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# An evaluation of mid-stream operation in Hong Kong

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## Abstract

**Purpose** – Mid-stream operation has had a significant role in Hong Kong's economic development since the 1960s. Prior to the building of container terminals in Hong Kong, cargo was mainly loaded onto and discharged from ocean-going vessels by mid-stream operations and then shipped to Europe and North America. This paper aims to reinforce mid-stream operation is considered a "must" in supporting the substantial growth of maritime industry and strengthening Hong Kong's role as an entrepôt.

**Design/methodology/approach** – The authors undertake a historical review of the evolution of Hong Kong's mid-stream operation over the past half-century and investigate the future of mid-stream operation in light of the Hong Kong Special Administrative Region government's policy of allocating Public Cargo Working Areas through an open auction process. Semi-structured, in-depth interviews are also undertaken in this study.

**Findings** – The emergence of container terminals generated competition for cargo between container terminals and mid-stream operators. In addition, the Hong Kong Special Administrative Region government's policy of allocating Public Cargo Working Areas to mid-stream operators through an open auction process intensified negative influences on the survival of the mid-stream operation sector.

**Originality/value** – To date, mid-stream operation has been abandoned nearly everywhere except in Hong Kong. Yet, Hong Kong's container system has become the most advanced in the world. The authors explain how and why mid-stream operation still plays such a key role in Hong Kong and how to enhance its sustainability. The authors also discuss the academic and managerial implications of their findings.

**Keywords** Hong Kong, Sustainability, Container terminal, Mid-stream operation, Public Cargo working

**Paper type** Research paper

## 1. Introduction

Hong Kong has one of the most productive container ports in the world. One of the port's oldest industries, mid-stream operation (MSO), currently supports around one-quarter of

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total container throughput. MSO is the loading and unloading of cargo ships moored at buoys or anchorage in the harbour. MSO sites in Hong Kong mainly serve for the loading and unloading of ocean and river cargo between barges and trucks. A wide range of vessels, from bulk, break-bulk and semi-container vessels to fully cellular container ships, are served. MSO offers a distinctive advantage in Hong Kong's port: the ability to operate simultaneously on both sides of a ship at sea rather than on only one side at a time, as when a ship is berthed at a container terminal. MSO maintains a significant role in the maritime industry because:

- the handling fees in MSO are 40 to 60 per cent cheaper than at container terminals; and
- trade volume within Southeast Asia continues to grow at a rapid pace, providing extended market coverage for MSO.

MSO is characteristic of shipping in Hong Kong and an essential part of the Hong Kong logistics industry. According to the Port Development Board (formerly the Hong Kong Port Development Council), by the early 1990s, there were 2,000 privately owned lighters servicing ships moored mid-stream and about 200 lighters "specially designed" to carry containers. MSO can be more efficient than container terminals in some respects – for instance, by offering lower initial costs and more diverse and flexible services. MSO mitigates container traffic at terminals by reducing their workload, and it constitutes a specialised shipping market. It strengthens Hong Kong's role as an international shipping hub in a competitive environment.

Despite MSO's role in supporting import and export trading in Hong Kong, the Hong Kong Special Administrative Region (HKSAR) government has historically had a complacent attitude towards MSO. In 1992, the HKSAR government proposed to establish the River Trade Terminal in Tuen Mun to "operate as a consolidation point for containers and bulk cargoes shipped between the Port of Hong Kong and the Pearl River Delta as well as between the Port of Hong Kong and the inland waterways in Guangdong and Guangxi Provinces" (Port and Maritime Board, 2000; Dufour *et al.*, 2009). For cargo located near waterways, river trade is more cost-effective than overland hauling, as a river craft can move more containers than a tractor-trailer. As the clientele of the River Trade Terminal overlaps with that of MSO, the River Trade Terminal has decreased MSO's share in the cargo-handling business.

