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Exploration and implementation of Seaport Manatee to relieve the supply chain congestion at California ports

Diane Wells MacLennan

Pepperdine University

Graduate School of Education and Psychology

EXPLORATION AND IMPLEMENTATION OF SEAPORT MANATEE TO RELIEVE THE SUPPLY CHAIN CONGESTION AT CALIFORNIA PORTS

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Diane Wells MacLennan

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Eric Hamilton, Ph.D. – Dissertation Chairperson

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Diane Wells MacLennan

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DOCTOR OF PHILOSOPHY

Doctoral Committee:

Eric Hamilton, Ph.D., Committee Chairperson

Brian Jacobs, Ph.D., Committee Member

Danielle Espino, Ed.D., Committee Member

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DEDICATION

I would like to dedicate this work to those who have not only inspired me during the journey but also supported me when I felt discouraged. First, to my beloved husband of 17 years, Duane, who gave me the strength to follow my dream of pursuing this Ph.D. To my two daughters, Bethany and Emma for their patience and understanding of missing birthdays and holidays while I worked on this degree. To the most special group of people, my cohort—specifically, Ruth Akumbu, Sheri Mackey, and Jennifer Jukanovich. You picked me up when I was down and gave me the strength and courage to push onward.

"Life is constant challenge. We exert ourselves, learn and adapt. It is the continuation of this process that leads to a victorious life". – Daisaku Ikeda

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VITA

Diane MacLennan
Fort Lauderdale, FL

Education

Ph.D. Global Leadership and Change, Pepperdine University

M.S. Arts Administration, Boston University

B.M. Vocal Performance, Berklee College of Music

Dissertation

Exploration and implementation of SeaPort Manatee to relieve the supply chain congestion at California ports

ABSTRACT

For the global economy to thrive, a stable supply chain network is imperative to provide control of the seamless flow of goods. What is detrimental to supply chain performance due to inconsistency can be costly and consequently cause out-of-stock items, deficient use of container storage capacity and faulty logistics planning. This feasibility study examined leadership decisions in the face of supply chain turbulence. The analysis introduces the congestion free SeaPort Manatee in Palmetto, Florida. It establishes how this seaport could offer an alternative sea trade path to alleviate the supply chain strain since the U.S. will most likely continue to experience an increase in global trade instability. As the closest U.S. port to the Panama Canal, the study, in part, explores the significance of the canal as a primary conduit that allows Panamax and Neo-Panamax vessels expeditious transit from the West Coast to the Gulf Coast. Together with the new locks, the canal can handle ships with an overall length of 1200 feet, 160 feet wide (beam) and a draft of 40 feet. Consequently, not all vessels can travel through the Panama Canal regardless of its newly expanded locks (Rosenberg, 2019). The study also presents data to show how some cargo vessels sailing into Sea Port Manatee have a deep draft, which results in them being restricted by tidal ocean conditions. The draft is the minimum amount of water required to float the boat without it touching the bottom, allowing container vessels to successfully transport up to 15,000 (TEU) cargo containers through the canal. Catastrophic events such as natural disasters, a volatile political climate, and a health pandemic directly impact a company's business strategy. This study addresses the challenge for leadership to make decisions to relieve the congestion at U.S. West Coast ports. By engaging in conversations with vessel shipping lines, shipping lines could create new sea trade routes in exchange for inefficient routes between Asia and the U.S. West Coast. This study introduced

how sea-level rise will significantly influence port expansion at Sea Port Manatee and how vessels entering and exiting the port must do so under specific conditions.

Keywords: Supply Chain, Seaport, Cargo Vessels, Cargo Containers, Oceanography

Chapter 1: The Problem

The size of container shipping vessels has been impinging on the potential for global port expansion. Due to the physical size of larger ships, newer mega-vessels cannot access smaller ports, significantly impacting the delivery of containers. Container ship construction orders to increase TEU capacity are being built along with technological sophistication to accommodate the growing global trade demand and rapid delivery expectations (Maritime Executive, 2022). With the ascendancy of eCommerce, consumers now assume the immediate availability of everyday household products on store shelves. The absence of items as essential as baby formula to paper products becomes glaring when those items are not readily available. The sight of empty store shelves sends shoppers into consternation and panic, creating havoc for the public and global retailers. Therefore, people are more inclined to purchase products online with the expectation that those items will arrive directly in their homes faster instead of waiting for their local retail stores to stock shelves with the products they want or need. U.S. West Coast ports have been struggling to maintain port fluidity, lacking rail capacity and truck chassis, and threatening productivity on West Coast ports. The average import container dwell times in Ports of Los Angeles and Long Beach (LA-LB) reached 9.6 days in early 2022 and 11 days by mid-2022 which is more than the level needed to maintain port fluidity (Pacific Merchant Shipping Association, 2022).

Study Introduction

This feasibility study examines the implementation of SeaPort Manatee and suggests a critical need for global port expansion and development. It will bring to light the significant challenges that LA-LB faces as the primary international trade gateways and what they have experienced during the COVID-19 pandemic. It may determine the feasibility of implementing

SeaPort Manatee by providing insight from port leadership, custom brokers, shipping lines, and oceanographers.

Due to the ongoing challenges of supply chain disruption, rerouting cargo vessels to a less congested U.S. port could alleviate the strain at LA-LB ports. SeaPort Manatee is the closest U.S. Deepwater port to the Panama Canal, located near Tampa Bay in west-central Florida alongside the Gulf of Mexico. Services include international customers of general cargo, bulk, and breakbulk (goods stored on board ships in individually counted units) generating an economic effect of over $3.9 billion annually (SeaPort Manatee, 2021). Ten million tons of cargo flow through SeaPort Manatee annually, including products from Latin America, Europe, Africa, and Australia.

