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The relationship between logistics performance and customer loyalty in manufacturing companies using (3PLs) services in Egypt

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Abstract

Nowadays, the third-party logistics providers (3PLs) has become an important issue in facilitating and moving business internally and externally. Thus, this study aims to examine the association between logistics performance and customer loyalty of third-party logistics providers (3PLs) from their manufacturing customers' perspectives. This study proposes a model which examines the relationship between the logistics performance index (LPI) and both customer satisfaction and customer loyalty from one side and the relationship between organizational logistics performance (OLP) and both customer satisfaction and customer loyalty from the other side. The results support that both the logistics performance index and organizational logistics performance index have a positive impact on both customer satisfaction and customer loyalty. In addition to supporting 3PLs to measure their logistics performance from their manufacturing customers' perspective and providing insights on how to retain their customers in general and manufacturing companies in specific.

Keywords

Logistics Performance Index (LPI); Organizational Logistics Performance (OLP); Customer Satisfaction (CS); Customer Loyalty (CL); Third-party logistics providers (3PLs)

Article history

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1. Introduction

Logistics play an important role within the supply chain. This role can help different companies especially manufacturing to reach their ultimate markets more promptly by reducing the delivery time of products and overcoming different industrial problems in case their production activities are decentralized and geographically dispersed.

Globally, the fierce competition forced manufacturing companies to distinguish their performance and create their competitive advantages to outperform their rivals. These can be achieved by offering distinctive business strategies and strategic concepts which in turn enhance their capabilities to provide tailored business solutions that exceed customers' expectations and gain their loyalty as well. In addition to that, this global fierce competition forced manufacturers to use (3PLs) as a strategic partner (özoğlubüyükkeklik, 2017; Mentzer et al.,2001).

Moreover, for the supply chain to be successful, both third-party logistics providers (3PLs) and shippers must work together to obtain data on time and to achieve their ultimate supply chain goals, which allow shippers to use the supply chain techniques as a competitive advantage (the 23rd Annual Third-Party Logistics, 2019).

Accordingly, third-party logistics providers (3PLs) are defined as "a firm which provides multiple logistics services for use by customers. Preferably, these services are integrated, or "bundled" together by the providers. These companies facilitate the movement of parts and materials from suppliers to manufacturers and finished products from manufacturers to distributors and retailers. Among the services which they provide are transportation, warehousing, cross-docking, inventory management, packaging, and freight forwarding". (Supply Chain Council, 2020).

Third-party logistics providers (3PLs) are becoming increasingly important in the economy and supply chains. Effective and quick service design is essential to their success. Moreover, manufacturing organisations are increasingly outsourcing their logistical activities to third-party logistics providers (3PLs) to meet their needs for logistics services.

Outsourcing the logistics function to (3PLs) and buying the service back, will help in enhancing the company's logistics activities more efficiently and effectively (Yayla et al., 2015). These manufacturing companies improve the quality of services and products and increase their efficiency levels by decreasing the costs of manufacturing through outsourcing to third-party logistics providers (3PLs). Furthermore, (3PLs) is a useful and important strategy for manufacturing companies to gain a competitive advantage over rivals, and the selection of these logistics providers plays a critical role in the success of outsourcing (Ecer, 2018).

In general, there are many measuring scales for the logistics performance of third-party logistics providers (3PLs). One of these measuring scales is the logistics performance index (LPI) issued by the world bank to measure the logistics performance of countries in general and companies in specific. So, measuring the logistics

performance of third-party logistics providers (3PLs) from the perspective of their manufacturing customers can improve logistics performance.

The logistics performance of (3PLs) can be measured from another scale depending on organizational logistics performance (OLP) which contains three sub-indexes (cost-operational-relational) performance. It is employed in this study along with the world bank logistics performance index (LPI) to proxy the degree of satisfaction and loyalty towards (3PLs) from their manufacturers' perspective.

Based on a marketing perspective, customer satisfaction plays an important role in the success or failure of any organization, especially in the manufacturing sector. It can provide them with a metric to measure and monitor the degree of acceptance and satisfaction toward their services and products. They can get the chance to improve and well manage their manufacturing business.

Accordingly, understanding logistics from the customer's viewpoint can help logistics-service providers (3PLs) to provide different logistics offerings. These could be taken as tools for differentiation and enhancement for their capabilities to focus on the type of services that best suit and influence future relationships with their customers (Mentzer, J. T., Flint, D. J. & Hult, G. T. M., 2001). Additionally, (Mittal. 1998) pointed out that customer loyalty leads to long-term success for companies, as getting new customers and working with them for a long time will require money, effort, and time. Therefore, retaining customers is more economical and profitable for companies, which enhance the third-party logistics providers' organizational performance.

Measuring the logistics performance of (3PLs) from the manufacturing customers' perspective and especially by using the six components of the world bank logistics performance index (LPI) will fill the gap in this area, in particular, when we use the index to measure the logistics performance of companies instead of countries.

Therefore, the research problem can be stated as follow: **Examining the relationship between logistics performance and customer loyalty on manufacturing companies using third-party logistics providers (3PLs) services in Egypt.**

The research has many different objectives:

1. Identifying the logistics performance index dimensions (LPI) which are being represented in (Customs- Infrastructure -Logistics Quality-Tracking and Tracing- International Shipment- Timeliness) in addition to explaining the organizational logistics performance dimensions (OLP) which include (Cost-Operational-Relational) performance.
2. Examining the relationship between logistics performance index (LPI) and customer satisfaction of third-party logistics providers (3PLs).
3. Explaining the relationship between organizational logistics performance dimensions (OLP) and customer satisfaction of third-party logistics providers (3PLs).
4. Examining the relationship between logistics performance index (LPI) and customer loyalty of third-party logistics providers (3PLs).

5. Explaining the relationship between organizational logistics performance dimensions (OLP) and customer loyalty of third-party logistics providers (3PLs).
6. Examining the relationship between customer satisfaction and customer loyalty of third-party logistics providers (3PLs).
7. Examining the mediating effect of customer satisfaction on the relationship of logistics performance index (LPI) and customer loyalty.
8. Examining the mediating effect of customer satisfaction on the relationship of organizational logistics performance (OLP) and customer loyalty.

2. Literature Review and Hypotheses Development

2.1. Supply Chain Management (SCM) and Logistics Management.

In today's market challenges, it is crucial to understand, design, and establish a robust supply chain that can achieve customer demands. Supply chain management has evolved throughout the years in response to global challenges. Supply chain start from raw materials to consumers, include different entities and processes, run in reverse as well as forward to the final user, include cash, product and information flows, and finally connect to outside stakeholders.

As in supply chain, logistics had several terms and definitions that could be explained from different perspectives. The Council of Supply Chain Management Professionals (CSCMP) defines it as "Logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements'' (Supply Chain Council, 2020).

Different theories were set and discussed by researchers to describe the relationship between supply chain and logistics, Lamming, (1996) considered supply chain as an extension of logistics. Moreover, both supply chain and logistics are vital for any organization in terms of the flow and supply of raw materials, manufacturing processes, tracking, transporting, and storage of finished goods including special attention to effective transportation as it helps in improving and optimizing the supply chain by decreasing the waste of both time and materials which will help logistics managers to deliver the right products to the right location at the right price on time.

2.2. Third-party logistics providers (3PLs) and Manufacturing companies.

Several authors defined the term third-party logistics providers (3PLs) from different perspectives. For example, Zhang and Zhang, (2010) identified (3PLs) as a type of company that offers a different portfolio of logistics services between two parties consigner and consignee at a stated price within a stated period of time-based on advanced information technology system. Moreover, Berglund (1999) revealed that

(3PLs) could be described as a "separate industry" that provides their customers with unique value in terms of costs and enhancing business processes. In addition to that, Skjoett-Larsen et al. (2003) define (3PLs) as, "Third-party logistics are activities carried out by an external company on behalf of a [customer] and consisting of at least the provision of management of multiple logistics services. These activities are offered in an integrated way, not on a stand-alone basis. The co-operation between the shipper and the external company is an intended continuous relationship".