To generate profits and support sustainable business development, the HKSAR government allows terminal operators to lease parcels of the dedicated shoreline by auction. The auction operates as a private market, with no consideration of MSO as a related and supporting industry. As a result, public cargo working areas (PCWAs) are likely to be reduced dramatically. It is expected that three out of the existing eight PCWAs will be phased out progressively by 2020 [GHK (Hong Kong) Ltd., 2004]. The operation of PCWAs involves the short-term allocation of berths and waterfront working areas for the purpose of handling containers (35 per cent of total weight of cargo handled), sand and aggregate (17 per cent), waste paper (12 per cent), cement (11 per cent) and construction materials (8 per cent) transferred between lorries and barges (HKSAR Legco, 2016). The PCWAs are waterfront areas managed by the HKSAR government's Marine Department where the cargo transfer operations are conducted by a large network of relatively small and long-established family firms (Dufour *et al.*, 2009). The decreasing number of PCWAs adversely affects the movement of cargo and operating efficiency in the various seafronts of the harbour. Furthermore, MSO has inherent weaknesses in its operation chain that put it at a competitive disadvantage,

such as insufficient land sites for repositioning, limitations on the size of buoys that are a barrier to the operation of larger vessels at mid-stream sites, inefficient equipment and a lack of sheltered waters for anchorages (HKSAR Legco, 1993). Thus, the HKSAR government offers minimal assistance to and investment in MSO. Starting in 1991, the HKSAR Legislative Council began discussing MSO. However, the council underestimated the potential of MSO (HKSAR Legco, 1991) and further undermined MSO in the years thereafter (HKSAR Legco, 2013).

Since 2008, MSO has faced significant changes in its operational environment:

- PCWAs near the Central Business District (CBD) were recalled and reallocated for other purposes.
- The original allocation of PCWAs was conducted under short-term tenancy from the government. From 2008 onward, the allocation of PCWAs has gone through an open auction process that has increased the overhead costs of MSO.
- There have been a number of accidents, mostly caused by Pearl River Delta barge operators, which have forced the government to take an active role in supervising the safety of MSO.
- Safety concerns have led to restrictions on the maximum number of containers that may be loaded onto a barge.

We have identified three critical issues that may lead to significant changes for MSO in Hong Kong: the reduction of PCWAs, the auctioning of shoreline and the opening of the River Trade Terminal. MSO has been ignored in the maritime transport research. To fill in the research gap, we aim to address the evolution of MSO in Hong Kong and its role in Hong Kong's maritime industry. Below, we try first to identify the forces currently diminishing the role of MSO in Hong Kong's maritime industry and second to determine whether MSO should be abolished in the future. The rest of this paper is structured as follows. Section 2 describes the history of Hong Kong's port development. Section 3 discusses the evolution of MSO in Hong Kong and examines the present operating environment of MSO in Hong Kong. Section 4 concludes the paper.

## 2. History of Hong Kong port development

Hong Kong is one of the largest ports in the world. Its long maritime tradition began in August 1842. After the signing of the Treaty of Nanjing, Hong Kong was officially under British colonial rule. Evidence of the development of shipping and entrepôt trade was first recorded in 1844. The coolie trade contributed to the growth of shipping in Hong Kong. In response to the growth of international trade, Hong Kong evolved from an entrepôt to an international port between 1899 and 1940. Prior to the construction of container terminals, standardised containers were only handled at three facilities: the North Point Wharves, the Kowloon Docks and the Kowloon Wharves of Hong Kong and Kowloon Wharf and Godown Co Ltd (Marine Department, 2017). A 1966 report on containerisation suggested that Kwai Chung should be Hong Kong's purpose-built container terminal (Seabrooke *et al.*, 2003). Construction of the first three terminals began in 1970. Symbolic of the containerisation era is the first container ship to visit the terminal: *Tokyo Bay*, of Overseas Container Lines (P&O Nedlloyd), used the Kwai Chung Container Terminals in September 1972. Hong Kong boasted that the port "has a worldwide reputation for catering to the requirements of modern shipping" (Loughlin and Pannell, 2010). In the 1970s, two terminals were in

operation at the Kwai Chung Container Terminals. Terminal 1 was run by Modern Terminals Limited beginning in 1972. In 1974, work on Terminal 4 commenced on behalf of Hong Kong International Terminals. Modern Terminals Limited and Hong Kong International Terminals became the main operators at the Kwai Chung Container Terminals (Wang, 1998; Airriess, 2001).

