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**TOWARDS A SUPPLY CHAIN MANAGEMENT MODEL IN EGYPTIAN SEAPORTS**

A Dissertation Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Business Administration

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**ABSTRACT**

This dissertation primarily aims to examine the relationships between Port Supply Chain Orientation(PSCO), Port Supply Chain Management Practices(PSCMP) and Port Performance(PP), the dissertation also attempts to test whether the proposed relationships of the framework can be applied across different types of ports and different port groups.

The current dissertation applied the philosophy of pragmatism, which supported the researcher‘s choice of mixed methods . Mixed methods research is utilised in the current dissertation to achieve the listed research objectives by both qualitative and quantitative data. Mixed methods is regarded in the current study as appropriate and consistent with the nature of interpretivist and positivist enquiry.

The current dissertation was carried out by means of a literature review, interviews and questionnaire surveys in two Egyptian seaports, which are Alexandria and Sokhna ports. The two ports were selected based on different characteristics between them regarding these items: port management, the level of automation, geographical position, the total amount of throughput and the number of shipping lines deal with them.

With respect to the response rate for each port, 341 questionnaires were distributed in Alexandria port, 179 out of the 185 returned responses were found to be valid (valid response rate=52.49%), while in Sokhna port 98 questionnaires were distributed and 92 out of 95 returned responses were identified to be valid (valid response rate=93.8%). The total valid response rate was 61.73%.The data collected through questionnaire were analysed using SPSS version 24 and partial least squares SEM (PLS-SEM) approach SEM analysis techniques.

The findings of this dissertation showed that PSCMP has a direct and positive impact on port effectiveness and efficiency , PSCO has a direct and positive impact on PSCMP , PSCO has a direct and positive influence on port effectiveness while it has no positive impact on port efficiency. Moreover, the results revealed that PSCMP partially mediates the relationship between PSCO and effectiveness as well as mediates the relationship between PSCO and efficiency.

Finally, the multi-group analysis showed that the research model can be applied across Alexandria and Sokhna ports as well as port operators and users groups . However, the proposed relationships of the model have significant differences across operators and users groups in Alexandria port.

Regarding the practical contribution of the dissertation, The outcomes are expected to aid port managers and other port supply chain partners that have direct or indirect power over port performance to focus their attention on improving port performance through applying port supply chain orientation and port supply chain management practices.

**Keywords** Port supply chain orientation, Port supply chain management practices, Port performance, Value added logistics services, Lean practices.

**CHAPTER (1) INTRODUCTION**

* 1. **Research background**

Maritime transport is the backbone of international trade and a key engine driving globalization, the demand for seaborne trade is derived from the demand for international trade (Lun et al., 2010). In fact, over 80 percent of global trade by volume and more than 70 percent of its value being carried on board ships and handled by seaports worldwide *(*UNCTAD, 2017). In Egypt, maritime and related logistical services play an important role in developing the Egyptian economy, they constitute 36% of GDP and 16% of jobs in economy. The foreign seaborne trade volume of Egypt represents about 90% of the Egyptian foreign trade volume.

Seaports are the main industrial and commercial tools for economic and social development of the countries (Hlali and Hammami, 2017) and they are considered as a necessary element for facilitating seaborne trade (Tongzon et al., 2009; Simoes and Marques, 2010). According to Roa et al. (2013), seaport is a multidimensional system combined between economical function, infrastructure system, geographical space and trade.

The definition of port has evolved over time, the evolution is discovered by fourth generations, which explain that the economic, geographical, technological, and international trade transformation influenced the meaning of the seaport concept over time (Hlali and Hammami, 2017). For the first generation, ports were essentially interfaces between the land and the sea in goods transport. Their role was then focused on the subsequent activities, the loading and unloading of ships, storage and delivery of merchandise.

For the second generation, port and port service providers have a vital role in the global port functions. The port is considered a service centre in the transport sector, industry and trade. It can consequently implement and offer its users industrial or commercial services which are not directly linked to traditional activities like loading/unloading but which are indirectly through the logistical services offered by the port.