According to, (Mordor Intelligence, 2020), the global (3PLs) market is expected to reach $ 1.7 trillion by 2025, with a CAGR (Compound annual growth rate) of more than 8% over the projected period, 2020-2025. Moreover, The 2019 23rd annual third-party logistics study 3PLs providers and their customers are working together to build strategic relationships to achieve their ultimate supply chain goals. In addition to those statistics showed that the global third-party logistics (3PLs) market was valued at the US $802 billion in 2016 and is expected to exceed US $1.1 trillion by 2022. Hence, it is recommended for both the (3PLs) service providers' and (3PLs) service users to coordinate and agree on their future logistics strategies and operations (Smriti and Ashish, 2020).

Manufacturing companies can improve their competitive performance by coordinating the logistics and manufacturing processes through decreasing costs and investment, while maintaining high service levels (Mentzer et al., 2004). In addition to facilitating and integrating production from all locations, manufacturing companies depend on (3PLs) providers to focus on their core business and decrease cost during the different supply chain processes (Hwang et al.,2017).

2.3. Logistics Performance

Logistics performance has several definitions explained by many researchers, Mentzer and Konrad (1991) explained the term as the analysis of efficiency and effectiveness in achieving a given task. Fugate et al. (2010) suggested another definition as the degree of efficiency, effectiveness and differentiation related to the achievement of logistics services. Furthermore (Mentzer, J. T., & Konrad, B. P., 1991) stated that efficiency is how to utilize the resources more economically or "do things right". while (Panayides, P. M., & So, M., 2005) defined effectiveness is how to achieve the goals or "doing the right thing". Moreover, (Karagöz, B. İ. & Akgün, A. E., 2015) concluded and defined differentiation as the business capability that creates more logistics values for customers.

logistics became a very important sector, for the success and sustainability of companies, to create a competitive advantage for them and their countries by providing their customers with a high level of logistics performance (Akdoğan, M. Ş., & Durak, A., 2016). In addition to that, (Akdoğan, M. Ş., & Durak, A., 2016) revealed that the logistics performance index (LPI) set by the World Bank to measure the logistics performance of countries in general and therefore measuring the logistics performance of companies in specific.

From the supply chain perspective, logistics performance refers to the degree of complexity in achieving export & import activities. Li et al., (2006) pointed out that, the management of logistic activities have become a vital source of a competitive advantage which will help in improving the organizational performance.

Third-party logistics providers (3PLs) should understand which factors could affect the decision-making process of their customers to choose and select between the different logistics service providers available in the local and international logistics market. Therefore, maintaining its leading position in the logistics market,

Globally logistics has a significant role in the economy of each country, which required finding a suitable tool to measure the logistics performance of (3PLs) (van Roekel, 2017). From this point, we can understand that the role of third-party logistics providers (3PLs) is to link between different parties and stages in a supply chain.

Accordingly, logistics performance is crucial for logistics providers in transporting and delivering products and services to other participants in the supply chain (Lai et al., 2004). In the same context (Bakar, M. A. A., & Jaafar, H. S, 2016) mentioned that the output of the logistics performance index (LPI) is based on the feedback from the (3PLs)' customers, so this will help to measure the logistics performance from the perspective of logistics service users. These logistics performances are visible across all supply chain members, including third-party logistics providers (3PLs) that offer various logistics services. Furthermore, logistics performance encompasses a variety of operations, including improved customer satisfaction, lower overall logistics costs, and higher quality logistics services provided and served by (3PLs) (Makmor, Saludin, Saad, 2019). As a result, the impact of (3PLs) performance is critical, and logistics performance is a key determinant of success for both logistics providers and their clients (Richard, W, and Rein, J, 2004).

Logistic performance was considered as one of the most important factors that drive the selection of (3PLs) (Mentzer, JT, and Flint, DJ, 1999);(Feng, Y-x, Zheng, B and Tan, J-r, 2007); (Ho, JSY, Teik, DOL, Tiffany, F, Kok, LF and Teh, TY, 2012): (Thai, VV, 2013). Moreover, (Knemeyer, A. M., & Murphy, P. R., 2004) conducted a study to evaluate the perceived performance of (3PLs) based on six key relationship marketing dimensions, findings show a linkage between both of them. In the same context, (Colin, J., Estampe, D., Large, R. O., Kramer, N., & Hartmann, R. K, 2011) studied the effect of customer-specific adaptation by logistics service providers, they found that there is evidence that customer-specific adaptation by these providers is a significant and important prerequisite to third-party logistics providers (3PLs) performance, results show also the important role of (3PLs) adaptation to maintain the relationship with customers. Furthermore (Stank, Theodore P., Thomas J. Goldsby, and Shawnee K. Vickery, 1999) findings indicated that creating and building strong relationships with customers help (3PLs) to achieve sustainable competitive advantage by providing tailoring logistical operational offerings to fulfil the needs of each customer.

In light of the above, prior studies in literature related to logistics performance can be divided into 3 groups in terms of companies where the data have been collected from

Third-party logistics providers (3PLs) are being evaluated from their customers' perspectives.

According to some research (e.g., Wallenburg et al., (2010); Li andGreen, 2011; (Stank et al., 2003); (Liu, C. L., & Lyons, A. C, 2011); (Zailani et al., 2017)), the data were collected from users of logistics services as manufacturing, wholesale and retailing companies.

Third-party logistics providers (3PLs) that evaluate their own logistic performances

According to researches done by (Lai et al., 2004); (Ellinger et al., 2008); (Wallenburg et al., 2010); (Liu, C. L., & Lyons, A. C, 2011); (Mothilal et al., 2012); (Karia, N., & Wong, C. Y, 2013); (Karagöz, B. İ. & Akgün, A. E., 2015) the data were collected based on the self-assessment of (3PLs) in which they evaluate their own performances themselves.

Measuring logistics performance carried out by companies -which main business is not logistics.

(Fawcett, SE, and Cooper, MB, 1998); (Schramm-Klein, H. and Morschett, D, 2006); (Töyli et al., 2008); (Green et al., 2008); (Fugate et al., 2010) have investigated the relationship between logistics performance, company performance, and marketing performance in retailers and manufacturing companies, they also measured the logistics performance by both logistics costs and logistics quality.

2.4. Logistics Performance Index (LPI)

The World Bank has released a logistics benchmark to measure the logistics performance of various countries throughout the world based on six logistics components in the context of the logistics supply chain. The index's output measures a country's logistics performance from the perspective of logistics service customers. This type of logistics performance will help and enable manufacturing companies to get excellent logistics services from third-party logistics providers (3PLs).

2.4.1. Categorization of Logistics Performance Index (LPI)

According to the World Bank, the six indicators of the index are divided into two categories: policy regulation, which reflects the supply chain's inputs (customs, infrastructure, and logistics services), and the outcome of supply chain service delivery performance, which comprises (tracking and tracing, timeliness, and international shipments).

As per the (World Bank, 2020), the main feature of logistics is that it's a business-to-business and the majority of its activities are executed by private companies, and hence the logistics performance index (LPI) was formed based on professional

knowledge of logistics experts worldwide. Moreover, (LPI) is a well-respected tool of logistics analysis worldwide, and is widely used in the academic community, deeply analyzed in journal articles, textbooks and business reports. In addition to that, (LPI) is widely used in many reports and documents prepared by multinational organizations and consultants. The outcome provides a benchmark for the logistics industry in general and logistics users in specific (World Bank, 2020). The logistics performance index (LPI) has been mentioned in many studies that accepted the index as a measure of addressing the logistics performance of a country. For example, (Jumandi, H., Zailani, S, 2010) mentioned the case of Malaysia, (Solakivi et al., 2015) Finland, and (International Transport Forum (ITF), 2015) Turkey.