Deng Xiaoping carried out economic reforms to achieve a "socialist market economy" and implemented an "open-door" policy in 1978 (Airriess, 2001; Cullinane *et al.*, 2004; Zhang *et al.*, 2005). These liberalisation policies generated significant growth in trade volume and traffic. After Shenzhen became a Special Economic Zone, Hong Kong's manufacturing sector shifted to the Pearl River Delta due to low land and labour costs. More manufacturers used Hong Kong for export because while China's ports had not containerised, Hong Kong was reputed to have world-leading container terminal facilities during this period (Wang, 1998). Aided by China's favourable trade policies, the Hong Kong port rode the waves of containerisation and Chinese economic growth. It expanded significantly with Terminals 4, 6, 7 and 8, while throughput at both Kwai Chung and Hong Kong International Terminals reached new peaks. Because of dramatically increased demand, the Hong Kong government carried out the Port Development Strategy Study, which recommended a development program and strategy for the construction of major new port facilities in Hong Kong (Marine Department, 2017). Between 1986 and 1996, Hong Kong's throughput reached double-digit growth, and Hong Kong firmly established itself as a global logistics hub (Wang, 1998; Wang and Slack, 2000; Yeung *et al.*, 2004; Fu *et al.*, 2010). The total container throughput of Hong Kong grew from 9.2 million TEUs in 1993 to more than 19.1 million TEUs in 2002 (Yeung *et al.*, 2004).In the 1990s, Hong Kong maintained its position as the world's busiest port measured by container throughput (Wang and Slack, 2000; Loo and Hook, 2002; Seabrooke *et al.*, 2003).To enlarge container terminal capacity, Terminal 9 was opened in 2004 on the south-eastern shoreline of Tsing Yi Island. The enlargement of what was now known as the Kwai Tsing Container Terminals (formerly the Kwai Chung Container Terminals) helped Hong Kong to keep its role as one of the leading ports for southern China in the twenty-first century (Marine Department, 2017).

Basically, MSO is not a heavy capital investment as the operation has no need of wharf. Thus, MSO rates are about ½ to 1/3 of the container rate at container terminals. MSO is a primitive way of container handling. MSO flourished in Hong Kong when there was a shortage of handling capacity for the container terminal in Hong Kong and South China. The 1990s saw continuous growth and the consolidation of a unique kind of container-handling mode in Hong Kong, MSO. MSO contributes to the service flexibility of the Port of Hong Kong by offering smaller container ships the ability to lie at secure buoys in the harbour and be unloaded by barge. This relieves congestion and bottlenecks on port infrastructure. In the long term, this increases container terminals' capacity and encourages the port to operate efficiently (Wang, 1998). Besides, MSO creates another choice of shipping lines to handle their business, rather than at terminal, therefore supporting to generate a balanced market mechanism. It has strengthened Hong Kong's position as the regional hub port (HKSAR Legco, 1999). Furthermore, MSO suits the characteristics of some trading activities like the west-bound trade of Taiwan to Hong Kong or South China trade when an ocean going vessel discharge full container loads (FCLs) to be carried to many river ports in Pearl River Delta (PRD). Container can be discharged into river trade vessels/barges directly without the need to pass through the terminal. Operational cost will be decreased significantly.

## 3. Methodology

A qualitative research approach has been adopted to gather substantial unpublished, qualitative information. Apart from historical and legislative documents, the researchers carried out seven semi-structured, in-depth interviews with key personnel. Because of confidentiality agreements, all details of the interviewees are excluded in our reporting. The target interviewees are held in supervisory and managerial job position of maritime industry ranging from liner firm, terminal and maritime logistics associations. The interview questions are mainly focused on the current and further development for MSO; the comparative advantages of container terminal and MSO; MSO contribution to Hong Kong development; the critical factors to sustain MSO in Asia-Pacific; the regulatory issues relevant with the development of MSO; and the changes and pressures that happened at MSO after the introduction of container terminal.