The third generation ports are evolved due to the global expansion of containerization and intermodalism, jointed to the growing demands of international trade. The decision-makers, managers and operators of a port of the third generation have different views towards the operation for which they are responsible. They observe the port as a dynamic link in the international production and distribution system.

The fourth generation ports are distinguished by their internationalization and diversification on the basis of the network system, which attaches many port areas and permits the cooperation with other ports, these are called network ports. Recently, some authors discuss about the fifth generation ports, such as: Flynn et al. (2011); Lee and Lam (2013); Lee et al. (2014).

According to Flynn et al. (2011), “four port generations” framework is not enough to reflect the port functions required by the community and the needs of port users in the fast evolving globalised economic system. Thus, The fifth generation ports reflects the concept of customer orientation.

From the above discussion regarding seaports evolution, it can be noticed that the role of ports within the supply chain has taken different forms and development paths with the increasing emphasis on value-added activities and the gradual integration of ports into the supply chain (Pettit and Beresford, 2009). In other words, ports have been studied as an isolated transportation unit, while it is now essential to study ports in the context of supply chain management.

Tongozon et al. (2009) argued that ports need to be oriented towards supply chains to meet the changing needs of their customers (e.g. shipping lines and shippers) and accomplish their new role in the supply chain management era. Moreover, Bichou and Gray (2004) revealed that most managers in ports appear as they have a common recognition of ports as key logistics and distribution centres however, they lack an understanding of logistics and supply chain management concepts and consequently an ability to apply the related techniques to identify, manage and assess performance. Accordingly, it becomes inevitable to study the concept of SCM in seaport regarding its practices and orientation.

Supply chain management (SCM) is defined as ”*the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole*” (Mentzer et al., 2001).

Simchi-Levi et al. (2003) view SCM as a set of approaches used to efficiently integrate suppliers, manufacturers, warehouses, and stores so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time in order to minimize systemwide costs while satisfying service-level requirements. Some authors like Hsu et al. (2009) suggested that SCM creates value added activities, they view Supply chain management stresses the seamless integration of value-creating activities across organizational boundaries. It allows firms in a supply chain to eliminate waste, leverage synergies and compete more effectively in a strongly competitive global market.

Even though a huge number of organizations have realized the importance of applying SCM, they often do not know exactly what to apply, due to a lack of understanding of what constitutes a comprehensive set of SCM practices (li et al., 2006). SCM practices viewed as techniques that managers implement in order to define how the chain operates (Cigolini et al., 2004).

There are different SCM practices applied in different sectors. Tan (2002) summarised 25 SCM practices in manufacturing industries under six main dimensions: supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and Just in time (JIT) Capability. Ulusoy (2003) assessed four of the supply chain management practices in manufacturing industries, they are, logistics, supplier relations, customer relations, and production. Moreover, Petrovic -Lazarevic et al.(2007) identified five dimensions for SCM practices in Australian manufacturing companies, namely, supplier and customer relations, internal operations which refer to all activates related to production systems and internal logistics flow, information sharing, information technology and training.

Lenny Koh et al. (2007) determined twelve dimensions of SCM practices in manufacturing small and medium size enterprises in Turkey. The authors grouped the practices into two factors: outsourcing and multi-suppliers (OMS), and strategic collaboration and lean practices (SCLP). The first factor contains seven practices, namely, close partnership with suppliers, close partnership with customers, JIT supply, Supply chain benchmarking , Strategic planning, holding safety stock and few suppliers, while the second factor contains five practices, namely, outsourcing, E-procurement, 3PL, subcontracting and Many suppliers. Okongwu et al. (2015) used only three SCM practices, information sharing, supplier partnership and customer orientation. More and more SCM practices found in relevant SCM literature, the researcher gathered these practices in chapter two Table 2.3

Despite the huge number of different SCM practices that found in SCM literature, few articles applied SCM practices in services sector and no article found in maritime sector. By considering the argument that maritime transport SCM does not match well with manufacturing SCM characteristics (Kuiper 2005), therefore a cautionary approach should be needed when adapting the theories, concepts and practices used in SCM research to maritime transport research. Accordingly, the current study works on investigating the most relevant SCM practices in maritime industry, specifically, in Egyptian seaport sector. The investigated SCM practices is denoted by port supply chain management practices (PSCMP), which considered as the first construct of the current dissertation.