In 2016, the Manatee County Port Authority approved a $750 million master plan providing a strategic vision for growth and development to attract containerized shipping to the port and intermodal industries. The SeaPort Manatee Encouragement Zone is a Manatee County program to assist in fortifying the county's vitality. A Planned Development Encouragement Zone (PDEZ) fosters the development of vacant lands within the vicinity of SeaPort Manatee (Manatee County Florida, 2021) to include manufacturing, warehouses, and distribution centers in addition to various industrial use. The plan is to expand and develop the land at the Port to welcome an increase in cargo vessel volume, invite new tenants and business partners, and create a range of employment opportunities in the community. Other program features include berth and container terminal expansions, thorough environmental improvement strategies, and road and railroad augmentations. As these initiatives progress, opening trade routes from Asia to SeaPort Manatee may be a viable solution to alleviate the strain at the Ports of LA-LB.

While this study does not focus on the COVID-19 pandemic, data suggest that it caused a universal reevaluation of ocean transportation due to viral transmission within numerous restricted or inaccessible regions. From this perspective, much consideration was given to the health concerns aboard cargo vessels traveling from Port to Port. These vessels carried large amounts of people who were enclosed in small places. Due to high-profile outbreaks onboard multiple commercial cruise lines, the area of ocean vessels transmitting the virus was considered relatively minor (Coll, 2020). Nevertheless, what failed to be acknowledged was that cargo ships were transporting many essential items, such as food and medical supplies. Therefore, port entry for these vessels could not be restricted during the pandemic. Port operations had to remain ongoing, which included support vessels. For instance, tugboats and pilot vessels provide specific personnel required to board ships as they enter and exit ports. They function as a guide for the safe passage through narrow or shallow water involving close contact with the vessel crew. On the docks, ground crews were needed for boat inspection and loading and unloading cargo, which brought them in contact with the ship's crew. Procedures for protecting the maritime workforce need to be reevaluated. Future studies to examine the association between Florida ports and the global maritime community could outline virus-related threats by incoming vessels during the COVID-19 pandemic.

Leadership

A coherent and viable logistical environment in the ocean transit industry relies on executive leadership and its expertise in the maritime community. All leaders must make difficult decisions and choices that are in their respective organization's best interests (Northouse, 2019). An effective leader can make informed decisions with integrity, assurance, and the intellectual aptitude to execute those decisions. Since the supply chain

turbulence directly affects the ocean transit industry, in the context of this study, such turbulence hints at a breakdown of leadership and collaboration between the U.S. West Coast ports, ocean shipping companies, drayage trucking companies, and intermodal associations (Littlejohn, 2021).

Exceptional leaders can make unpopular decisions without hesitation (Heifetz & Linsky, 2017). One example of leadership breakdown is the noncollaborative attempt to ease the massive congestion at the West Coast terminals. For instance, port officials at the Port of Oakland have stated that there appears to be a slowdown in vessel traffic and advocate for ships to avoid the Southern California ports and consider adding direct shipping routes to Oakland (Hawes, 2021). However, drayage truckers transporting shipping containers report that Oakland is severely backlogged on the landside as they are experiencing severe staffing issues, plus lines of trucks more than two miles long with wait times up to ten hours (Hawes, 2021). Drayage truckers blame a faulty appointment system and a myriad of efficiency issues, indicating a lack of leadership.

The affiliative leadership style, also known as the "people first" approach, could be described as harmonious (Goleman, 2017). These management traits promote harmony and conflict resolution among teams. Unfortunately, the shipping industry is often hindered by silos between business divisions, making it challenging to collaborate. The leader who embraces the affiliative leadership style aims to build groups that work well together in accomplishing the objectives set forth by the organization. Often, these leaders are brought in to inspire team building and employee morale which directly impacts the work satisfaction of employees.

Developing a healthy work culture is key to the success of any organization and begins with successful executive leadership. High affiliative affinities will produce positive outcomes with attention to individual and work environment cultural contexts. Affiliative leaders are generally well liked by those with whom they interact, which accounts for them being personally more effective and productive due to their solid and cooperative relationships (Sigglekow & Rivkin, 2005).

When a mutual leadership style is present in a work setting, the focus on morale and handling hostility among employees translates to job satisfaction and engagement with the organization, which leads to better job performance and higher productivity. Usually, it defuses complex, negative dynamics (Patil et al., 2018). The first and most important priority would be to break down communication barriers and meet the needs of the employees. Second and almost equally important is offering praise for any job well done despite the tremendous scale of the project. Accolades and recognition are critical in showing support along with encouraging feedback. In making sure workers feel appreciated, a good leader should be mindful that it could cause workers to become complacent and get away with behavior that does not represent the organization in the best light. Third, since supply chain logistics are multidimensional and ever changing, an excellent affiliative leader must be flexible and not be authoritative or demanding when speaking with employees (Moshood et al., 2021). The focus should be positive and consider the employees' perspectives when offering constructive criticism.

Supply Chain

A supply chain is the convergence of a network of individual units that intersect through the flow of goods. These units are linked to the supply system, where the primary purchasing

company acquires products from a supply structure, from either a domestic or global source. Three areas can contribute to the strain of a supply chain disruption and affect the flow of goods and materials through the network. They are supply chain consistency, complexity, and unit necessity. Another critical component of today's global economy is the lack of supply chain confidence, resulting in vulnerabilities leading to disruption. It has impacted other international matters such as labor shortages, equipment availability, and global bottlenecks. Researchers have defined supply chain disruption as an unexpected occurrence that harms a company's everyday operations (Schmidt & Raman, 2012). The disruption can take many forms, such as a natural disaster including a weather event or contrived atrocities such as a terrorist attack or war. However, there is no common explanation for a supply chain disruption. Since March 2020, the COVID-19 pandemic has crippled the global supply chain, and the domino effect has led to a significant breakdown in international trade.