## 4. Mid-stream operation

### *4.1 History of mid-stream operation*

According to Wan (2009), MSO has played a significant role in the economy of Hong Kong since the 1960s. Prior the containerisation period, MSO provided the cargo handling service for ocean-going vessels. In 2015, 4,175 persons engaged in the MSO sector which provides direct and indirect employment opportunities. Also, MSO obtained HKD5.6bn revenue (Census and Statistics Department, HKSAR, 2017). In other words, MSO continue contributing to the well-being of Hong Kong economy. Hong Kong was already one of the major manufacturing cities in the global market at that time, and commodities from mainland China were transported to Hong Kong for re-export beginning in the 1980s. Long before container terminals were established, products were loaded and unloaded from ocean-going vessels by MSO and then shipped to North America and Europe. However, by the twenty-first century, the relocation of manufacturing industries in Hong Kong and the development of sophisticated ports for sea-freight transport and container services in southern China threatened the survival of MSO in Hong Kong.

Currently, there are three main components of Hong Kong container throughput. MSO is one of them. Hong Kong MSO has handled containers since the early 1970s. In November 1972, the UN held the world's first Conference on International Container Traffic in Geneva, Switzerland, to which over 120 nations and organisations sent delegates. The concept of containerisation was widely accepted by delegates, which led to the governance of ship particulars, capability and safety by the International Standardisation Organisation and International Maritime Organisation and the replacement of the traditional Break-Bulk Marine Transport Model by the Containerisation Marine Transport Model (HKMOA, 2017). Prior to the introduction of containers, ships used in MSO were built from wood. Bulk cargo was moved to wooden barges, which were then towed to the shore by tugs. The kinds of cargo being carried were diverse and included bricks, sugar cane and fresh and frozen food from mainland China and rice from Southeast Asia. Beginning in the 1950s, steel barges were used, increasing capacity and stability. Materials such as sand, metals and stone could now be handled by MSO (Marine Department, 2017). At the same time, Hong Kong, though blessed with a natural harbour, lacked a container terminal. To meet market demand, in the early 1970s, the British colonial government issued a grant to a private terminal developer to construct a container terminal with three berths at Rambler Channel near Kwai Chung Sea Bed. However, the three berths faced capacity

constraints, notably during peak hours. Vessels were required to wait for berths, which disrupted shipping lines' schedules and raised their costs. That motivated shipping lines to consider the use of derrick barges to load and discharge containers from waiting vessels, contributing to the development of the now-familiar operational model of MSO (HKMOA, 2017). Although MSO does not involve large ships, it has contributed to a significant percentage of total throughput since the 1980s, especially when the container terminals were near their maximum capacities (Marine Department, 2017).

Due to containerisation, the international shipping industry grew significantly. To ease berth congestion, the British colonial government proposed providing more land to establish additional container terminals. Four container terminals with a total of 14 berths were opened by private developers under various terms and conditions in 1976, 1985, 1988 and 1991. Container throughput increased at a faster pace than the number of available berths; however, mainland container terminals had not yet fully developed leads to trans-ocean shipping lines and failed to call mainland ports directly. As a result, there was an on-going shortage of container berths that continues to the present day. Although Hong Kong-China feeder services were expanded rapidly, MSO achieved record performance into the early 1990s. Further, derrick barges were modified and enlarged for use in MSO. MSO thus made a dramatic contribution to Hong Kong's port development (HKMOA, 2017).

The Port Control (Cargo Working Areas) Ordinance (Cap 81) established PCWAs to help meet demand in 1974. The first PCWA was set up in Wan Chai, and berths were allocated on a first come, first served basis. The Marine Department controlled two public waterfronts and nine PCWAs. In this period, all PCWAs were open daily from 0700 to 2100 and upon special application. The PCWAs have been provided a larger strip of land behind the waterfront for cargo handling, and with some modern handling equipment. PCWAs are seafronts for MSO cargo operations managed by the cargo handling section. On the whole, a PCWA aims to foster MSO operators to carry out cargo transfer across vanning, seawall and devanning operations (Marine Department, 2017). In the past two decades, MSO has been significantly developed and modified. The government allocated two pieces of land with an area of 6.9 hectares for MSO on a 50-year basis under open tender to the public near Stonecutter Island. The tender awarded land to design and plan an operation that would perform at a level as near as possible to that of Kwai Chung Container Terminals. Because charges for the use of the container pier were and are relatively high and the supply of land is inadequate, MSO has endured in Hong Kong (HKMOA, 2017).