According to Min and Mentzer (2004), managers first need specific behavioural guidelines within the firm’s boundaries before Setting SCM philosophy in motion known as supply chain orientation. Mentzer et al. (2001) also emphasized the importance of embracing supply chain orientation within a firm and argued that without developing a supply chain orientation inside a firm, hard indeed to implement supply chain management across the firms within the supply chain. Accordingly, supply chain orientation considered as antecedents for SCM implementation.

Hult et al. (2008) defined supply chain orientation as “*the extent to which there is a predisposition among chain members toward viewing the supply chain as an integrated entity and on satisfying chain needs in an integrated way*”. Moreover, Schulze-Ehlers et al. (2014) view SCO as the total positive attitude of an entrepreneur towards collaboration with supply chain partners in all phases of the supply chain and the recognition of common goals of members along the supply chain. Min and Mentzer (2004) proposed that a supply chain oriented firm should build and maintain the following cultural elements of relations with its supply chain partners: trust, commitment, cooperative norms, organizational compatibility, and top management support. These five dimensions of SCO were mostly used by a large number of authors (Patel et al., 2013; Min et al 2007; Miocevic Crnjak-Karanovic, 2012).

Regarding the dimensions of SCO in maritime sector, very limited empirical work on port supply chain orientation exists in relevant literature (Tongzon et al., 2009).There are only two studies that highlighted the whole concept of SCO in seaports (Woo et al., 2013; Tongzon et al., 2009). According to Woo et al. (2013), four dimensions of PSCO were determined, namely, Organizational relationships (OR), Human resources (HR), financial resources (FR) and Top management support (TMS), while Tongzon et al. (2009) used four different dimensions to measure SCO. These dimensions are relationship with users (RWU), value-added services (VAS), inter-connecting inter-modal infrastructure (ITM) and channel integration practices (CIP). The researcher views the dimensions of SCO applied by woo et al., (2013) are nearly like the dimensions applied by Min and Mentzer (2004), which considered as antecedents for SCM implementation.

Based on the above discussion, it can be said that there is a shortage of studies that focus on identifying dimensions of SCO in port review. Accordingly, the current research works on investigating the most relevant SCO dimensions in maritime industry, specifically, in Egyptian seaport sector. The investigated SCO dimensions is denoted by port supply chain orientation (PSCO) which considered as the second construct of the current study.

The third construct of the current study is known as port performance (PP), it was handled in port literature from two point of view, port performance measurement and port performance improvement. First, Performance measurement systems in ports are split between measuring either internal efficiency or external effectiveness (Bichou, 2006), but hardly used to capture both dimensions. According to Talley and Marsillac (2014), a port is technically efficient when it maximizes its output in the utilization of given levels of resources, while the port considered to be effective when it optimizes its overall operating objective in the provision of port service. Bichou (2006) argued that a single focus on either efficiency or effectiveness does not mean that this is the only way to increase performance, as there are many examples of ports around the world that operate effectively but are still inefficient, and vice versa.

Due to the heightened competitive pressure on ports within a supply chain, it is essential to measure performance levels that extend beyond the optimization of operations, cost reduction, time efficiency and trade promotion objectives. Ports are increasingly expected to meet other performance criteria by ensuring the highest service reliability and standards relating to quality, safety, security, environmental protection and social inclusion (UNCTAD, 2017). Accordingly, it is suggested that, in the global supply chain era, Port performance should reflect the effectiveness aspects of ports concerning customers’ perspectives and expectations (Song and Panayides, 2008), as well as the internal efficiency aspects of port operation. Thus, the two aspects of port performance measurements (effectiveness and efficiency) will be used to measure port performance in the current study.