2.4.2. Main components of Logistics Performance Index (LPI)

2.4.2.1. Customs index

The customs clearance procedures involve different companies and agencies working and specializing in the field of export and import and other trading services at borders. These procedures represent one third of the time of export and import activities, and the degree of efficiency and effectiveness of these procedures depend on the logistics capabilities of the agencies and the third-party logistics providers (3PLs) involved in the process.

2.4.2.2. Infrastructure index

The degree of quality of transportation infrastructure and information technology encompasses a variety of concerns relating to physical transportation conditions (Keedi, 2007). Moreover and because of the physical handling of items and the link between the material and information flow, maintaining acceptable conditions in these areas is critical to business processes. High-quality infrastructure can help also to improve communication among the supply chain's primary players.

2.4.2.3. Logistics quality and competence index

Logistics service providers, such as (3PLs) and carrier companies, use rail, air, and road transportation, as well as other companies that work as customs brokers and help with border procedures. They provide high-quality special logistics services to meet their customers' needs with the best logistics performance. According to the (World Bank, 2007), countries with better logistics performance have a strong and well-developed private sector, whereas countries with lower logistics performance have issues and problems in both public and private sectors (Faria, R. N. D., Souza, C. S. D., & Vieira, J. G. V., 2015).

2.4.2.4. Tracking and Tracing index

Due to the requirement to shorten transit time, managing logistics flow from origin to ultimate destination has become a critical job. Competitiveness is determined by the ability to adjust to changes in shipment route, departure, and arrival dates. From here, the tracking and tracing index will concentrate on the quality of information technology used in logistics processes, the degree of transparency of customs procedures, and the continuous improvement and innovation of communication

technologies, all of which will lead to a higher level of cargo transportation (Faria, R. N. D., Souza, C. S. D., & Vieira, J. G. V., 2015).

2.4.2.5. International shipments index

According to the (World Bank, 2010), the international shipments index examines the management of goods in terms of the ability to organise shipments more efficiently in terms of delivery and competitive costs. Any changes in the trade environment could have an impact on companies that provide low-cost services to their clients (Faria, R. N. D., Souza, C. S. D., & Vieira, J. G. V., 2015).

2.4.2.6. Timeliness index

The lack of timeliness in the trading system has a significant impact on logistical performance, by raising costs and diminishing competitiveness, they can create trade barriers. As a result, timeliness is a critical measurable component of quality (Hummels, D., & Schaur, G., 2012). Moreover, delivery delays, the need for physical inspections, a lack of shipments, the usage of antiquated communication technology, and obsolete transportation infrastructure could all affect the timeliness index. As a result, as compared to other indexes, the difference in satisfaction between countries with high and low performance is bigger for the timeliness index (World Bank, 2007).

2.5. Organizational Logistics Performance (OLP)

Measuring the performance of companies, particularly in the field of supply chain and logistics, has become a critical step in determining their success or failure, resulting in improving overall logistics performance levels.

Third-party logistics providers (3PLs) should strive to measure their logistics performance from the perspective of their service users to focus on and meet their ongoing expectations. Not only that, but companies that outsource a part or all of their logistics business to (3PLs) should track their logistics performance because it impacts their total performance, even though a few companies measure their logistics performance, especially when they outsource their logistics activities to outside logistics service providers (3PLs) (Keebler et al., 1999). Moreover (Yuen, S. M, 2006) applied the approach of organizational theory based on (context-structure-output) relationship as a corporate function to achieve organizational success. The theory reveals conceptual and empirical links between third-party logistics providers, supply chain partners, and (3PLs) organizational performance measurement. The study focused on (3PLs) because the organizational logistics performance of logistics companies is not only dependent on the logistics service providers, but also both upstream and downstream partners along the supply chain.

2.6. Customer Satisfaction

According to (Mentzer, J. T., Flint, D. J. & Hult, G. T. M., 2001) understanding logistics from the customer's viewpoint can help (3PLs) to provide different logistics

offerings that could be taken as a tool for differentiation and enhancing their capabilities to focus on the type of services that suit and influence future relationships with their customers.

A large and growing body of literature has attempted to identify different definitions that explain how logistics can help to create customer satisfaction as tied to the "seven R's" described by (Mentzer, J. T., Flint, D. J. & Hult, G. T. M., 2001) as the firm's ability to deliver the right product to the right service at the right place at the right time in the right condition at the lower price with the right amount of information (Coyle, J. J., Bardi, E. J., & Langley, C. J, 1996); (Douglas M.. Lambert, & James, R, 2001). In addition to that, many authors have emphasised the importance of logistics performance as a tool to create customer satisfaction (Dadzie, K. Q., Chelariu, C., & Winston, E, 2005): (Mentzer, J. T., Flint, D. J., & Hult, G. T. M, 2001).

2.7. Customer Loyalty

Loyalty may be defined "as a long-term commitment to repurchase involving both a favorable attitude and repeated patronage" (Li et al., 2012). Similarly (Wallenburg, C. M., 2009) have mentioned that loyalty is based on a positive attitude toward the service or product providers, and consequently, loyalty is reflected in the desire to repurchase from the same providers and mention or recommend the name of the providers to other customers. In addition to that (Zeithaml, V.A., Berry, L.L., and Parasuraman, A., 1996) mentioned that loyal customers can convey their positive attitude toward the service providers to other customers through a word-of-mouth. Thus, loyal customers in this case are less sensitive to price increase and are willing to repeat their buying many times (Heskett, J. L., & Sasser Jr, W. E, 1997). Accordingly, customer loyalty and favourable word-of-mouth and recommendations can enhance the company's capabilities to decrease costs and capital investments (Oliver, R, 1999).

3. Hypotheses Development

3.1. Relationship between Logistics Performance Index (LPI) and Customer Satisfaction

As per (Hartmann, E., & de Grahl, A, 2011) companies should think to build long-term relationships with (3PLs) providers to get the best results from outsourcing plans and that can be achieved through synchronizing communication and information exchange at the operational level. Moreover, (Chu, Z.,Wang ,Q, 2012) indicated that third-party logistics providers can support their customers to achieve the overall objectives of their companies by sharing information and value-added services. Additionally, (Mothilal et al., 2012) indicated that building a strong relationship with third-party logistics providers is very crucial to improve customer satisfaction. Furthermore (Leuschner, R., Charvet, F., & Rogers, D. S, 2013) conducted a study to investigate the relationship between logistics customer service and the overall company performance, they found a significant and positive relationship.

According to the previous literature review, logistics performance index dimensions have a significant impact on the organizational logistics performance of companies. For example (Larson, P.D., Poist, R.F., and Halldórsson, A, 2007) revealed that the performance of logistics activities can affect organizational performance. Those authors in another study conducted among business leaders on the impact of the perception of logistics performance on business results found that a large number of managers said that the perceived impact of logistics performance has led to better performance in customer satisfaction. Furthermore, (Huang, Y. H., & Han, S, 2007) clarified that logistics service performance level, which describes to which degree the (3PLs) services meet customers' needs, is the general description of an enterprise's logistics services. Therefore, finding out the related factors that affect the customer's satisfaction is the first step in analyzing an enterprise's logistics services.

Since the logistics performance index (LPI) contains 6 main dimensions of customs, infrastructure, service quality, timeliness, international shipments, and tracking and tracing. Accordingly, these findings provide the theoretical basis for the following hypotheses

H1: There is a positive relationship between Logistics Performance Index dimension and customer satisfaction (toward 3PLs companies).

H1-1: There is a positive relationship between the efficiency of customs and customer satisfaction (toward 3PLs companies).

H1-2: There is a positive relationship between infrastructure and customer satisfaction (toward 3PLs companies).

H1-3: There is a positive relationship between logistics quality and competence and customer satisfaction (toward 3PLs companies).