### *4.2 Current trends in mid-stream operation*

Land is the scarcest commodity in Hong Kong. No wharves with proper cargo cranes have been installed in the territory to handle traditional cargo. Hong Kong relies on MSO to supplement services provided for the import and export of container and bulk cargo. MSO has two requirements. The first is a movable container barge with its own derrick crane, called a lighter. The second is a shallow water depth (5 m) (Kim and Morrison, 2012). MSO involves the loading and unloading of containers to and from cargo ships while at sea, with barges or dumb steel lighters performing the transfer and the distribution of containers occurring at piers nearby. Ocean-going vessels do not need to berth alongside for cargo loading and unloading; they simply drop anchor at mooring buoys and discharge their cargo with the help of single-derrick cranes installed on board local dumb steel lighters. This kind of derrick crane-equipped

lighter is unique to Hong Kong, and MSO is seldom used outside of Hong Kong (Fung, 2002; Yip *et al.*, 2002; Gunaskaran and Ngai, 2004; Green Cross, 2010; Fu *et al.*, 2010; Loughlin and Pannell, 2010). Traditional MSO in Hong Kong is illustrated in Plate 1.

In the maritime industry, Hong Kong has become the only place in the world with at-sea loading and unloading operations. MSO in Hong Kong has boomed. At present, 28 shipping lines use MSO. In Hong Kong, MSO takes place at 11 different locations (e.g. Western District, Chai Wan, Yau Ma Tei, Stonecutters Island, Rambler Channel, Tuen Mun, Lamma Island, etc.) occupying a total land area of 24 hectares and water frontage of 4,936 m. At present, the main MSO operators include Fat Kee Stevedores Ltd (2017), Tai Wah Sea/Land Heavy Transportation Ltd and Transward Ltd. Currently, the berth width of Chai Wan PCWA is 40 m, that of Stonecutter Island PCWA is 50 m and that of Rambler Channel PCWA is between 20 and 30 m (Marine Department, 2017).

*4.3 Advantages and disadvantages of mid-stream operation*

MSO has demonstrated seven key advantages. It:

(1) can be rapidly removed, deployed, expanded and relocated;

(2) is minimally affected by seabed provisions;

(3) needs no foundation work;

(4) can be established in a large number of locations;

(5) causes no ground subsidence;

**Plate 1.**
Traditional MSO in Hong Kong

**Source:** Author

(6) has a low impact on the environment (Kim and Morrison, 2012); and
(7) has low costs (Fu *et al.*, 2010).

However, MSO faces pitfalls, as it:

- is affected by weather conditions;
- is disrupted or damaged by serious waves;
- needs stabilisation or mooring systems; and
- has increased operational costs and has a short life cycle (Kim and Morrison, 2012).

MSO is inefficient, as the vessels that carry it out are not self-propelled but towed (Malchow, 2012; Kim and Morrison, 2012). Researchers criticise MSO for the danger involved in transferring cargo between two ships at sea, a very difficult operation. Workers must stay at the top of high stacks or in cramped spaces in cargo holds so as to guide containers into twist locks at their four corners. The slewing mechanism relies on the combination of a wire drum, a counterweight and a manually applied foot brake. This cargo handling technology hardly complies with international safety standards (Green Cross, 2010; Malchow, 2012). Four fatal accidents occur in MSO on yearly average (Marine Department, 2017).