Second, In port literature there are different approaches used to improve port performance, some studies examined the impact of privatisation on port efficiency claiming that transfer of ownership from public to private authority will lead to an improvement in economic efficiency and, hence, financial and operational performance (e.g. Cullinane and Song, 2002). Another study pointed out that human capital will improve port efficiency (De, 2005). Some authors confirmed that improving port efficiency can be achieved through applying advanced information technology (e.g., Bisogno et al., 2015). Other studies emphasised that applying lean concept in seaport will enhance port performance (e.g. Loyd et al., 2009; Olesen et al., 2015). Moreover, Beresford et al. (2009) concluded that logistics activities improved performance in Korean ports.

Based on Mentzer et al. (2001) definition for SCM, which implies that SCM can be used as an approach to improve performance, and the relevant SCM literature that considered lean practices, logistics services and information technology as supply chain management practices (lusoy, 2003; Burgess et al., 2006; Petrovic -Lazarevic et al., 2007; Haque and Islam, 2013; Ghatebi et al.., 2013; Sah et al., 2014), in addition to the shortage of studies that empirically test the impact of various port SCM practices simultaneously on port performance in the Middle East and Egypt. Therefore, the current study focuses on applying SCM as an integrated and holistic approach for improving Egyptian seaport performance.

The relationships between the three construct PSCMP, PSCO and PP in the current study can be discussed in three points. Firstly, the literature is replete with examples of firms that have improved their performance using SCM practices. Tan (2002) Concluded that supply chain management practices positively impact firm performance. Wisner (2003) demonstrated a positive relationship between SCM and firm performance. Moreover, Petrovic -Lazarevic et al. (2007) confirmed that SCM practices extensively improve firms’ performance. Hsu et al. (2009) confirmed that there was a direct influence of supply chain management practices on firm performance.

Chong et al. (2011) showed that SCM practices could improve firms’ innovation and organizational performance in Malaysian manufacturing and service firms. Cook et al. (2011) disclosed that SCM practices can lead to better performance depending on the position of the company in its supply chain. Valmohammadi (2013) confirmed that there is a positive and significant relationship between SCM practices and organizational performance.

Despite the huge amount of studies confirmed that there is a positive relationship between SCM and performance, there is no article examines this relationship in maritime context. In other words, it is obvious that there is a shortage in SCM and port literature that highlighted the impact of various SCM practices simultaneously on port performance aspects (effectiveness and efficiency).

Table 1.1 shows all the causal relationships between SCM practices and different variables in different context. It can be noticed from this Table that no study tests the impact of port supply chain management practices on port effectiveness and port efficiency.

Accordingly, the current study aims to examine the relationship between PSCMP and port performance aspects (effectiveness and efficiency).

Secondly, although there is an existing literature that highlighted the importance of supply chain orientation and integration to the supply chain performance (e.g. Min and Mentzer, 2004; Min et al., 2007), a very limited empirical work on port supply chain orientation was found in port literature (Tongzon et al., 2009). Furthermore, Tongzon et al. (2009) concluded that there was no clear-cut positive relationship between supply chain orientation and terminal performance. Moreover, the researcher found no studies examined the relationship between PSCO and port performance aspects (effectiveness and efficiency). Thus, the current study aims to test the relationship between PSCO and port performance dimensions (effectiveness and efficiency) in Egyptian seaport context.

Thirdly, There was also a few research that examined the relationship between SCO and SCM practices (e.g. Min and Mentzer, 2004; Min et al., 2007), while no study tested this relationship in maritime sector, especially, in Egyptian seaport. Based on this, the current study aims to enrich maritime literature by examining the impact of PSCO on PSCMP in Egyptian seaport.