H1-4: There is a positive relationship between tracking and tracing and customer satisfaction (toward 3PLs companies).

H1-5: There is a positive relationship between timeliness and customer satisfaction (toward 3PLs companies).

H1-6: There is a positive relationship between international shipments and customer satisfaction (toward 3PLs companies).

3.2. The relationship between organizational logistics performance and customer satisfaction

Several researchers have mentioned the importance of the relationship between organizational logistics performance and customer satisfaction. They concluded that manufacturing companies that use logistics management are having a higher percentage of customer satisfaction than companies that do not apply the same concept. Thus, outsourcing the logistics services to third-party logistics providers (3PLs) can enhance the degree of customer satisfaction of these manufacturing companies from their customers' perspective.

Another opinion by (Hotrawaisaya, C., Chandraprakaikul, W., & Suthikarnarunai, N, 2014) showed that Logistics performance indicators (LPI) had criteria that include costs, time, and reliability, which can measure the logistics operations performance among partners in the supply chain. Furthermore, Stank et al. (2003) revealedthat relational performance provides service to suppliers with more detailed information about both customers' needs which help the service providers to focus on operational plans. Thus, decreasing the costs of service provided to the customer. Consistently, (Stank et al., 2003) highlighted that the performance by third-party logistics (3PLs) was considered the most significant factor in creating customer satisfaction. (Ghoumrassi, A., & Țigu, G, 2019) have mentioned that the relationship between customer satisfaction and logistics performance has many indicators, and the most important indicator is the cost of the product. Consequently, manufacturing companies can lower shipping rates from third-party logistics providers (3PL), along with using high production with low labor costs, and a cheap raw material for competing in the marketplace.

Moreover, (Stank et al., 2003) provided the following hypotheses based on the results from the previous logistics literature review as follow:

- “Logistics relational performance has a positive effect on customer satisfaction".
- “Logistics operational performance has a positive effect on customer satisfaction".
- “Logistics cost performance has a positive effect on customer satisfaction".

The organizational logistics performance index contains three dimensions (i.e., cost, operational, and relational performance) which provide the theoretical basis for the following research hypotheses.

H2: There is a positive relationship between organizational logistics performance dimensions and customer satisfaction.

H2-1: There is a positive relationship between cost performance and the customer satisfaction.

H2-2: There is a positive relationship between operational performance and the customer satisfaction.

H2-3: There is a positive relationship between relational performance and the customer satisfaction.

3.3. The Relationship between Logistics Performance Index (LPI) and Customer Loyalty

Manufacturing companies are working hard to improve their internal resources to provide their customers with a high level of logistics services, and hence retaining their customers (Yang, C. C, 2016); (Luu, T.T, 2017).

One of the most effective tools to build long-term relationships with customers by enhancing their logistics capabilities which will give the company the power to exploit that in maintaining their loyalty (Bowersox et al., 1992). Additionally (Koh, S. C. L., & Tan, Z, 2005); (Striegler, R. B, 2013) stated that third-party logistics providers (3PLs) need to offer a portfolio of products and services like flexibility, price, and responsiveness to compete in the market with other competitors. They need to develop sophisticated transportation management systems (TMS) to handle material handlings, freight, cross-docking and adding IT sophistication (Vlachos, I, 2017).

Based on the above, the logistics performance index contains six main dimensions (i.e., customs, infrastructure, service quality, timeliness, international shipments, and tracking and tracing). Accordingly, the previous findings provide the theoretical basis for the following hypotheses

H3: There is a positive relationship between logistics performance index dimensions and customer loyalty.

H3-1: There is a positive relationship between customs and customer loyalty.

H3-2: There is a positive relationship between infrastructure and customer Loyalty.

H3-3: There is a positive relationship between logistics quality and competence and Customer Loyalty.

H3-4: There is a positive relationship between tracking and tracing and Customer Loyalty.

H3-5: There is a positive relationship between timeliness and customer loyalty.

H3-6: There is a positive relationship between international shipments and customer loyalty.

3.4. The Relationship between Organizational logistics performance & Customer Loyalty

Prior studies have covered the relationship between organizational logistics performance (OLP) and the degree of customer loyalty.

For example (Wallenburg et al., 2010) explained that (3PLs) need to figure out how to enhance loyalty in their relationships with their customers. In addition to that (Ramanathan, 2010) pointed out that, because many operational factors affect customer loyalty, logistics plays an important role in customer loyalty. (Stank et al., 2003) stated that logistics service performance positively affects customer loyalty. Consistently, (Wallenburg et al., 2010) supported that organizational performance is an important factor to generate customer loyalty. In addition to that (Li et al., 2012) stated that relational benefits which are considered as one of the factors of organizational logistics performance in a (B2B) service environment, affect manufacturers' loyalty.

Previous literature review shows that both operational and customer relationship performance has a positive impact on customer loyalty. For example (Stank et al.,

2003) stated that logistics service performance has a positive impact on customer loyalty. Furthermore, (Wallenburg et al., 2010) indicated that performance is a significant factor to generate customer loyalty. (Li et al., 2012) concluded that relational benefits affect manufacturers' loyalty as it considers one of the main factors of logistics performance in a business-to-business service environment.

The organizational logistics performance index contains three dimensions (i.e., cost, operational, and relational performance). Hence, these findings provide the theoretical basis for the following research hypotheses.

H4: There is a positive relationship between organizational logistics performance and customer loyalty.

H4-1: There is a positive relationship between cost performance and Customer Loyalty.

H4-2: There is a positive relationship between operational performance and customer loyalty.

H4-3: There is a positive relationship between relational performance and customer loyalty.

3.5. The Relationship between Customer Satisfaction and Customer Loyalty

As mentioned above, the customer satisfaction for the products or services of organizations could be taken as a metric to monitor the success or failure of their manufacturing plans and policies. Hence, customer satisfaction could be taken as a way to well manage the product life cycle or even the continuity of the business and consequently measure the loyalty degree of their customers (Ghoumrassi, A., & Țigu, G, 2019).

Evidence was found that customer satisfaction positively affects repurchase intention (Lee, E. J, 2005); (Huddleston, P., Whipple, J., Mattick, R. N., & Lee, S. J, 2009) it affects customer trust positively (Dabholkar, P. A., & Sheng, X, 2012) so it's an important predictor of customer loyalty (Chen, Y. M., M.-J. Goan, and P.-N. Huang., 2011). Furthermore (Cronin, J. J., & Morris, M. H, 1989): (Daugherty et al., 1998) informed that customer satisfaction toward the performance of companies has a positive and significant impact on repurchase intentions of customers. Accordingly, these findings provide the theoretical basis for the following research hypotheses

H5: There is a positive relationship between customer satisfaction and customer loyalty.