*4.4 Future challenges for mid-stream operation*

Hong Kong handled 21 million TEUs of containers in 2009. Of that total, 74 per cent were handled by container terminals at Kwai Tsing Container Terminals, with the rest handled mid-stream by Hong Kong's mooring buoys and river trade facilities. In the early 1990s, more than 30 per cent of all containers were handled by MSO. At present, only approximately 10 per cent of the huge port's container throughput of 24 million TEUs is left to this unique cargo handling operation (Malchow, 2012; Kim and Morrison, 2012). In 2015, Hong Kong handled 20.1 million TEUs; only around 4.5 million TEUs were handled by MSO (Marine Department, 2017). The moorings also handle most of Hong Kong's break-bulk cargo. Bulk shipping handles bulky, unpacked goods such as oil, gas, grain, minerals and timber. Figure 1 summarises Hong Kong container throughput involving Kwai Tsing Container Terminals, the River Trade Terminal and MSO.

MSO in Hong Kong augments container terminals so that they have more capacity to meet the high demand for terminal services. More container terminals were completed and put into operation over the past 10 years. MSO has complemented terminal operations due to the functions of MSO in Hong Kong both as a transhipment point between barges and ocean-going vessels (especially for intra-Asia lanes) and as a consolidation point for barges dispatching cargo to the Kwai Tsing Container Terminals (Europe or America). MSO and container terminals cater to different customer needs (Fung, 2002; Dufour *et al.*, 2008; Dufour *et al.*, 2009; Fu *et al.*, 2010).

The next few years are expected to see significant changes in the mix of the port's container-handling services as additional capacity is added and as the Hong Kong container terminals compete with nearby ports in South China, particularly Shenzhen Port (Zhang *et al.*, 2005; Fu *et al.*, 2010). While MSO is a low-cost operation compared to container terminals, some higher-value cargo on larger vessels may be better suited to the terminals. Because MSO only involves transferring cargo from ships at anchorages and buoys, its fees are 40-60 per cent lower than shore operations (i.e. terminal handling charges), and MSO also acts as a valve for overflow from shore

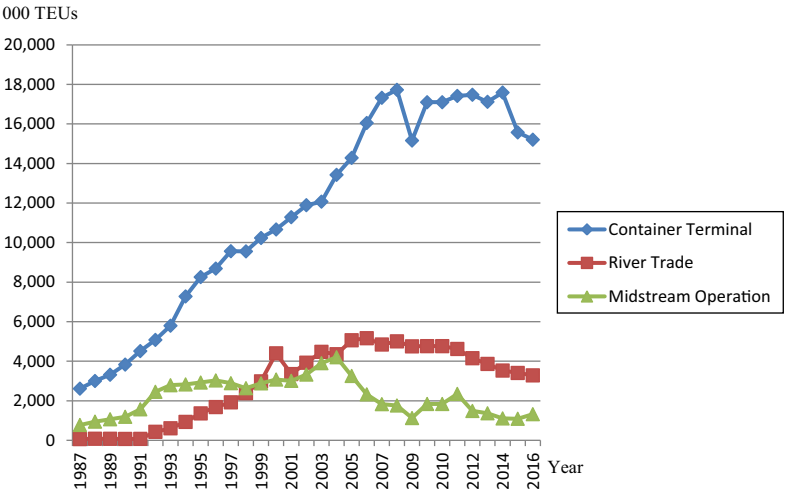


**Figure 1.**
Hong Kong container throughput (1987-2016)

**Source:** Marine Department (2017)

operations. However, limitations on equipment pose a technical upper limit on the size of ship that is appropriate for MSO. In general, only 21.1 per cent of cargo is handled by MSO (Marine Department, 2017), and MSOs contribute about 2.3 per cent to the economic viability in Hong Kong (Census and Statistics Department, HKSAR, 2017). To retain flexibility to respond to changing volumes, we recommend that the current mix of long- and short-term tenancies be retained with some short-term tenancies extended to encourage greater investment in facilities to increase throughput and efficiency. The possibility and feasibility of upgrading some waterfront sites outside the inner harbour for alongside berthing should be kept under review.

