The Analysis of Logistics Model in Special Economic and Trade Zones for Manufacturing and Exporting Large Engineering Assets

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***Abstract*—The purpose of this study is to analyze and plan the logistics model for Special Economic and Trade Zones (SETZ). Firstly, the orientation and the characteristics of the different types of domestic special zone is compiled. The preferential laws of international SETZ are then summarized, with a discussion regarding the supplementary measure when setting the SETZ in order to encourage Taiwanese entrepreneurial investment or to improve foreign companies setting up headquarters in Taiwan. Lastly, the logistics model for SETZ's characteristics is planned. This study takes the manufacturing and the export of large-scale engineering assets as an example, analyzing the supply chain's status of large equipment. Afterwards, according to the case company's business strategy and demand in the future, plans the operation model as a foundation and a basis of building the SETZ when the case company entering and being stationed in SETZ.**

Keywords- logistics model; special economic and trade zones; large-scale engineering assets

I. INTRODUCTION

Facing the global trade and fierce competition, companies must improve their efficiency in logistic and supply chain operations [1, 2, 3]. Taiwan has designed several special export-oriented industrial zones combining with trade incentives to expand the capacity of existing infrastructure with global competitive advantage. The purpose of Export Processing Zone (EPZ) or Free Trade Zone (FTZ) is mainly to attract foreign investment and expand exports [4], while the purpose of Science Park is to promote the development of export-centric high-tech industries. Both special zones have some incentives, such as one administrative window, bonded and tax concessions. With the changes in global economics, the two special zones mentioned have lost the competitive advantage. In particular, the expansion of the domestic demand in China, cheap land, labor costs and favorable tax incentives, and convenient administrative measures provided by local governments all attract global industries wanting to expand their businesses. That makes Taiwan to rapidly lose its competitive advantage. Recently, Taiwan and the regional economies face great challenges. Issues such as the efficiency of government administration, capital outflow, and unemployment need to be addressed. Under the accelerating trend toward global trade liberalization, developing or near developed regions, such as Taiwan, seek to merge into the global economic system [5], reduce industry migration to other countries, and further grab opportunities of global economic growth [6].

Cross-strait deregulation increases the return of capital and cash flow from Taiwanese business abroad. The government intends to develop the Special Economic and Trade Zones (SETZ), which is a special operation district of the economy, based on the "zone within zone" concept. Taiwanese firms can carry out manufacturing process, logistics and transportation in the region of SETZ. This idea was proposed by government and is under careful study for the possibility of SETZ establishment within the EPZ. The establishment of SETZ will bring a great benefit to the economic development and industrial upgrading in Taiwan. For the economic development, the "SETZ to SETZ" operational mode provides an efficient way for linking the Taiwan and China industry. Furthermore, it is a new model in vertical integration of a work force between cross-strait economies. This model also

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makes it convenient for enterprises to manage their logistics between cross-strait facilities. For the industrial upgrading, SETZ is planned to be established in the existing special industrial zones (such as EPZ, science parks, FTZ, and offshore shipping centers) or the areas close to these zones. The major logistics and manufacturing companies will support the processing or logistics business in the special zones. The flow of goods between special zones is still tax-bonded and that should promote the economic cluster. Among a variety of special economic zones, the operational modes of EPZ and SETZ are similar to each other. Therefore, the management model, business model and administrative information systems in SETZ can be modified based on the best practice of EPZ.