Supply chains are different from one another in numerous ways. One way to differentiate is to divide them into two groups: the innovative product supply chain and the functional product supply chain (Salyers, 2015). Varying needs characterize the innovative group. For example, electronic products depend on numerous materials that need to be sourced. Then, these products are manufactured and sent to market. Electronics have an expiration date, meaning a limited product life cycle. However, a moderately high-profit margin can lead to a durable market share partnering supply and demand.

On the contrary, the functional product group, such as household consumables, oil and gas, clothing, and essential foods, enjoys a more stable demand but a low-profit margin. At one time, quick and cost-effective were characteristics of healthy supply chains. However, the

current turbulent political environment has had a profound negative influence on the global supply chain.

Cooper et al. (2016) used a multiple case method to explore how capabilities develop in leaders of supply chain networks and how that can act as a catalyst in accomplishing better performance. They revealed that capitalizing on essential leadership abilities dismissed as an unimportant component of business management philosophy is critical to a company's success in a supply chain network. Challenges often arise due to a lack of effective leadership within an organization. Researchers could argue that a case study analysis has limitations, with bias, external validity, and reliability concerns.

Methodology and Research Design

A nonexperimental feasibility study was conducted to understand strategic leadership decisions to address seaport congestion, a specific type of supply chain disruption. Interviews were conducted using an online video platform. An online survey questionnaire was distributed to leaders in maritime transit, freight forwarding, ocean carrier industries, and ocean scientists for insight into the feasibility of implementing SeaPort Manatee as an option to ease the bottleneck at U.S. West Coast ports. A freight forwarder acts as the intermediary between a company making a shipment and its destination—namely, a distribution center, warehouse, or retailer. There are several types of freight forwarders. For instance, transport modes include sea/ocean cargo, rail, trucking, and air shipping. This study focused on how ocean cargo vessels could be diverted away from LA-LB and offload cargo at SeaPort Manatee instead of staying at anchor on the West Coast for numerous days. Consideration of international cargo destinations from Asia was examined to include intermodal transport to West Coast vendors once cargo was offloaded and to determine the practicability of the movement of trade routes from Southern

California to SeaPort Manatee. Supply chain logistics deal with the daily operations of moving freight from the point of origin to its destination through trade routes. Leaders in these industries experience product flow disruptions due to a destructive weather force, human accidents, or the more recent COVID-19 pandemic and determine a course of action that will not impede the transport of goods.

Subtopics emerged from this study leading to further assessment of the expansion and development of global ports and leadership decisions. The study was conducted using human subjects, required sensitivity and neutrality, and was carried out objectively.

Sources of Data

Since the beginning of the COVID-19 pandemic in March 2020, truckers and longshore workers have been working more hours to clear the logjam at the ports of LA-LB (Littlejohn, 2021). The target population for the study was the leadership at SeaPort Manatee, leadership at freight forwarding organizations, ocean carriers, and oceanographers. The study was conducted to strategically analyze port operation logistics regarding international shipping obligations. Onsite observations at SeaPort Manatee provided a firsthand experience of how port operations maintain the fluidity of bulk and break bulk goods, such as concentrated orange juice, fresh produce, petroleum, lumber, steel, and gravel. It also offered insight into how the port organizes its warehouses and container yards for exporting empty boxes and the process by which truckers pick up gravel and containers for distribution.

Visitation to the Center for Maritime and Port Studies at the University of South Florida enabled a better understanding of maritime intelligence technologies using a proprietary surveillance system called Pole Star. It functions as a maritime tracking system similar to the marinetraffic.com radar website. However, it also enhances reliable monitoring of oceanic

conditions to alert seaports and vessels of conditions surrounding SeaPort Manatee and other global ports.

Holistic Approach

A holistic approach can ease decision makers' minds by providing concrete evidence that a change must be implemented to enhance port operations and identify weak areas. Holistic techniques can add value to the work climate, ensuring it runs at its fullest potential.

One of the broader views in dealing with a problematic situation is holism, which considers all aspects, then focuses on interactions between the various viewpoints (parts). Holism is the theory that pulls apart an in-depth interconnection such that it cannot exist independently or cannot be recognized without reference to the whole (Jacowski, 2020). When researching human subjects, the study was objective, observing current processes to understand what processes work and whether adjustments are necessary. Submitting a recommendation proposal can be detrimental to the study and met with resistance. The research aimed to establish distinguishable leadership traits that impact supply chain logistics during turbulent conditions and, if deploying cargo vessels to the Gulf Coast is feasible, to ease the congestion at U.S. West Coast ports.

A holistic approach is a creative way to pull back the lens, look at the entire operational landscape, and then analyze the nuances to determine whether any fissures exist in the overall infrastructure (Bradley, 2017). When an organization uses holistic techniques, the entire organization is measured in its processes and policies instead of focusing only on its specific elements. The holistic method can run at its full potential (Jacowski, 2020). An example of holism is the assessment to determine if current systems can integrate within the complexities of the global need or whether another structural management tool implementation is needed. For

instance, SeaPort Manatee operations strategically connect each port function, such as the availability of chassis, which is necessary to transport cargo containers across the supply chain, multiple mobile harbor cranes, and warehousing in a container trade increase. Due to the ever-changing political and economic climate, a port can quickly outgrow its systems, affecting its ability to keep anchorage times on track for offloading and loading containers.

A future study of port operations may reveal processes to be eliminated, new developments to be designed, and the overall effect on the port. A customer's potential to lose millions of dollars due to product damage on containers awaiting berth will reduce the amount of product received. The backlog at LA-LB ports could result in increased prices passed on to the general consumer.