According to Wan (2009), MSO will fade out if unfavourable conditions continue. First, Victoria Harbour is becoming narrower. Hence, the future of PCWAs operating on its shores must be reassessed (Dufour *et al.*, 2009). Currently, mid-stream vessels are becoming either too deep-draughted or too long. If this trend continues, we predict that it will strain the capacity of the anchorages. MSO fundamentally benefits from smaller ships (i.e. 3500 TEUs or below) (Loughlin and Pannell, 2010). To improve productivity at anchorages and ease congestion problem, the government has implemented a series of measures, such as reviewing charges to encourage faster turnaround and discourage non-cargo-working activity at the sites closest to mid-stream sites [GHK (Hong Kong) Ltd., 2004; Dufour *et al.*, 2009]. If MSO is to survive as a viable operational model, we recommend associating it with mainland Chinese businesses or moving it to another country.

Second, MSO has faced a serious problem of extortion and thievery in the early stages of operation. This has led the government to discourage the further development of the MSO industry (Dufour *et al.*, 2009). Third, the government has adopted a more favourable policy towards the container terminals, subsidising their operations, while imposing stricter licencing and labour requirements and restrictive financial conditions on MSO. Thus, the number of mid-stream operators has dropped

significantly in recent years (only three large operators with direct land bases remain in regular operation) (Fu *et al.*, 2010). Fourth, the government needs to attract shipping lines and their cargo to Hong Kong. Otherwise, MSO only competes with container terminals and the River Trade Terminal in a diminishing shipping market. Fifth, MSO and PCWA workers are unskilled and not well educated; they are unable to seek alternative work in other trades (Wong, 2012). Education and training will be a key issue for MSO in the future. The National 13th Five-Year Plan and the Belt and Road Initiative highlighted that education and training can foster manpower development to sustain the growth of different maritime sectors (HKSAR Legco, 2017). Comprehensive maritime education and training would upgrade skills and knowledge for the remainder of one's working life (Lau and Ng, 2015). It would also improve the competitiveness of Hong Kong's maritime industry and boost Hong Kong's position as a regional maritime hub. However, it is not obvious that academic institutions offer professional education programmes are relevant with MSO. A shortage of skilled labour still exists in MSO.

## 5. Conclusion

MSO represents the evolution of Hong Kong's maritime industrial development since the 1960s. The appearance of MSO diversified the shipping market segment of Hong Kong maritime industry; MSO was fundamental to establishing the maritime industry in Hong Kong, and it solidified Hong Kong as a trade centre in the Asia-Pacific region. When container terminals are well developed in PRD, the enlargement of container terminal capacity induces much less needs for MSO. Nevertheless, the interviewees point out that the government has not taken a proactive role in supporting MSO due to a poor financial return. What will be the fate of MSO? The decline of MSO is unavoidable in the forthcoming years. In the coming years, the interviewees indicate that MSO will face unfavourable conditions, including strong competitors, unstable sea condition that affected cargo handling, reduced a number of cargo barges, a lack of skilled labour, a waterfront shortage, increased capital intensity, competition with direct international sailing from PRD ports and longer distances between the waterfront and the anchorage area. These conditions will lead to MSO's gradual decline in the maritime industry. In the past 10 years, the introduction of an open auction process to allocate PCWA berths has significantly increased operating costs for both PCWA and MSO operators. Consequently, the weaker existing players will be phased out and the stronger operators will dominate the market. To cope with the shortcomings, the interviewees proposed that:

- opening up more anchorages for specialised cargo, such as Junk Bay, Sham Shui Kok and Causeway Bay (after withdrawal of buoys). These anchorages are geographically located in a more sheltered area which is ideal for specialised or project cargo;
- revising labour policy;
- avoiding accidents and enhance maritime safety standards;
- allocating more PCWAs and expanding waterfront area (barge berth); and
- maintaining marine traffic control over the usage of space in the harbour.

Because cost figures and relevant data are commercial secret, it is difficult for researchers to collect data from maritime stakeholders and published materials.

However, we undertake a small scale of qualitative study by interviewing seven participants in the maritime industry. Their insights can generate a useful reference for maritime industry to review MSO's position in the Far East. To a certain extent, MSO creates a foundation of Hong Kong maritime industry and diversifies the coverage of maritime service. This preliminary study provides a possible research work in the future. How the business leaders transform the culture and business models of MSO? How to establish a sound safety management in MSO? These research studies can fill in the previous research gap in maritime studies.

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