3.6. Customer satisfaction as a mediator between logistics performance and customer loyalty.

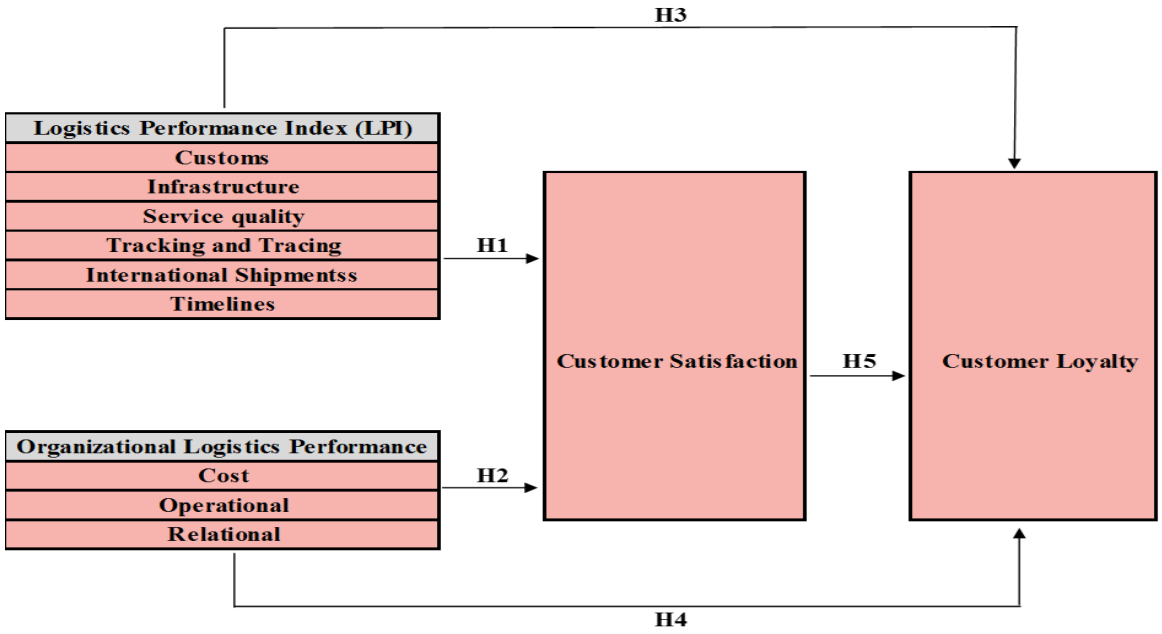
Researchers have shed light on how customer satisfaction used as a mediator between logistics performance and customer loyalty. For example, (Cronin Jr, J. J., &

Taylor, S. A, 1992) investigate the relationship between customer satisfaction and customer loyalty in the field of service quality, they found that customer satisfaction is the main mediator between service quality and customer loyalty. Furthermore, (Siddiqi, K. O, 2011) examine the relationship between service quality and both customer satisfaction and customer loyalty, the findings revealed that service quality affects customer satisfaction and affects customer loyalty directly and indirectly. Therefore, customer satisfaction plays a significant role as a mediator between service quality and customer loyalty (Caruana, A, 2002). Consequently, customer satisfaction mediates the relationship between service quality and customer loyalty (Li, M. L., & Green, R, 2010). Accordingly, these findings provide the theoretical basis for the following research hypotheses.

H6. Customer satisfaction is a mediator between logistics performance index (LPI) and customer loyalty.

H7. Customer satisfaction is a mediator between organizational logistics performance (OLP) and customer loyalty.

Based on the prior discussion, the research hypotheses were proposed and are illustrated as follows:



4. Research methodology

4.1. Population and Sample

The research population includes all manufacturing companies located in Egypt to measure their perception of loyalty toward the third-party logistics providers (3PLs). Since the population is large and hard to be defined and unrealistic to reach due to

inconvenience reasons. This limitation left the options of the sampling process restricted to a non-probability sampling technique (convenient sample).

The total number of distributed questionnaires was (300). However, the response was (200) including (2) invalid respondents. The response rate is just (66%) which needs to be taken into consideration in future research.

4.2. Research Measurement

This research is conducted by using a face-to-face and online interview with logistics managers in the manufacturing companies using third-party logistics providers (3PLs) in Egypt.

The data collection method begins first by gathering various items from other scales extracted from the prior literature that have acceptable validity and reliability levels. The revised items were pre-tested among a group of manufacturing companies in which logistics managers were suggested further change. Accordingly, some modifications were done and then translated into Arabic.

A single cross-sectional descriptive form of research was employed. A questionnaire was used to collect data from 200 manufacturing companies. Confirmatory factor analysis (CFA) was used to test the validity of scales and structural equation modelling (SEM) was used to test the research hypotheses.

Questionnaire items representing the independent, dependent, and mediating variables were measured using a five-point Likert scale type (where 1= strongly disagree, 5=strongly agree).

While other personal information like the employee position in the company, the organizational level of the manufacturing company, the freight mode they deal with, the direction trade and transport they are primarily dealing with, and finally the geographical regions they usually ship to. All these questions were measured by multiple-choice questions.

Different scales have been used to measure the logistics performance of (3PLs) as follow: logistics performance index (LPI) including six sub-indexes was adapted from the world bank 2018, cost performance items were adapted from Stank et al (2003), Operational performance items were adapted from (Stank et al. (2003) & Lyons (2011) and Panayides (2007), relational performance items were adapted from Stank et al. (2003) & Lyons (2011) and Panayides (2007), customer satisfaction items were adapted from Lam et al. (2004), Customer loyalty items were adapted from Lam et al. (2004) & Zeithalm et al. (1996) & Wallenburg et al. (2010) ve Li (2011)& Stank et al.(2003).

5. The Main Research Findings

5.1. Descriptive statistics of the study variables:

Table (1) shows the descriptive statistics of the study variables and their measurement items. Such statistical include the valid and missing responses using frequencies, the central tendency measures (using mean and standard deviation), and the normal distribution assumption using the Skewness and Kurtosis.

Table (1), descriptive statistics of the study variable and their measurement items

Variable/item*	N	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
IV1_1_1	198	1	5	3.75	0.865	-0.913	1.091
IV1_1_2	198	1	5	3.86	0.959	-1.082	0.976
IV1_1_3	198	1	5	3.39	1.088	-0.548	-0.467
IV1_1_4	198	1	5	2.97	1.035	-0.283	-0.689
IV1_1_5	198	1	5	3.29	1.119	-0.369	-0.832
IV1_1_6	198	1	5	2.79	1.059	0.201	-0.83
IV1_1_7	198	1	5	2.69	1.119	0.314	-0.887
IV1_1_8	198	1	5	3.29	1.064	-0.225	-0.965
IV1_1_9	198	1	5	3.46	0.932	-0.546	0.043
IV1_1_10	198	1	5	3.59	1.113	-0.642	-0.431
IV1_1_11	198	1	5	3.78	0.85	-1.012	1.671
IV1_1				3.35	0.491	-0.279	0.373
IV1_2_1	198	1	5	3.8	0.798	-0.783	1.073
IV1_2_2	198	1	5	3.38	1.029	-0.305	-0.322
IV1_2_3	198	1	5	3.56	0.979	-0.878	0.429
IV1_2				3.58	0.723	-0.738	0.668
IV1_3_1	198	1	5	3.82	0.783	-1.344	3.176
IV1_3_2	198	1	5	3.9	0.778	-1.531	3.996
IV1_3_3	198	1	5	3.97	0.824	-1.317	2.759
IV1_3				3.9	0.604	-1.47	4.195
IV1_4_1	198	1	5	2.85	1.07	0.306	-0.636
IV1_4_2	198	1	5	3.63	0.884	-0.805	0.542
IV1_4_3	198	1	5	3.82	0.865	-1.017	1.168
IV1_4				3.43	0.556	-0.316	1.394
IV1_5_1	198	1	5	3.91	0.836	-1.05	1.676
IV1_5_2	198	1	5	3.6	0.772	-0.978	0.833
IV1_5_3	198	2	5	3.86	0.629	-1.241	2.637
IV1_5				3.79	0.557	-1.55	3.811
IV1_6_1	198	1	5	3.48	0.865	-0.436	-0.237
IV1_6_2	198	1	5	3.86	0.855	-0.905	0.911
IV1_6_3	198	1	5	2.95	1.137	-0.015	-0.944
IV1_6				3.43	0.685	-0.312	0.128
IV1				3.58	0.396	-1.289	3.347
IV2_1_1	198	1	5	3.83	0.779	-1.393	3.032
IV2_1_2	198	1	5	3.13	0.939	-0.367	-0.397
IV2_1_3	198	1	5	3.16	1.078	-0.155	-0.834
IV2_1				3.37	0.742	-0.421	0.005