Context of Study

The ports of LA-LB are the 9th busiest ports after Shanghai, Singapore, Shenzhen (China), Ningbo (China), Busan (S. Korea), Hong Kong, Guangzhou (China), and Qingdao (China; Port of Long Beach, 2021). Nevertheless, LA-LB ports have been experiencing catastrophic delays throughout their supply chain networks. The Port of Long Beach features 3,530 acres of land, 4,600 acres of water, ten piers, 80 berths, and 70 Panamax gantry cranes. A Neo-Panamax vessel is the largest that can transport cargo through the Panama Canal. A ship’s dimensions typically have a deadweight between 65,000 and 80,000 tons. Deadweight tonnage measures a ship's total contents, including cargo, fuel, crew, passengers, food, and water. A Panamax crane is a piece of equipment that can load and unload containers from a Panamax class ship to transit the Panama Canal. There are 22 shipping terminals: five breakbulk (automobiles, lumber, steel, and iron ore), six container terminals, six dry bulk (petcoke, a petroleum byproduct, salt, gypsum, and cement), and five liquid bulk (petroleum). Located in San Pedro,

CA, the Port of Los Angeles is often called America's Port, the country's principal and most active gateway for global trade. The Port comprises 7,500 acres (4,300 land/3,200 water) alongside 43 miles of waterfront (Port, 2021). There are 25 cargo terminals, seven container terminals, and 82 ship-to-shore container cranes. The 116 miles of on-dock rail and six intermodal rail yards have direct access to the Alameda Corridor, a 20-mile express railway connecting the port to the rail hubs in downtown Los Angeles (Port, 2021).

However, even with the abundance of piers, berths, gantry cranes, and shipping terminals, too many empty containers are sitting on the docks, leaving no room to offload full containers from vessels. It has resulted in a severe backlog, with an unprecedented number of ships waiting off the West Coast to unload cargo (Schuler, 2021). Port of Long Beach leadership describes the problem as having capacity issues due to the exceptionally high number of containers waiting to move off the terminals. Warehouses cannot accommodate the ongoing spike in cargo moving through the port due to a lack of space at the depot.

Meanwhile, SeaPort Manatee transports over ten million tons of freight annually, including a wide range of imports and exports to and from Latin America, Europe, Africa, Asia, and Australia (SeaPort Manatee Facts, 2021). In its 2021 fiscal year ending on September 30, 2021, a record 135,660 TEU containers crossed the docks of SeaPort Manatee, up 53.3% from the preceding 12-month period, more than 3.5 times the 38,361 units handled by SeaPort Manatee three years earlier in fiscal 2018-2019. Additionally, SeaPort Manatee achieved a record in total cargo tonnage in fiscal year 2020-2021, with 10,451,566 tons, up 12.1% from 9,327,043 tons in fiscal year 2019-2020 and eclipsing the prior record of 10,081,743 tons handled in fiscal year 2018-2019 (SeaPort Manatee, 2021).

SeaPort Manatee's leadership states that their expanded dockside container yard and future additional infrastructure enhancements may mean the port is ideally positioned to sustain its cargo volume surge. The port has been managing two vessels per week and is increasing to three boats per week for the first time, putting much stress on port operations due to augmented congestion at the docks. Port operations will need advanced logistical planning to accommodate the rise in port access from two vessels per week to three boats per week and possible future growth.

The dock has a staging area for empty containers waiting to be loaded onto cargo ships when they arrive at the port. These will be shipped back to their point of origin and clear space for new fully loaded containers to be offloaded. Customers will pick up the containers being unloaded for transport to their destination. The World Direct Shipping company, headquartered at SeaPort Manatee, offers container delivery by truck or rail to anywhere in the eastern United States. The port has highway connections to three major Interstates: Interstate 75, Interstate 275, and Interstate 4. The port directly connects to the CSX Corp. short-line railroad mainline, located within one mile of its north gate. The short line contains two modern switcher engines. Its track extends nearly seven miles, which accepts a volume of 300 railway vehicles and provides public warehouse space spread out over one million square feet. It has a refrigerated area of 207,000 square feet, 328 stationary refrigerated plugs, and 120 portable receptacles totaling 448 reefer plug capacity (SeaPort Manatee, 2021). SeaPort Manatee can accommodate Panamax vessels within 1,300 feet in the diameter turning basin. They operate multiple cranes—two Gottwald HMK 6407 mobile harbor cranes and one Liebherr mobile harbor crane—capable of handling containers, bulk, breakbulk, heavy lift, and general cargo at multiple berth locations (SeaPort Manatee, 2021).

Global supply chain turbulence has plagued the ocean transit industry for many years, and numerous ports have been congested with vessels waiting to offload thousands of containers. Necessary trucking equipment such as chassis has been unavailable due to port restrictions on empty returns, which has resulted in substantial backlogs and delays in returning the chassis (Ozkan, 2020). When trucks are finally deployed to retail distribution warehouses, they discover many are over capacity, resulting in an overaccumulation of products that are no longer in demand and a shortage of products in high demand.

The global supply chain is crippled, beginning at the ports and extending to distribution warehouses in California and the greater United States. It has had a considerable impact on the ability to deliver products. The bottleneck in LA-LB has emphasized the need for port expansion. Therefore, a feasibility study could provide important information as to whether the implementation of SeaPort Manatee is a viable solution considering the cost of rail and trucking transport for cargo rerouted to the Gulf Coast, which is destined for the western U.S.

This study examined leadership styles and organizational design elements at SeaPort Manatee and how leadership teams collaborate with ocean carrier leadership and freight forwarders to make strategic decisions germane to rerouting cargo vessels to alleviate the bottleneck at California ports. The strengths and weaknesses examined will aid in evaluating innovative approaches among the multichannel supply chain networks within the port's operational system, potentially exposing the need for port expansion.