II. THE SETZ LOGISTIC MODEL

Because of the characteristics of a "special zone within special zone" operation mode in SETZ and the major reason that the critical processes or key components have to be provided by Taiwan's high-tech industries, the flow of goods between SETZ is frequent. The vertical division of labor is taken between SETZ [7, 8]. Key operations and order-taking headquarters are based in Taiwan. They take orders directly from foreign clients, clients in China, or indirectly from foreign subsidiaries. With respect to the allocation of orders and works, the cheap low-end components and WIP requiring mass production are manufactured in China or Southeast Asia, and the critical processes and key components– even customized components– are produced in Taiwan [1, 9]. It can be seen that the production logistics are such that the local vendors in China and Southeast Asia supply raw materials and transport those to Taiwan to assemble key components and conduct critical processes. They then transfer those to major markets to package and sell the products [10]. There might be some products sold inside and/or outside Taiwan markets. The logistic operations include Taiwan supplies key components and conduct final assembly processes to end products or key assemblies. The end products or key assemblies may be shipped overseas or sold directly in Taiwan market. So the frequent flow of import and export logistics, and even the back sales, will need a composite transport services to support the logistics and transfer operation processes in SETZ [11]. The point-to-point flow of goods operation mode in SETZ is that when orders are taken, if there are still inventories in the foreign warehouse in SETZ, then the goods can be immediately transported to the port terminals in order to deliver products on time. The sea routes to ship products back to Taiwan are the contents in the economic agreements in the way of point-to-point direct sail to ship products to the designated terminal. If the transfer is by air, it is also a direct flight to the Taiwan Taoyuan International Airport from foreign special zones. When the cargo arrives at the port or at Taoyuan airport, it is then shipped back to SETZ to facilitate the assembly, or re-processing, and completes the shipping operation. Taiwan's operational headquarters are responsible for taking orders, if there are stocks in the finished goods warehouse, they will pass the information directly to that warehouse to accurately ship the products. On the contrary, the orders will be converted to work orders, and ship WIPs to the assembly warehouse. After notifying the customs broker, the shipping information, and completing the customs declaration, they will contact the contractors to cargo the finished goods and ship those to the port terminal to transport those to China. Through a direct point-to-point shipment, the transfer of cargo to a foreign port and then a third party logistics company to send finished goods to the vendor-designated warehouse, the operators will conduct the final assembly of finished goods and then place the goods to the storage spaces to complete the procurement operations. Figure 1 shows the logistic operation mode in SETZ [12].

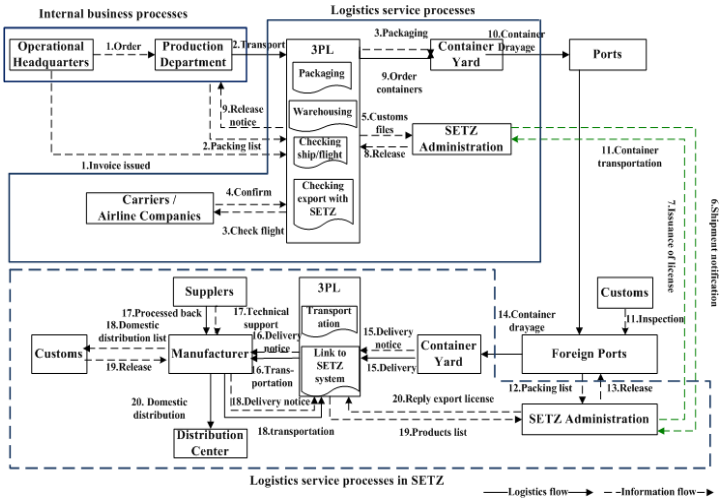

Figure 1. Logistic operation mode in SETZ [12].

A. The Logistic Process between Manufacturer and 3PL in SETZ

The services provided by an early logistics industry is the transportation of the goods to a packing company for packaging, shipping to container yard after loading, and final shipment loading onto the ship or aircraft. The current logistics industry in SETZ emphasizes the connection with the information systems of vendors and administration in order to provide complete shipping information, scheduling, container number, and ship and aircraft or other information. The detailed process is illustrated in Figure 2. First, the manufacturer books the product by enterprise resource planning (ERP) or business hub system [13, 14] after producing, and transports to the storage hub or notifies the third-party logistics (3PL) service provider by production department. The 3PL receives the goods at the logistics hub or the factory and the operation headquarters will issue an invoice at the same time. Then, the production department or 3PL will submit a packing list. Finally, the 3PL will send shipping notes and obtain permission. After that, the 3PL will check the ship schedules and arrange a cabin seat with freight forwarders. The SETZ administration contacts with foreign SETZ administration and releases the permission, and the 3PL can issue the export notes to the production department.

