo traffic in marginal growth. The East African: <http://www.theeastafrican.co.ke/business/Mombasa-port-transit-cargo-traffic-in-marginal-growth/2560-4105412-v98dpr/index.html>

OECD. Djibouti: <https://atlas.media.mit.edu/en/>

OECD. Ethiopia: <https://atlas.media.mit.edu/en/profile/country/eth/>

Overseas business department of CMG (Feb 2017). Djibouti Project: [http://www.cmhk.com/main/a/2017/b07/a32755\\_33575.shtml?2](http://www.cmhk.com/main/a/2017/b07/a32755_33575.shtml?2)

Oxford Business Group (2016). Investment and reform to expand role of industry in Djibouti: <https://oxfordbusinessgroup.com/overview/expand-and-upgrade-investing-key-segments-and-removing-bottlenecks-growth-promise-expand-industry%E2%80%99s>

Oxford Business Group (2016). New transport infrastructure positions Djibouti for trade: <https://oxfordbusinessgroup.com/overview/connecting-country-new-transport-infrastructure-better-positions-djibouti-international-trade>

Peter Shaw-Smith (July 2017) Djibouti increasingly attractive to shipping as hub status grows: <https://fairplay.ihs.com/ports/article/4289571/djibouti-increasingly-attractive-to-shipping-as-hub-status-grows>

Piraeus Port Authority (Feb 2018). Piraeus Port Sees Profit Surge under COSCO's Ownership. World Maritime News: <https://worldmaritimenews.com/archives/244233/piraeus-port-sees-profit-surge-under-coscoss-ownership/>

Piraeus Port Authority S.A. Statistics 2008-2011: <http://www.olp.gr/en/stats>  
Port De Djibouti S.A. Port of Djibouti Statistics: <http://www.portdedjibouti.com/Pages/Statistics.php>

Port De Djibouti S.A. Statistics: <http://www.portdedjibouti.com/statistics/>

Port De Djibouti S.A: <http://www.portdedjibouti.com/>

Port of Aden. Statistics Data: <http://www.portofaden.net/Statistics.aspx>

Port of Antwerp. International Cooperation: <http://www.portofantwerp.com/en/international-cooperation>

Port of Rotterdam: <https://www.portofrotterdam.com/en/news-and-press-releases>

Port of Salalah. Annual Report (2010, 2015, 2017): <http://www.salalahport.com/index.php?lang=en&name=Annual%20Reports&itemid=103>

Port Sudan. Statistical & Tariff. Report for the Year 2013: [http://sudanports.gov.sd/portal/statistics/statistics\\_list.php?menuItemId=2&q=%28Type~equals~Statistics%29](http://sudanports.gov.sd/portal/statistics/statistics_list.php?menuItemId=2&q=%28Type~equals~Statistics%29)

Portstrategy (May 2018). Ethiopia diversifies trade access with Sudan and Kenya port investment: <http://www.portstrategy.com/news101/world/africa/ethiopia-diversifies-trade-access-with-sudan-and-kenya-port-investments>

Qiang Liu (Apr 2015). The Significance, Opportunities and Challenges of the One Belt

One Road Strategy. Xinhua news: [http://www.xinhuanet.com/politics/2015-04/02/c\\_127650223.htm](http://www.xinhuanet.com/politics/2015-04/02/c_127650223.htm)

Ralf Fiedler & Verena Flitsch (Sep 2016). Port cooperation between European seaports – fundamentals, challenges and good practices. Fraunhofer Center for Maritime Logistics and Services CML.

Republic of Djibouti. Geography & population: <http://www.djibouti.dj/en/about-djibouti/geography-region/>

Saif Mohd. Khan, Karan Arora (2017). Scope of India's and China's Investment in African Continent. Information Technology and Quantitative Management. Procedia Computer Science 122 (2017) 691-697. ScienceDirect.

Shipping and World trade. International Chamber of Shipping: <http://www.ics-shipping.org/shipping-facts/shipping-and-world-trade>

Sohar Port and Free Zone. Port Statistics 2018: <http://www.soharportandfreezone.com/en/shipping/port-statistics>

Sohu News (May 2017). Djibouti Doraleh Multi-purpose Port is officially opened: [http://www.sohu.com/a/143790593\\_397917](http://www.sohu.com/a/143790593_397917)

Statista. PSA International's throughput from FY2009 to FY2017: <https://www.statista.com/statistics/325943/throughput-of-psa-international/>

Statista. Volume of containers handled by APM terminals from FY2009 to FY 2017: <https://www.statista.com/statistics/326005/containers-handled-by-apm-terminals/>

Steve George, Brad Lendon (Mar 2018). 'Weaponizing capital': US worries over China's expanding role in Africa. CNN: <https://edition.cnn.com/2018/03/09/asia/djibouti-port-china-us-intl/index.html>

Tay Yoshitani (2017). PNW Seaport Alliance: Stakeholder's benefits of port cooperation. Research in Transportation Business & Management. ScienceDirect.

The World Bank (2018). Overview of Djibouti:  
<https://www.worldbank.org/en/country/djibouti>

Theo Notteboom, Jean-Paul Rodrigue. The corporate geography of global terminal operators:  
<https://pdfs.semanticscholar.org/574e/840e60b24b27b20dfa95a5d67f168c431b29.pdf>

Trade Economics, Djibouti – Economic Indicators:  
<https://tradingeconomics.com/djibouti/indicators>

UNCTAD (2017). Review of maritime transport.

UNCTADSTAT. Container port throughput annual 2010-2017:  
<http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=13321>

Valentin Carlan, Christa Sys, Thierry Vanelslender (Sep 2015). How port community systems can contribute to port competitiveness: Developing a cost-benefit framework. Research in Transportation Business & Management. ScienceDirect.