Summary

Supply chain instability has hit the maritime sector hard, causing TEUs' import volume to be severely delayed. The upsurge in consumer spending has impacted LA-LB ports during the COVID-19 pandemic, partly from government stimulus and lockdowns. Southern California

ports are experiencing a record-breaking backlog and represent a dramatic aspect of the supply chain crisis. Every facet of the industry is in chaos. In October 2021, Moody Analytics warned there would be "dark clouds ahead" (Kay, G., 2021b) for the supply chain. The only near-term solution would be to cut back on consumer spending, though the prospect seems unlikely. Experts predict the disruptions will continue well into 2023, despite efforts from the government to mitigate the issue. The delays have affected numerous consumer goods, including everyday household items, food products, and clothes. Florida state officials have openly encouraged shippers to direct their interests to Florida (Achumba, 2021). SeaPort Manatee could be a strategic choice if ocean shippers begin to divert their cargo. However, the availability of intermodal equipment, container capacity, and labor force must be considered. The port's cargo trade catapulted 53.3% in the2020-2021 fiscal year. It also broke weight records, reaching 135,660 container units of more than 10 million tons (Achumba, 2021). Additionally, with an expansion project underway, the SeaPort Manatee’s administration has confidence that it is well prepared to handle a sizable cargo surge.

Chapter 2: Literature Review

Container ships that travel between major global ports are an extraordinary engineering model, with 90% of the world trade moving through ocean transit. In mid-2021, a global supply chain crisis wreaked havoc on ocean transit and world trade due to unforeseen disruptions in international trade. Freight forwarders from maritime logistics, air cargo, and intermodal transportation, including rail and drayage trucking, attempted to minimize the effect of the crisis, which has had catastrophic consequences on the supply chain. As a result of empty store shelves, consumers have become even more dependent on online purchasing, further aggravating retailers' inability to meet demand (Weber, 2021). Studies have shown that countries highly reliant on imports or exports could have different purchasing behavior from the domestic supply chain (Inoue, 2021).

The unexpected gridlock has resulted in significant delays in container transport volume at the LA-LB ports. In the past, ocean transit has been a reliable alternative to road and air transport. However, the COVID-19 pandemic has led to sizeable on-dock workforce shortages. Along with their supply chains, companies must consider making substantial modifications to benefit society (Gargalo et al., 2021). For example, a reduction in high-traffic, in-person activities, like shopping at their local mall, had been anticipated. With social distancing protocols, retailers and restaurants offered curbside pickup, online ordering, and food delivery platforms.

For this reason, it is vital to create new methods of trimming processes and activities that add no value. A multitude of interruptions caused by the pandemic has obstructed production continuity and ocean transport logistics worldwide (Klump & Loske, 2021), having an extraordinary impact on supply chains in the U. S. Arguments have been made to take a lean

approach using smaller vessels instead of mega-vessels, allowing frequent deliveries and fleet automation. Customized shipments offer logistical benefits, such as reduced containerized inventory and faster response to sustain customer demand (Larsson et al., 2012). Using lean techniques would allow shipments to reduce inventory levels, creating a one-piece flow logistics process that means smaller shipments, smaller vessels, and faster delivery. In contrast, developing technology will influence how services are provided regarding distribution price and energy savings (Bernacki, 2021) of using larger vessels.

A vessel is efficiently organized to haul containers leaving thousands of possible points of failure that can severely bottleneck the supply chain system. The size and weight of mega-vessels, which sail at a near-capacity of 18,000 TEU containers, make them more vulnerable than smaller vessels. They are often challenged by potential stowage collapse or containers falling overboard when these vessels encounter rough weather during ocean transit (Falvey Cargo Underwriting, 2021). It can lead to a dramatic impact on the global supply chain and economy. Consumers are irritated because of the enormous delays, and cargo is piling up at the ports, leaving the shipping industry at risk. The political factor continues to dictate the shipping industry's conditions. Port authorities from Los Angeles describe how introducing the U.S. trade policy and tariffs under sections 232 and 301 has resulted in a broken-up supply chain. Section 232 of the Trade Expansion Act of 1962 gives the President broad authority to restrict imports in the interest of National Security by imposing tariffs (Smith & Walters, 2019). Section 301 of the Trade Act of 1974 gives the president broad authority to impose tariffs against countries that make unjustified, unreasonable, or discriminatory trade actions (Meinderts, 2020). The overall effect was that retailers were importing goods with a sense of urgency. The term “front-loading” became a phenomenon in 2019. Merchants knew of the deadline to start paying tariffs (Cavallo

et al., 2021), so they, in turn, ordered large quantities of products that they did not need but wanted to get as much into the United States before tariffs were imposed. Ports were crippled without enough employees to process the containers arriving in the country.

When the pandemic hit in early 2020, imported cargo plunged nearly 20%. What happened next was utterly unexpected. American consumers began a buying surge unlike anything ever seen before. During this purchasing blitz, the Suez Canal, a critical ocean transit superhighway, became immobilized for six days when the Evergiven ship ran aground (Ramos et al., 2021). The cascading effect created delays in container delivery. When the Evergiven vessel was stuck in the Suez, other shipping companies had to decide whether to stay in the queue or take a much longer route to an awaiting terminal (Lee & Wong, 2021; Yizhen et al., 2021). This was a logistics nightmare as it took longer and required complex planning and was also more costly due to the vessel's additional fuel.

Port Operations and Logistics

Economist Levinson (2016) provided a historical landscape pointing out neglected resources and how container shipping transcended economic geography, which fueled the growth of global ports. During the ocean transit industry transformation in the 1950s, Levinson revealed that the expansion of ocean shipping was inexpensive for international retailers. Factories beyond their local customers (Levinson, 2016) paved the way for other countries to cultivate global manufacturing, bringing consumers an incredible assortment of low-cost merchandise from every corner of the globe.