**Table 1.1** Causal relationships between SCM practices and different variables

| **Authors** | **Causal relationships** | **Sector applied** |
| --- | --- | --- |
| Tan(2002) | SCM practices →firm Performance | Manufacturing industries |
| Min and Mentzer(2004) | SCO→SCM →business performance | Manufacturing and Services industries |
| Wook Kim(2006) | SCM practices/ the level of SC integration /competition capability →performance | Small and large manufacturing corporations |
| Li et al.(2006) | SCM practices →Organisational Performance / Competitive Advantage |  |
| Petrovic -Lazarevic et al.(2007) | SCM practices →firm Performance | Manufacturing companies (e.g., food, textile, chemical, others). |
| Lenny Koh et al.(2007) | SCM practices → operational performance/ SCM-related organizational performance | Manufacturing Small and Medium size enterprises (SMEs) |
| Min et al.(2007) | MO→ SCO→SCM →business performance | Different firms whose managers are belong and responsible for SCM |
| Bayraktar et al.(2009) | SCM- IS Inhibitors →SCM Practices/IS Practices →Operational Performance | Manufacturing SMEs of fabricated metal products |
| Hsu et al.(2009) | Operations Capability →SCM Practices →firm performance | Managers identified from Institute for Supply Management (ISM) |
| Peng Wong and Yew Wong (2011) | Knowledge management capability →SCM Practices →firm performance | Manufacturing companies |
| de Souza Miguel (2011) | SCM →operational performance | More than 20 firms in different industries |
| Cook et al.(2011) | SCM Practices →organizational performance | Retail sector |
| Gharakhani et al.(2012) | SCM Practices → Innovation performance/ organizational performance | Manufacturing and service firms |
| Prajogo et al.(2012) | ISO 9000 implementation →SCM practices→ operational performance | Manufacturing and non-manufacturing firms. |
| Thatte et al.(2013) | SCM practices → supply chain responsiveness / competitive advantage | Manufacturing supply chain area |
| Haque and Islam(2013) | SCM practices → customer satisfaction | Pharmaceutical industry |
| Ghatebi et al.(2013) | SCM practices →competitive advantage | Manufacturing companies |
| Valmohammadi (2013) | SCM practices → organizational performance | Manufacturing organizations |
| Sah et al.(2014) | SCM practices → organizational performance | Automotive industries |
| Govindan et al.(2014) | SCM practices →supply chain sustainability | Automotive supply chain. |
| Abdallah et al.(2014) | SCM practices→ supply chain performance | Manufacturing companies |
| Handoko et al. (2015) | ERP system / SCM practices →firm Performance/Competitive Advantage | Public companies |
| Vencataya et al.(2016) | SCM → competitive advantage/ operational performance | Hospitality sector (Four Star Hotels) |
| Khalil et al.(2019) | SCM →Innovation→ organizational performance | Small and Medium Enterprises (SMEs) |

**Source:** Tabulated by the researcher

IS information sharing

ERP enterprise resource planning

Regarding the theoretical basis of the current dissertation, it was found that the most frequent theory used in SCM review is Resource-Based View (RBV) (Karatas-Cetin and Denktas-Sakar, 2013; Kembro et al., 2014; Halldórsson et al., 2015). RBV has emerged as an important and effective theory of persistent superior performance in the strategic management literature (Barney and Arikan, 2001).

RBV theory postulates that the combination of different resources and how they are managed impacts firm capabilities and can result in competitive advantage and superior performance if the resources are valuable and inimitable, and have no equivalent substitute (Barney, 1991; Barney, 2012).

Moreover, Barney (2012) and Hunt and Davis (2008) argued that supply chain management practices are capabilities that result in variation in firm performance, also Golicic and Smith (2013) suggested that environmental supply chain practices are expected to not only enhance firm performance, but also provide sources of competitive advantage. Based on this arguments, the researcher applies RBV theory as theoretical base for the current study as the study aims to improve Egyptian seaport performance via implementing PSCMP.