IV2_2_1	198	1	5	4.15	0.877	-1.533	3.162
IV2_2_2	198	1	5	3.73	0.865	-1.154	1.528
IV2_2_3	198	1	5	3.25	1.055	-0.495	-0.473
IV2_2_4	198	1	5	3.83	0.798	-1.143	1.73
IV2_2_5	198	1	5	3.26	0.957	-0.092	-0.031
IV2_2_6	198	1	5	3.75	0.716	-0.771	1.198
IV2_2_7	198	1	5	3.88	0.662	-1.248	3.853
IV2_2_8	198	2	5	3.88	0.68	-0.726	1.172
IV2_2_9	198	1	5	3.61	0.84	-0.874	0.871
IV2_2_10	198	1	5	3.82	0.845	-0.723	0.397
IV2_2				3.72	0.481	-1.319	3.987
IV2_3_1	198	1	5	4.13	0.849	-1.403	2.887
IV2_3_2	198	1	5	2.63	1.042	0.243	-0.822
IV2_3_3	198	1	5	3.78	0.761	-1.692	3.806
IV2_3_4	198	2	5	3.53	0.759	-0.227	-0.299
IV2_3_5	198	1	5	3.75	0.804	-1.226	2.373
IV2_3				3.56	0.534	-0.746	1.752
IV2				3.55	0.475	-0.812	2.006
MV1	198	1	5	3.81	0.679	-1.812	4.777
MV2	198	1	5	3.79	0.721	-1.879	4.497
MV3	198	1	5	3.48	0.865	-0.594	-0.014
MV4	198	1	5	3.78	0.753	-1.493	3.291
MV5	198	1	5	3.73	0.763	-1.579	3.67
MV				3.72	0.648	-1.581	4.284
DV1	198	1	5	3.51	0.829	-0.707	0.301
DV2	198	1	5	2.8	1.022	0.444	-0.815
DV3	198	1	5	3.71	0.672	-1.195	2.484
DV4	198	1	5	3.61	0.709	-1.09	1.936
DV5	198	1	5	3.59	0.72	-0.924	1.126
DV				3.44	0.607	-0.599	1.874

Table **(1)** shows that the number of valid responses per item is 198, which is the sample size. Hence, there are no missing values to be treated. Moreover, the minimum and maximum values are within the proposed range of 5-point (totally disagree - totally agree) Likert-type scale. Hence, the data screening and cleaning process are valid.

The sample tends to be neutral on item IV2_3_2 (**3PL makes proposals according to our purchase history)** as it has the **lowest mean** by 2.63 ± 1.042 out of 5 on the above-mentioned scale. "This is because the majority of logistics managers at the manufacturing companies admit that the logistics proposals received from a third party- logistics providers (3PLs) are not relevant to the previous purchasing history with them". On the contrary, the sample tends to agree on item IV2_2_1 **(The 3PL understands the logistics services requirements of our company),** as it has the **highest mean** score by 4.15 ± 0.877 out of 5. "This is because third-party logistics providers (3PLs) are always working hard and competing to understand the business of their customers to fulfil their logistics needs and gain their satisfaction and loyalty as well.

5.2. Common Method Bias:

Since all data of the study variables have been collected from one sampling unit at one time using one instrument, a structural questionnaire, the Common Method Bias (CMB) can exist. The CMB refers to the shared variance between the measurement items, due to collecting the data from one respondent at one time using a single instrument (Assaf & Tsionas, 2019; Jordan & Troth, 2020). Consequently, the CMB can be checked via Harman's one Factor approach (Podsakoff et al., 2003). The Exploratory Factor Analysis (EFA) is used to check the CMB using Harman's one factor. By including all measurement items in the EFA, the extracted first-factor variance should be less than 50% of the total variance of all extracted factors.

5.3. Structural Equation Modelling:

Testing the research hypotheses require the validation of the incorporated construction. Therefore, the Structural Equation Modelling (SEM) is applied. The Partial Least Squares-Structural Equation Modelling is more relevant approach to the current study for various reasons. First, the current research aims to extend the prior theory by exploring new relationships. Second, the ongoing study sample is quite small. Finally, the constructs in the theoretical model are measured in various levels (Hair, Joe F. et al., 2011). To this end, the PLS-SEM analysis gained its widespread in social sciences, especially the Marketing research (Henseler Jörg et al., 2009; Hair, Joe F. et al., 2012), Human Resources (Ringle, Christian M. et al., 2018; Cepeda-Carrion Gabriel et al., 2019), Strategic Management (Hair, Joseph F. et al., 2012), Tourism and Hospitality (Ahmet & Kucukergin, 2018; do Valle & Assaker, 2016; Faizan et al., 2018), and Supply Chain and Operations Management (Kaufmann & Gaeckler, 2015). Finally, the PLS-SEM is applied in the current study using the Smart PLS v.3.3.3 software (Ringle, C. M. et al., 2015; Sarstedt & Cheah, 2019).

The PLS-SEM is applied using a two-stage approach. The first stage aims to build and assess the measurement model, and the second stage aims at testing the structural model (Hair, Joseph F. et al., 2017; Hair, Joseph F. et al., 2019). At the first stage, the Confirmatory Composite Analysis (CCA) is implemented to test the item reliability, and the construct validity and reliability. Moreover, at the second stage, the multicollinearity should be assessed, then the direct and indirect hypotheses, and eventually the model predictive ability (Hair, Joseph F. et al., 2020; Sarstedt & Cheah, 2019; Hair, Joseph F. et al., 2019).

5.4. Building the measurement model:

The measurement model assessment begins with the theoretical model specification, then the item reliability using outer loadings, construct convergent and discriminant validity, and construct reliability (Hair, Joseph F. et al., 2017). Concerning the theoretical model, the current research model has two exogenous variables, namely, the Logistics Performance Index (LPI) and Organizational Logistics

Performance (OLP). Both constructs are measured in High Order Construct (HoC) reflective-reflective measurement level. In addition, there is an exogenous-endogenous construct, namely, customer satisfaction which is measured in first order-reflective measurement level. Finally, the endogenous variable is customer loyalty which is measured in a reflective first-order level.

It is worth noting that the High Order Constructs (HoC) is measured using the two-stage disjoint approach (Sarstedt et al., 2019). The first stage validates the dimensions (low order constructs) from the observed items, the second stage validate the construct (high order) from the generated latent scores of the valid dimensions in the first stage. To This end, the theoretical model can be accessed via item reliability. The item reliability refers to what extent each observed item is correlated with its dimension/construct. The outer loading for each item in the reflective measurement level should be higher than 0.708 to be retained. Any item that has outer loading less than 0.4 must be removed. If the item has outer loading between 0.4 and 0.708, it is recommended for retention if the other items at the same dimension/construct have outer loadings higher than 0.708 and their increase can substitute the decrease in this item. Otherwise, it should be removed (Hair, Joseph F. et al., 2017). To this end, the IV1_1_7, IV1_1_4, IV1_1_9, IV1_1_6, IV1_6_3, IV2_2_3, IV2_2_5, IV1_4_1, and IV2_3_2 due to their low loadings less than 0.4. In addition, the IV1_1_8, IV1_1_3, IV2_2_6, IV2_2_8, and IV2_2_9 items have been removed due to their low loadings between 0.4 and 0.708 and their counterparts cannot substitute their decrease. Therefore, **table 2** shows the results of the retained item reliability at both low and high order constructs.