Excitement arose on December 26, 2015, when the new ultra-large, French-made container vessel CMA CGM BENJAMIN FRANKLIN (the name for the first U.S. ambassador to France) and its crew of only 27 members brought more than $985 million worth of cargo to

the Port of Los Angeles in a single visit (Pavur et al., 2020). The French container shipping company, Compagnie Maritime d'Affrètement (CMA), Compagnie Générale Maritime (CGM), built the 1300-foot-long, 177 feet wide ship. Economic scale allowed more containers to be hauled on fewer vessels and be more efficient than smaller boats with less volume (Smith, 2021). Government officials in Los Angeles announced that the West Coast ports were big ship ready and prepared the shipping industry and port operations to service large vessels. As a result, shipping companies built longer, deeper, and more expansive ships to increase cubic container volume (Hyland et al., 2020). Understanding a mega-vessel's size, how many containers are aboard, and its impact is essential. One of these vessels is the Maersk Triple E, the largest in their fleet. It measures 400 meters long, is more extensive than four football fields, and carries more than 18,000 TEU containers. This Maersk ship carries containers stacked in columns, 23 columns across its width, 24 columns along its length, and 21 columns high.

The need for shoreside infrastructure to handle the massive influx of ultra-large vessels carrying 18,000 TEUs was not completely factored in. This shift in the commercial transaction harmed port and terminal operations (Pinder, 2016). A few days before the arrival of the BENJAMIN FRANKLIN vessel, Ship & Bunker reported that U.S. West Coast ports were not ready to manage the new mega-box ships since the ports were in dire need of equipment. Ship & Bunker feared the arrival would be an exercise in public relations (Ship & Bunker, 2021) rather than a meaningful test of how Los Angeles port operations might handle a fully loaded ultra-large vessel. Without the enhancements, days would be added for the loading and discharging time for boxes at the terminals undermining the West Coast's competitiveness versus the Gulf Coast.

Nevertheless, in February 2016, the CMA CGM BENJAMIN FRANKLIN was sent to Long Beach port instead of Los Angeles, and in May 2016, CMA CGM deployed six more mega-ships to the West Coast. Although hailed as a success, many questioned whether the ports could handle these mega-ships regularly (Schuler, 2016). Even though CMA CGM committed to the deployment, the company announced that it canceled plans for the BENJAMIN FRANKLIN to sail into Long Beach. The mega-vessel was redeployed to the Shanghai-Southampton route stating weak U.S. market conditions (Schuler, 2016). Global ports are vital connections in maritime industry networks, posing risk factors in port operations when faced with the risk that disrupts the logistics chain and cargo flow (Lai et al., 2020). The events surrounding the CMA CGM BENJAMIN FRANKLIN may have caused cascading effects throughout the supply chain (Dolgui & Ivanov, 2021), causing significant delays and other adverse effects on the global economy. LA-LB ports still do not have adequate infrastructure or workforce to process the influx of 18,000 TEUs shipped on ultra-mega-ships.

Shipping from a port authority requires signatures from several essential agencies to approve the export and numerous documents that explain the origin, chemical treatments, the quality of produce (if applicable), and customs duties. With a personal computer or mobile device, the vendor submits a Bill of Lading available to all parties initiating a binding agreement that administers export approval among the required agencies. Simultaneously, an inspection report, the pickup by the inland transport truck driver, and authorization from customs are transferred to the exporting port authority to begin the requested container preparation (Park et al., 2020). All necessary documentation is captured and then shared. For perishables, there must be no delays or errors.

Reefer Containers

Shipping containers used in maritime logistics have risen since Malcolm McLean first introduced the shipping practice in 1956 (National Oceanic and Atmospheric Administration [NOAA], 2017)). The demand for international culinary delights has increased with the heightened exposure of celebrity chefs and food enthusiasts on television and social media. Ingredients from various cultures have grown exponentially, stressing agricultural food product distribution (Pradita et al., 2020). Cold chain logistics requires specialized equipment. Refrigerated containers called “reefers” are essential for shipping perishable goods to global markets. A reefer container is built to maintain a constant temperature and humidity level to ensure the safe transport of food and medicine (Tang et al., 2019). For this reason, continual monitoring and surveillance within the reefer container are imperative. The evolution of container technology extends to mechanically refrigerated containers known as reefer containers.

Cold-chain logistics is a vital aspect of the ocean transit industry (Zhu & Xie, 2020), which involves importing and exporting commodities at 34 degrees Fahrenheit. Computational fluid dynamics technology mathematically measures the physical phenomenon of fluid flow through reefer containers to ensure a balance between the temperature and airflow in the box (Zhu & Xie, 2020). Reefers are commonly used in cold-chain logistics transport since they are energy-efficient, inexpensive to operate, and offer environmental protection (Li et al., 2020) for the transportation and distribution of agricultural products. Insurance claims data reveal how a cold-chain malfunction of cargo damage occurs from mechanical breakdowns and organizational errors, mainly because of delays at container transfer points (Castelein et al., 2020). Even though the technology exists for monitoring reefer boxes that have not been unloaded and delivered, containers onboard a vessel drifting hundreds of miles off the West Coast for many weeks may

be at high risk of spoilage and an unquantifiable monetary loss (Bigaj & Kolinksi, 2017). Once reefers reach their port destination, offloading the container is a meticulous process by which near-surgical precision is crucial.