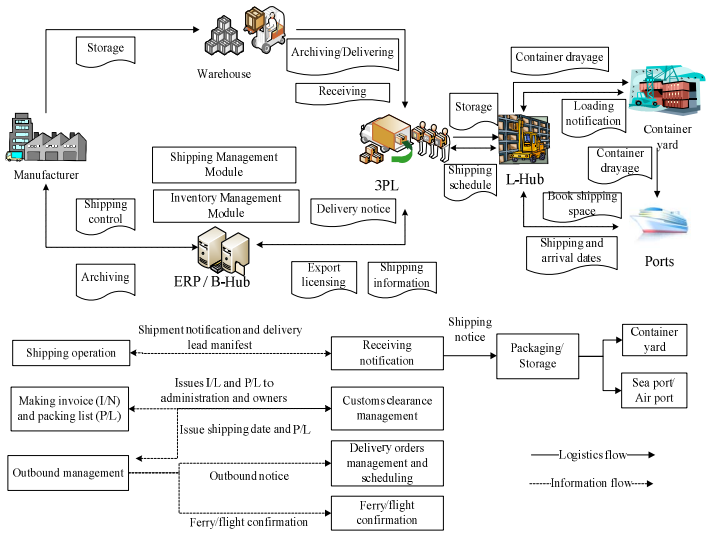

Figure 2. Logistics process between manufacturer and 3PL in SETZ.

B. *The Logistic Process between 3PL and Administration in SETZ*

The 3PL in SETZ will provide integrated logistics services in response to frequent logistics operation, including connecting with the information system of the SETZ administration in order to speed up the import and export operations. It focuses on the manufacturers importing materials or parts from foreign vendors and exporting finished goods to a foreign purchaser. Manufacturers have to apply for permission when importing materials or exporting products. Only when the approval message is received, can the goods be transported to the SETZ port. The procedure of informing the customs should be completed by the administration of SETZ. Finally, manufacturers can receive the goods to manufacture. 3PL is entrusted to transport the finished goods, and should package the products, check the flight, and send the invoice information to the administration of SETZ in order to receive the approval message. Figure 3 shows the Logistic process between 3PL and management in SETZ.

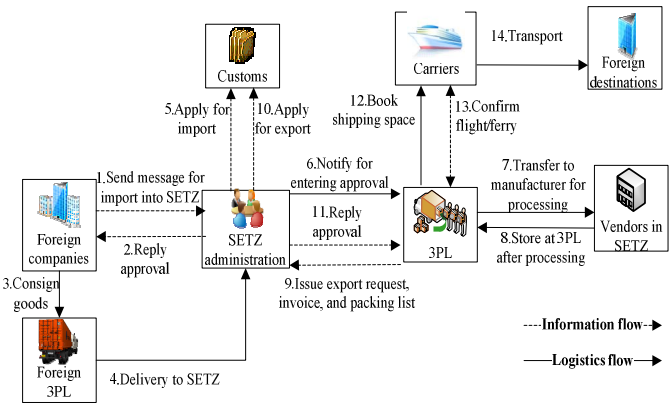

Figure 3. The logistic process between 3PL and administration in SETZ.

III. CASE DISCUSSION OF LARGE-SCALE ENGINEERING ASSETS

In the case discussion, a power transformer manufacturing company of the heavy electronic industry is selected for in-depth case study. The industrial transformers are critical and large-scale engineering assets own by power plants. As a result of the transformers' characteristics (large-scale, heavy, and expensive), the case company considers to set up a logistics and processing factory in SETZ to export the transformers.

Since the SETZs are mainly operated by point-to-point mode, the manufacturers can choose and purchase the other inexpensive suppliers in the area. As a result, in the feed mode of companies in special economic zone, the proportion of foreign suppliers will increase much more. If it is supported by the corresponding information system, the flow of goods in different countries would also reduce the time of customs inspection and information processing. This can reduce the various freight problems caused by manufacturers coming from different countries [15]. Figure 4 describes the logistic model in SETZ.

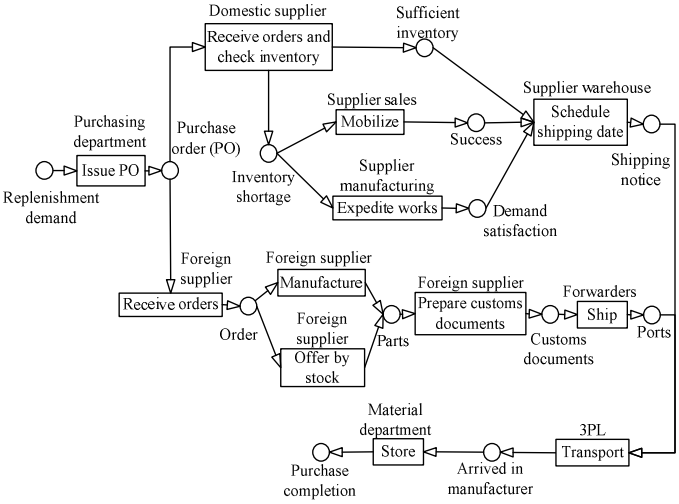

Figure 4. The logistic model in SETZ.