Wang Xi (Mar 2018). The US and the military are concerned that China may take over the Djibouti terminal. Radio Free Asia:  
<https://www.rfa.org/mandarin/yataibaodao/junshiwaijiao/nu-03072018105429.html>

Weiwei Huo, Wei Zhang, Peggy Shu-Ling Chen (Jan 2018). Recent development of Chinese port cooperation strategies. Research in Transportation Business & Management.

World Bank Group (Jun 2014). Republic of Djibouti High-Level Development Exchange Launch of “Vision Djibouti 2035” Outcome Note.

WPSP. Environmental Ship Index ESI:  
<http://www.environmentalshipindex.org/Public/Home>

Xinhua News Agency (May 2016). Wang Yi: “One Belt One Road” initiative achieves series of important early-stage harvest. Belt and Road Portal. YiDAIYILU.GOV.CN:  
<https://eng.yidaiyilu.gov.cn/sjjs/1702.htm>

Xu Zhao, Xiaowei Wang, Qiaolin Zhou (Dec 2016) Study on port cooperation mechanism in the background of “Marine Silk Road” strategy. China Soft Science

Ziaul Haque Munim, Hans-Joachim Schramm (2018). The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade. Journal of Shipping and Trade.



## Appendices

### *I. Trade Value of Djibouti and Ethiopia from 1997 – 2016*

Table 9 Trade value of Djibouti and Ethiopia

USD million		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Djibouti	Import	308.48	431.34	473.37	486.44	463.54	543.73	691.21	783.54	1013.07	1433.67
	Export	19.55	25.95	18.93	12.29	63.36	79.22	73.38	34.78	98.60	211.85
Ethiopia	Import	1113.28	1458.67	1385.76	1260.58	1811.18	1593.53	2683.05	2873.78	4094.78	5207.32
	Export	553.97	560.28	448.58	482.29	402.92	414.86	512.1	614.7	926.2	1042.96
USD million		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Djibouti	Import	1744.17	2103.82	2072.76	2260.89	2729.77	3319.63	3531.03	3602.45	4374.94	4412.82
	Export	207.95	272.11	193.70	119.60	134.06	130.85	167.21	156.09	136.77	112.13
Ethiopia	Import	5808.65	9680.33	7973.88	8601.77	8896.29	11912.93	14899.15	21914.37	25815.26	19120.74
	Export	1277.15	1601.83	1618.17	2329.79	2614.89	2891.35	4076.94	5666.89	5027.55	1723.89

## II. Container Throughput of Top Terminal Operators

Table 10 Container Throughput of CMPort, COSCO, HPH in 2007-2017

('m TEU)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CMPort	47	50	44	52	57	60	71	81	84	96	103
COSCO	40	44	46	49	51	56	61	67	69	78	88
HPH	66	68	65	75	75	77	78	83	84	82	85

Table 11 Container Throughput of Major Terminal Operators in 2012-2017 <sup>(1)</sup>

('m TEU)	2012	2013	2014	2015	2016	2017
PSA	60	62	65	64	68	74
HPH	77	78	83	84	82	85
APM	35	36	38	36	37	40
DPW	39	39	42	43	45	49
CMPort	60	71	81	84	96	103
COSCO	56	61	67	69	78	88
Eurogate	13	14	15	15	15	14
World	614	640	677	688	701	740

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<sup>1</sup> The container throughput of World comes from UNCTAD

### III . Throughput in the Djibouti port cluster in 2009 - 2016

Table 12 Throughput in the Djibouti port cluster (<sup>2</sup>, <sup>3</sup>, <sup>4</sup>)

	2009	2010	2011	2012	2013	2014	2015	2016
Djibouti ports total throughput ('000 mt)	11960	9387	13858	15044	15212	16899	18290	20362
container ('000 TEUs)	520	425	743	793	795	856	910	987
bulk cargo ('000 mt)	6656	5052	6279	6955	7103	8168	9008	10295
Mombase port total throughput ('000 mt)	19062	18934	19953	21920	22307	24875	26732	27360
container ('000 TEUs)	619	696	771	903	894	1012	1076	1091
bulk cargo('000 mt)	12748	11835	12163	13197	13469	14828	16456	16232
Dar Es Salaam port total throughput ('000 mt)	9003	10993	12084	13389	13880	15770	14260	15330
container ('000 TEUs)	371	410	477	547	554	613	684	648
bulk cargo ('000 mt)	5218.8	6811	7218.6	7809.6	8229.2	9517.4	7283.2	8720.4
Sudan port total throughput ('000 mt)	12020.1	10926.6	11962.3	8955.7	11818.3	11818.3	12433.38	12125.84
container ('000 TEUs)	500	439	464	441	538	538	566	552
bulk cargo ('000 mt)	6920.1	6448.8	7229.5	4457.5	6330.7	6330.7	6660.179	6495.439
Aden port total throughput ('000 mt)	14554.4	18973	13231.2	15627.6	18683.2	17906.2	6969.727	14608.85
container ('000 TEUs)	382	370	181	263	281	296	178	268
bulk cargo ('000 mt)	10658	15199	11385	12945	15817	14887	5154.127	11875.25
Salalah port total throughput ('000 mt)	37790	43204	39169	44318	42042	41261	38747	46952
container ('000 TEUs)	3340	3620	3201	3634	3343	3034	2569	3325
bulk cargo ('000 mt)	3722	6280	6519	7251	7944	10314	12543	13037

<sup>2</sup> The liquid bulk cargo of Djibouti port in 2015 is estimated by the average number of 2014 and 2016.

<sup>3</sup> Liquid bulk cargo of Aden port 2015-2016 is estimated in terms of other cargos annual growth rate.

<sup>4</sup> Non-container cargo of Sudan port 2014-2016 is estimated according to the growth rate of container.