Port Crane Operations and Processing Cargo

Crane operators play a vital role in daily port operations as they stack containers in the depot and load each onto the vessel (Chargui et al., 2019). There are two types of cranes: quay cranes (pronounced “key”) and yard cranes. A quay crane is a massive dockside crane that unloads containers from the ship onto the port. A yard crane is located at the port and moves laden containers from the port onto trailers (Zhen et al., 2018). The container transfer chain requires a reliable scheduling system aligning the vessel, quay crane, operator, and drayage truck. Quay cranes contribute to the highest power demand at the interface between the Port and the ship. They must unload containers horizontally as expeditiously as possible before moving them to the stacking depot (Kermani et al., 2020). A gantry crane sits on a rail system like a train and is powered by 4,160 volts of electricity fed from a trench. An approximately 128-feet high trolley drives out and back over the ship. A hoist lever is connected to two 2100-foot cables used to lift containers. Crane operators constantly lean forward, looking down at the ship and the containers compromising their lower back, which often leads to musculoskeletal disorders (Li et al., 2019). Crane operators controlling cargo movement can delay port operations if they cannot handle the equipment (Jakovlev et al., 2020). The deployment of advanced technology provides tangible and intangible resources, which are valuable assets translating into positive port operations performance (Vrakas et al., 2021). Unfortunately, LA-LB ports have not experienced higher productivity since 2020 and, most likely, into 2022 and beyond, with crane operators

suffering from work overload with no end. The results of Senna et al., 2020 study suggest that human factors cause severe risks in the supply chain (Senna et al., 2020).

Ports in LA-LB report a downward trend in the number of containers moving at the end of 2021. However, Gulf Coast ports are reporting more boxes they can handle. The critical concern at Southern California ports is that LA-LB has reached a resistance level in its ability to reduce the number of empty containers on its docks. Massive confusion exists between marine terminals and ocean carriers regarding storage fees introduced in October 2021 for long-dwelling import and empty containers. LA-LB is unique because the average vessels coming to their gateway carry nearly 11,000 boxes. They offload 80%–100% of the containers, whereas the Gulf Coast ports only offload 20%–40% (Kennedy, 2021). The problems begin with the ashore containers, which are usually loaded onto a tractor-trailer and then taken to a distribution site or warehouse. However, space at the Los Angeles warehouse is minimal, forcing trucks to hold boxes on the chassis for a long time. Eventually, they will offload the box, and the drayage driver can return it to the port so the chassis can be reused. Without anywhere to put the empty container, it is inactive and unavailable.

With limited capacity and fierce competition, ocean transit companies must consider slot allocation for TEUs in response to shipping demands (K.Wang, Yang et al., 2020). Ships cannot store time-sensitive deliveries such as agricultural items, fresh meats, seafood, and reefer containers indefinitely. Deep-sea vessels have incurred a long wait time due to severe port congestion in Southern California, exposing poorly devised planning (Jia et al., 2020) on the part of port and government officials. There appears to be a disconnect between government officials, ocean carriers, port operations managers, and trucking associations. An examination of the LB-

LA throughput is needed to measure the average cargo being processed through the ports daily and identify organizational issues (B. Xu et al., 2021).

While there are options to alleviate container transportation congestion, the underground logistics system offers a sustainable solution: a system created to deliver goods using an underground tunnel system (Dong et al., 2019; Fan et al., 2020).

Port Expansion and Development

There is a strong relationship between the zoning district adjacent to SeaPort Manatee and port-compatible land development for warehousing, distribution, and heavy and light industrial uses related to transportation capacity (Yan et al., 2021). SeaPort Manatee comprises 5,000 acres of privately owned land available for commercial development and includes 207,000 square feet of refrigerated space, optimal for reefer container storage (Real Estate, 2021). In 2016, the Manatee County Port Authority approved a capital improvement plan (CIP), a multiproject plan suggesting the port's expansion. The CIP outlines strategies for the growth of current and prospective businesses in the Tampa Bay region, and future growth could positively impact global economic conditions. All projects in the CIP depend on demand and the Port Authority's intermodel land-use study to address future site development at the port. This study looked at the usable land usage for the port's numerous trade regions, including but not limited to bulk, container, cold logistics, and the interrelationship with intermodal cargo transit and entry of finished goods. The study determined each project phase in stages concentrating on the growth of shipping activities and serving as a plan for port expansion due to increased commodity demand. The seaport encompasses land and maritime exchange (Bernacki, 2021). They are vital components that safeguard the continuum of the two transport systems. The potential benefit of the expansion could positively impact port throughput and the state's economy, whether the

throughput would affect the gross domestic product (GDP) or not (Cong et al., 2020). However, it could positively affect retail sales and consumer goods.

In 2008, the world economy suffered a financial crisis, and global shipping revenues plunged. Container haulage started using larger ships and consolidated shipping routes to globalize shipping lines (Lezhnina & Balykina, 2021). Mega-container vessels with 18,000 TEUs were deployed on major trade routes (Clott et al., 2018). However, this presented numerous challenges for ports and inland region networks such as distribution centers and warehouses.

It is predicted with utmost certainty that the pandemic-fueled cargo swell will continue into 2023. The underlying issues within the supply chain have nearly halted the U.S.'s economic momentum. Fervent consumer spending and demand for a quick purchase delivery will continue to drive economic expansion (Schuler, 2021). Blockage at LA-LB ports was the focus of the Biden Administration's goal to partner with both the private and public sectors to transport products to retailers in time for the 2021 holiday season. President Biden introduced a bipartisan $75 billion infrastructure proposal to invest $25 billion in airports to address repair and maintenance backlogs, reduce congestion and emissions near ports and airports, and implement low-carbon technologies (Hunnicutt & Cowan, 2021). On October 29, 2021, Biden experienced a setback as “the House of Representatives abandoned plans for a vote on an infrastructure bill, with progressives seeking more time to consider his call for a separate $1.75 trillion plan for climate measures, preschool, and other social initiatives” (Hunnicutt & Cowan, 2021, p. 1). A debate in the 117th Congress on the proposed Ocean Shipping Reform Act of 2021 is a bipartisan effort introduced by Rep Garamendi/CA (D) and Rep Johnson/SD (R). In part, it hopes to “ensure an efficient, competitive, and economical transportation system in the ocean

commerce of the United States, support the growth and development of United States exports and promote reciprocal trade in the foreign commerce of the United States" (Garamendi, 2021, p. 1).