The logistic model of the output in the SETZ can be divided into two modes: delivery whole appliance of smaller machines directly and disassembly of the larger machines. To the smaller machine, in order to save resources and avoid components lost in the process of shipping, it will deliver the machine directly to the designated locations without disassembling. The obvious difference between as-is and to-be (improved) logistic modes and processes is that if the customer's location is in a foreign area, after the machines finish assembling, electrical test and the other preparations, when the companies contact the freight industry they will also convey the relevant information of the customs clearance to be forwarded to the 3PL industry. After the logistics companies handled the details about shipping and received the customs clearance information from the administrative center of SETZ, then the goods will be delivered to the designated locations. At

the same time, the administrative center of SETZ will contact with the foreign customs and inform relevant information about customs clearance. When the shipment is arrived at foreign port, the transformer can be directly delivered to foreign client after notifying the local customs. Figure 5 is the logistic model in SETZ for whole product delivering mode.

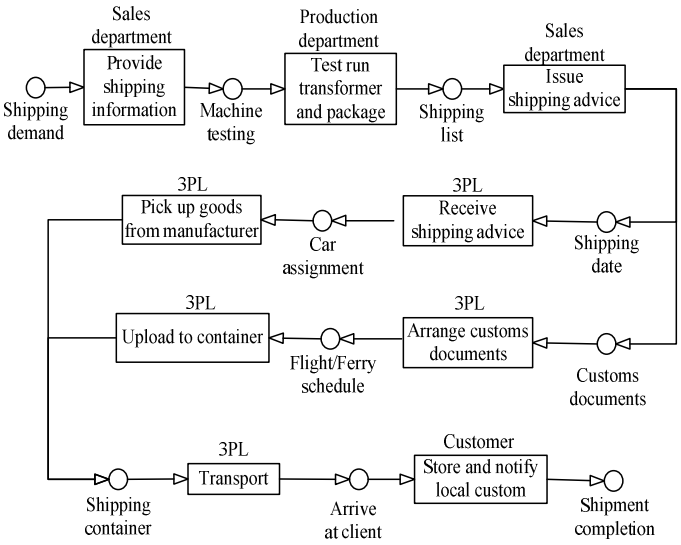

Figure 5. The logistic model in SETZ- whole product delivering mode.

Figure 6 is the flow chart for the bigger machines that deliver to a foreign area [16, 17]. Similarly, before the company ships the machine, it must be assembled and tested by an electrical then disassembled, packed in boxes, and then those boxes passed, with relevant information, to the 3PL industry. In accordance with the specific date, the logistics industry arranges the storage and flight schedules for the boxes [18, 19]. At the same time, they also pass the received data to the administrative center of SETZ in order to communicate with the relevant members of the foreign agency, and speed up the processes of customs when the goods arrive.

About after-sales service, in the past, the case company's engineers cannot provide the relevant service directly for foreign customer. When the transformers have a breakdown or maintenance, case company needs to designate local contracted workers to repair or only provide technical guidance for the foreign country. When establishing SETZ, the vendors operating in SETZ can streamline procedures for granting entry and issuing landing visas for business personnel. Therefore, it is convenient for case company to appoint the technicians into the foreign special zones. Figure 7 shows the after-sales service mode in SETZ.