Table (2), item reliability

Item/dimension*	Customs	Infrastructure	Quality	Timeliness	Shipment	Tracking	Cost	Operational	Relational	Satisfaction	Loyalty	LPI	Org. Log. Performance
IV1_1_1	0.760												
IV1_1_10	0.772												
IV1_1_11	0.594												
IV1_1_2	0.778												
IV1_1_5	0.652												
IV1_2_1		0.720											
IV1_2_2		0.740											
IV1_2_3		0.837											
IV1_3_1			0.783										
IV1_3_2			0.873										
IV1_3_3			0.613										
IV1_4_2				0.924									
IV1_4_3				0.945									
IV1_5_1					0.870								
IV1_5_2					0.599								
IV1_5_3					0.738								
IV1_6_1						0.826							
IV1_6_2						0.806							
IV2_1_1							0.666						
IV2_1_2							0.870						
IV2_1_3							0.826						
IV2_2_1								0.805					
IV2_2_2								0.802					
IV2_2_4								0.708					

Item/dimension*	Customs	Infrastructure	Quality	Timeliness	Shipment	Tracking	Cost	Operational	Relational	Satisfaction	Loyalty	LPI	Org. Log. Performance
IV2_2_7								0.703					
IV2_3_1									0.598				
IV2_3_3									0.855				
IV2_3_4									0.442				
IV2_3_5									0.859				
MV1										0.868			
MV2										0.849			
MV3										0.816			
MV4										0.875			
MV5										0.882			
DV1											0.801		
DV2											0.559		
DV3											0.756		
DV4											0.875		
DV5											0.880		
Customs												0.831	
Quality												0.836	
Shipment												0.842	
Timeliness												0.550	
Tracking												0.705	
Cost													0.804
Relational													0.887

As shown in the **table (2)**, the majority of the measurement items have outer loadings of more than 0.708. Some measurement items have loadings less than 0.708 but their outer loadings are higher than 0.4 and the other items at the same constructs have an increase that can substitute their decrease. Hence, they are retained as they are reliable items. Consequently, the construct validity can be assessed. The construct validity can be divided into two types, namely, the convergent validity and discriminant validity. The convergent validity measures to what extent the measurement items are correlated together to measure their construct. It can be accessed via the Average Variance Extracted (AVE). A construct has convergent validity if its AVE is at least 0.5 (Hair, Joseph F. et al., 2017). **Table (3)** shows the results of the convergent validity.

Table (3), Convergent validity assessment

onstruct/ dimension	Average Variance Extracted (AVE)
Cost	0.628
Customs	0.511
Infrastructure	0.589
Operational	0.572
Quality	0.584
Relational	0.505
Shipment	0.553
Timeliness	0.873
Tracking	0.666
Loyalty	0.613
Satisfaction	0.737
LPI	0.579
Org. Log. Performance	0.717

Table (3) illustrates the AVE per construct/dimensions rages between 0.505 and 0.873 which is higher than 0.5. Convergent validity is established in the measurement model.

Moreover, the discriminant validity refers to the extent the measurement items can distinguish its construct from the other constructs. In the other words, to what extent the measurement items are correlated together to measure their construct and do not measure other constructs in the same model. Accordingly, if an item has cross-loadings, it should be removed as item IV2_2_10. The discriminant validity can be evaluated via the Fornell-Larcker criterion that refers to the AVE of each construct must be higher than the squared correlation between this construct and each other construct at the same model to ensure this construct distinctiveness. **Table (4)** shows the results of the discriminant validity using the Fornell-Larcker criterion.

Table (4), Discriminant validity

Construct / dimension	Cost	Customs	Infrastructure	Loyalty	Operational	Quality	Relational	Satisfaction	Shipment	Timeliness	Tracking	LPI	Org. Log. Performance	Satisfaction	Loyalty
Cost	0.792														
Customs	0.513	0.715													
Infrastructure	0.492	0.512	0.768												
Loyalty	0.423	0.587	0.313	0.783											
Operational	0.358	0.559	0.542	0.476	0.756										
Quality	0.396	0.573	0.606	0.497	0.635	0.764									
Relational	0.439	0.462	0.434	0.595	0.565	0.570	0.711								
Satisfaction	0.567	0.646	0.604	0.612	0.752	0.690	0.689	0.858							
Shipment	0.278	0.600	0.479	0.417	0.678	0.674	0.455	0.634	0.744						
Timeliness	0.133	0.352	0.210	0.268	0.389	0.343	0.253	0.354	0.412	0.935					
Tracking	0.293	0.514	0.359	0.469	0.493	0.470	0.407	0.440	0.461	0.260	0.816				
LPI	-	-	-	-	-	-	-	-	-	-	-	**0.761**			
Org. Log. Performance	-	-	-	-	-	-	-	-	-	-	-	0.614	**0.847**		
Satisfaction	-	-	-	-	-	-	-	-	-	-	-	0.748	0.748	**0.858**	
Loyalty	-	-	-	-	-	-	-	-	-	-	-	0.604	0.610	0.613	**0.783**

As shown in a **table (4)**, the square root of the AVE of each construct (diagonal-off) is higher than the correlation with each other in the same model (diagonal-in). For instance, the underlined numbers in the first part of the table represent the square root of the AVE at the dimension levels. As well, the bold **numbers** in the second part of the table represent the square root of the AVE at the construct level. Accordingly, the discriminant validity has been established according to the Fornall-Larcker criterion. To this end, the construct reliability can be assessed.

The last step of assessing the measurement model is the construct reliability. The construct reliability measures to what extent the valid items can be reliable to measure the construct in the further analysis, such as structural model. It can be evaluated by the composite reliability which should be higher 0.7 for each construct (Hair, Joseph F. et al., 2017). **Table (5)** shows the results of the construct reliability.

Table (5), Construct reliability

Construct / dimension	Composite Reliability
Cost	0.833
Customs	0.838
Infrastructure	0.811
Operational	0.842
Quality	0.805
Relational	0.793
Shipment	0.784
Timeliness	0.932
Tracking	0.800
Loyalty	0.886
Satisfaction	0.933
LPI	0.871
Org. Log. Performance	0.835

Table **(5)** shows that each construct is reliably measured using its valid items/dimensions since the Composite reliability coefficients range between 0.784 and 0.933. To this end, the measurement model is valid and can be used to test the relationships between the constructs of the structural model.

5.5. Testing the Structural model:

Testing the structural model begins with checking the multicollinearity issue, path coefficient evaluation, and model predictive ability assessment (Hair, Joseph F. et al., 2020; Sarstedt & Cheah, 2019; Hair, Joseph F. et al., 2019).

The multicollinearity issue occurs when the correlation between two exogenous constructs is very high. Therefore, one of the two constructs must be removed, or the two constructs must be included in one higher construct (Hair, Joseph F. et al., 2017).

The multicollinearity in the PLS-SEM can be accessed via the Variance Inflation Factor (VIF) between the exogenous constructs in each model (low and high order). A VIF between each pair of exogenous constructs must be between 0.2 and 5 to ensure the absence of the multicollinearity issue (Hair, Joseph F. et al., 2017). **Table (6)** reports the results of the multicollinearity assessment.

Table (6), multicollinearity assessment

Construct / dimension	Loyalty	Satisfaction
Cost	1.772	1.623
Customs	2.296	2.231
Infrastructure	1.928	1.909
Operational	2.962	2.493
Quality	2.683	2.618
Relational	2.034	1.777
Shipment	2.568	2.546
Timeliness	1.267	1.265
Tracking	1.544	1.525
Satisfaction	4.185	
LPI	2.303	1.605
Org. Log. Performance	2.309	1.605
Satisfaction	3.262	

The statistical result reveals that the VIFs for each pair of exogenous constructs at the low order model range between 1.267 and 4.185 which is between 0.2 and 5. Moreover, the VIFs between each pair of exogenous variables range between 1.605 and 3.262 which is between the same threshold values. Hence, Multicollinearity is not an issue in the current study as previously highlighted in **table (6).** Therefore, the path coefficient can carefully be tested.

The path coefficient in the current study can be divided into two types: direct and indirect. The direct path coefficient can be accessed via the Beta coefficients and its significance by running the bootstrapping procedure for 300 iterations for the 5000 subsamples with replacement (Hair, Joseph F. et al., 2017). However, the indirect path coefficients can be accessed via the application of mediation analysis. Therefore, **table (7)** shows the results of the direct path coefficients.