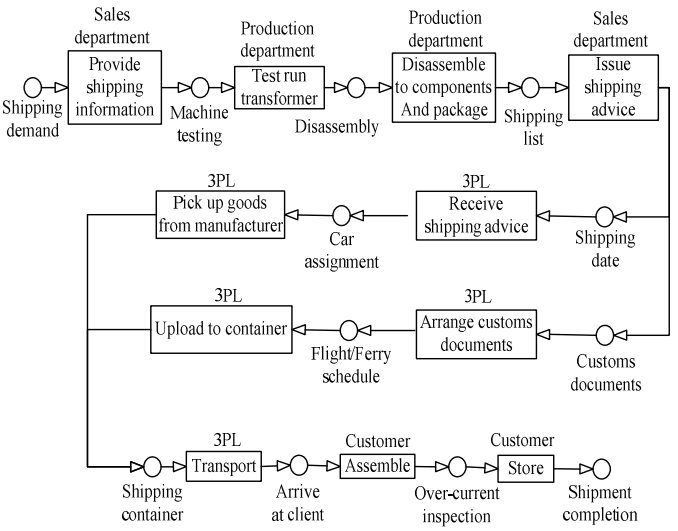

Figure 6. The logistic model in SETZ- disassembly mode.

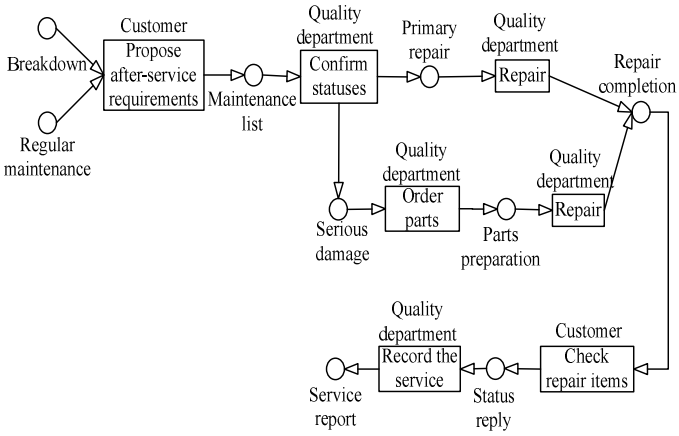

Figure 7. The logistic model in SETZ- after-sales service mode.

IV. DISCUSSION

The purpose of setting up SETZ is to actively engage Taiwan in the global supply chain network leveraging Taiwan's advanced manufacturing technologies and R&D capabilities. In addition, SETZ is to make the flow of goods and information more free to attract companies stationed, thus increasing the economic development. Further, SETZ initiatives also intend to develop Taiwan becoming the operational center of the Asia-Pacific region. Table 1 describes the differences of the 'As-Is' and 'To-Be' model in the benefit of the SETZ.

TABLE I. The comparison between As-Is and To-Be models

Items of comparison	As-Is Model	To-Be Model
Product shipping process	All shipments are required to complete customs procedures before shipping.	SETZ takes the advantage of the "within national territory, but outside customs territory" and "point-to-point" approaches to transport shipments conveniently.
After-sales service	Vendors have to delegate foreign technicians to execute maintain service.	Vendors operating in SETZ can assign their own technicians to maintain owing to the convenient inward and outward flow of personnel.
Procedures of custom clearance	Mostly handle by customs broker and rely on paper works.	Complete the customs procedures on information platform via Internet.
Procurement cost	Because of the statutory policy, components are almost provided by domestic suppliers.	It is allowed to purchase raw materials, components from the area with lower cost.
Information transparency and accuracy	Insufficient IT applications to communicate and coordinate.	Participants can share important information with the development of platform.
Goods tracking	Inquiries the progress of logistics by phone or fax.	Real-time update track & trace via the Internet.
Target customer	Focus on domestic large-scale project companies.	Trade with international companies and provide comprehensive products and after-sales services.

V. CONCLUSION

Currently, there are many different types of special zones in Taiwan, such as EPZs and Science Parks. However, in order to response the liberalization of the world economy, Taiwan government seeks to provide a more generous environment to attract more business and capital. Therefore, the government decides to promote the establishment of SETZ which can provide a comprehensive range of logistics services and create a better trade opportunities for domestic enterprises. This paper analyzes the critical factors of a logistics model between companies and SETZ and uses the heavy electronic industry as case study. We hope the proposed logistics approaches and suggestions with SETZ can help the heavy electronic industry to develop innovative logistics model. In addition, the scope and regulation of SETZ in Taiwan are still drawing up. Future research can propose the corresponding system platform in SETZ and evaluate the performance of the other industry sectors.

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