Table (7), direct path coefficients

Path		βeta	P Values	Result
H1	LPI -> Satisfaction	0.463	0.000	Supported****
H1-1	Customs -> Satisfaction	0.125	0.012	Supported**
H1-2	Infrastructure -> Satisfaction	0.067	0.090	Supported*
H1-3	Quality -> Satisfaction	0.125	0.009	Supported**

H1-4	Tracking -> Satisfaction	-0.067	0.076	Not supported
H1-5	Timeliness -> Satisfaction	0.023	0.314	Not supported
H1-6	Shipment -> Satisfaction	0.073	0.133	Not supported
H2	Org. Log. Performance -> Satisfaction	0.464	0.000	Supported****
H2-1	Cost -> Satisfaction	0.188	0.000	Supported****
H2-2	Operational -> Satisfaction	0.335	0.000	Supported****
H2-3	Relational -> Satisfaction	0.248	0.000	Supported****
H3	LPI -> Loyalty	0.292	0.002	Supported***
H3-1	Customs -> Loyalty	0.303	0.000	Supported****
H3-2	Infrastructure -> Loyalty	-0.195	0.001	Supported***
H3-3	Quality -> Loyalty	0.085	0.180	Not supported
H3-4	Tracking -> Loyalty	0.155	0.007	Supported***
H3-5	Timeliness -> Loyalty	0.012	0.422	Not supported
H3-6	Shipment -> Loyalty	-0.091	0.146	Not supported
H4	Org. Log. Performance -> Loyalty	0.308	0.000	Supported****
H4-1	Cost -> Loyalty	0.044	0.287	Not supported
H4-2	Operational -> Loyalty	-0.041	0.329	Not supported
H4-3	Relational -> Loyalty	0.282	0.000	Supported****
H5	Satisfaction -> Loyalty	0.164	0.076	Supported*

Table (8), indirect mediated path coefficients

Path		Indirect		Direct		Result
		βeta	P Values	βeta	P Values	
H6	**LPI -> Satisfaction -> Loyalty**	0.076	0.087	0.292	0.002	Partial complementary mediation
H6-1	Customs -> Satisfaction -> Loyalty	0.034	0.072	0.303	0.000	Partial complementary mediation
H6-2	Infrastructure -> Satisfaction -> Loyalty	0.018	0.133			Non-mediation
H6-3	Quality -> Satisfaction -> Loyalty	0.034	0.064	0.085	0.180	Full mediation
H6-4	Tracking -> Satisfaction -> Loyalty	-0.018	0.129			Non-mediation
H6-5	Timeliness -> Satisfaction -> Loyalty	0.006	0.327			Non-mediation

H6-6	Shipment -> Satisfaction -> Loyalty	0.020	0.163			Non-mediation
H7	**Org. Log. Performance -> Satisfaction -> Loyalty**	0.076	0.076	0.308	0.000	Partial complementary mediation
H7-1	Cost -> Satisfaction -> Loyalty	0.051	0.024	0.044	0.287	Full mediation
H7-2	Relational -> Satisfaction -> Loyalty	0.068	0.016	-0.041	0.329	Full mediation
H7-3	Operational -> Satisfaction -> Loyalty	0.091	0.018	0.282	0.000	Partial complementary mediation

6. Discussion

In light of the research findings and the insights gained from the exploratory phase of the study, the results provide third-party logistics providers (3PLs) with a holistic understanding of the role of logistics performance in enhancing their manufacturers' loyalty in the supply chain and logistics field.

This study contributes to the prior literature by examining the relationship between logistics performance and customer loyalty by applying the results on third-party logistics providers (3PLs), and in the (B2B) context by expanding the existing studies on the relationship among logistics performance index (LPI), organizational logistics performance (OLP) and both customer satisfaction and customer loyalty.

This study result leads to the fact that there is a positive relationship between the main components of the world bank logistics performance index (LPI) and customer satisfaction. which allows the third-party logistics providers (3PLs) the opportunity to focus on supporting the major sub-indexes that have a statistically significant effect like the Customs, Infrastructure and logistics quality and improving the other sub-indexes that have lower contribution like Tracking, Timeliness, and Shipments to enhancing its relationship with their manufacturers.

The results reveal that despite there is a strong positive relationship between the second index of organizational logistics performance (OLP) and its components (cost-operational-relational), which strengthen the satisfaction relationship between the third-party logistics providers (3PLs) and their manufacturing customers. The research results indicate also a negative relationship between two sub-indexes (cost-operational) with the customer loyalty which implies that satisfying customers doesn’t mean they are loyal to third-party logistics providers (3PLs).

Third-party logistics providers (3PLs) should invest in facilitating the customs clearance procedures for their manufacturing customers (IV1_1_2) (our 3PL facilitates customs clearance procedures). This is considered a top priority for both manufacturers and logistics experts by adding different core benefits for manufacturers like time-saving, customs compliance and cost-efficiency.

Third-party logistics providers can use the tracking and tracing index to share information on their services, schedules, and rates that can be easily accessed by their manufacturing customers and increase both satisfaction and loyalty as well.

Third-party logistics providers should understand that logistics services requirements of their manufacturing customers are something very important, as indicated on IV2_2_1 (3PL understands the logistics services requirement of our company). It has the highest mean by 4.18 ± 0.877 out of 5 in (Table 1) which lead them to focus on fulfilling their manufacturing logistics needs and providing new tailored logistics services. Thus, they keep them loyal all the time like one-stop logistics services from door to door, help in finalizing the inspection of shipments in the early steps, as it can save both time and cost for them.

Having access to stock control and inventory management is considered the most type of logistics services required by manufacturers from (3PLs), especially when they use the integrated version of (ERP) system to link between them.

Egyptian authorities should make significant reforms in its customs laboratories to decrease the time spent for collecting the needed documents from the public, private institutions, laboratory inspections, and other similar supporting processes. This represents a common request from the majority of the logistics experts during the exploratory phase of the study.

The government should focus on mitigating the timeliness of shipments (Inbound and Outbound) in reaching the final destination. This can be achieved by decreasing the waiting time between different customs clearance procedures in addition to the loading and unloading of shipments. Thus, manufacturing companies can gain benefit from decreasing the time spent at ports due to delays, longer and complicated import procedures which will lead to competitively priced shipments.

The government should establish logistics areas around Egypt with different sizes which have become a common demand for the majority of the third-party logistics providers (3PLs) in which they always complain from a shortage of specialized storage areas that prevent them from expanding their logistics business in Egypt.

The Egyptian government should promote in the Tracking & Tracing Index the (ICT) in logistics services to enhance track &trace performance. This can be achieved through enabling gathering, organizing, and distributing information on products, services, and trade regulations. For that reason, manufacturing companies can benefit from traceability, which result from the activity of the logistics sector as a whole. Since all parties in the goods and products supply chain are involved in this component, they can significantly benefit from the improvement in the tracking and tracing index which will be a major area for future investments in trade logistics.

7. Limitations of the Study and Suggested Future Research

The research findings have several limitations including the study sample is convenient (non-probability sample). Hence, limiting the generalizability of this study

on the whole population (all manufacturing companies in Egypt).Using a convenient sample that may not be representative of the whole population, could decrease the accuracy and limit the generalizability of the research findings.

As mentioned in the above results, the total number of distributed questionnaires was 300. However, the response rate is just 66.66 % which needs to be taken into consideration in future research.

After a thorough literature review, the current study examined only the variables proposed in this conceptual model due to their perceived importance. However, there may be other variables that could be used to measure the relationship between logistics performance and customer loyalty. For example, examining the effect of security in freight transport that is considered a significant indicator of logistics performance.

This study recommends applying the logistics performance of third-party logistics providers (3PLs) in other non-manufacturing fields like trading and service industries.

The current study was conducted in manufacturing companies located and operating in large Egyptian cities (Cairo- Obour-10th of Ramadan-Alexandria-Giza). Therefore, the results of the current research might be compared to the findings conducted in other cities in Egypt and other countries.

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