International establishments and policymakers could devise an operative framework for small port development (Chen et al., 2019). Seaports are an essential component in maritime shipping networks as they are a catalyst in global economics and trade development. As integral hubs of maritime supply chains, they are critical in contributing to community socioeconomics (Hossain et al., 2021). Responsible for transporting 90% of world trade (Song & Panayides, 2012; Walker et al., 2019), the shipping industry's access to seaports is critical since they are vital portals that link international businesses. In addition, they provide value by adding services such as storage, warehousing, and access to intermodal distribution (Pettit et al., 2009).

Supply Chain Disruption

There are challenges in linking a port to its borders, and it is especially critical for access to large seaports. For example, LA-LB ports process approximately 63% of its maritime traffic destined to vast inland locations, 37% of which is destined for Southern California alone (Port of Los Angeles, 2021). Local congestion and infrastructure expansion constraints push the need to justify a new approach considering cargo destination and logistics (Port Economics, Management and Policy, 2018)).

Prior to the 2020 pandemic, the leading causes of supply chain disturbance were 35% due to adverse weather conditions, 21% from new laws and regulations, 11% from civil unrest and conflict, 10% from political adjustment, and 5% directly related to acts of terrorism (Castellan Solutions, 2021). For instance, a voyage from the Port of Taipei to the Port of Los Angeles during the winter showed fuel consumption had increased substantially (Tsai et al., 2021),

suggesting that navigators contemplate multiple contingencies, such as weather conditions, ocean currents, speed, sailing time, and cargo safety. Unfortunately, shipping companies do not disclose their operational reports. Therefore, it is only possible to evaluate this information from publicly available data, such as the automatic identification system and ocean environment data (Oh et al., 2021).

Traditionally, the cycle time for a retailer to ship merchandise to overseas ports from China to the U.S. was approximately 40 days. To account for global economic uncertainties, managers in supply chain organizations may choose to undergo an inventory policy redesign (Shahed et al., 2021). For instance, COVID-19 has disturbed facets of the medical supply chain (Khan & Javaid, 2021), exposing network vulnerabilities. Essential medications, including sanitizers, hygiene, and anti-bacterial items in pharmaceutical structures, have experienced a decline in access to medical outlets (Tirivangani et al., 2021). Limited in-country delivery continues due to significant obstacles at the ports for offloading necessary ingredients for producing medications and access to intermodal transportation for the distribution to regional medical facilities. A solid infrastructure accommodating the possibility of unanticipated occurrences that may deteriorate port operations is essential to keep the supply chain running (Olivares-Aguila & ElMaraghy, 2021). However, making adjustments to resolve compounding bureaucratic interferences does not offer long-term benefits, as evident at the LA-LB ports.

Containers loaded onto vessels in China would travel by sea and then wait at a berth at LA-LB for no more than two days to be unloaded to trucking carriers and transported to distribution warehouses. In 2021, the average cycle increased from 40 to 75 days, and the ports were jammed with ships waiting to be offloaded. Road transportation equipment is frequently unavailable (Kohan, 2021), compounding the problem. The expanding number of cargo ships

waiting to enter the LA-LB ports indicates that this bottleneck is the primary supply chain impediment. However, in late September 2021, officials in California decided to drift the awaiting ships 150–300 miles offshore (Coles, 2021). The weekly advance volume estimate reports from LA-LB did not include ships adrift in the Pacific Ocean. The goal was to hide vessels offshore to give the illusion that the congestion is clearing up while hundreds are still 150–300 miles offshore (Western Overseas, 2022). Another serious consideration is that ships adrift must ensure their engines will be ready on short notice, resulting in costly fuel consumption.

Since ultra-large mega vessels cannot fit through the new lane in the Panama Canal as a way to access SeaPort Manatee, rerouting Panamax, Neo-Panamax and smaller vessels to the port would ensure products move to distribution warehouses and retail destinations on time. The larger mega-ships would have increased access to enter LA-LB ports to offload, and the supply chain could begin to move foreign merchandise. However, the shortage of trucking equipment on the landslide has made the logjam more complex. The problem is not so much offloading laden containers anymore as it is moving the empty containers off the docks so loaded ones can be picked up and delivered. Having a railway system close by does not relieve the backlog if there is no place to process containers brought in from other countries.

Currently, there is an imbalance in the flow of containers traveling only one-way, and emptied containers are returned without being loaded, impeding the movement of exports. This hybrid flow of full and empty containers allows empty containers to be shipped back to their point of origin to be used right away for loading products, reducing the wait time of being unloaded first (Notteboom et al., 2022). However, empty containers returned to the ports by

drayage truckers are sitting on the docks without being used or returned, having a profound detriment to the entire supply chain (S. Xu et al., 2020).

The issue becomes a question of supply chain resilience and examines any precursors that have led to the backlog at LA-LB ports (Shekarian & Parast, 2021). For instance, the supply chain disruption began mid-year 2020 when the response to the pandemic by governments and corporations, combined with a surge in consumer demand, generated many shipping delays. American retailers reacted by attempting to push an unprecedented number of goods through the bottleneck, which exacerbated the situation. Factory closures, workforce issues, equipment shortages, and inadequate port infrastructure and leadership have been attributed to the supply chain crisis. Preemptive and proactive analysis of vulnerabilities can encourage collaboration among stakeholders to identify essential strategies that may mitigate further delays or develop more flexible plans to allow ships to divert to alternative ports (Aboah et al., 2021; Messina et al., 2020).

West Coast port authority officials may report political complications as causes for the excessive container dwell times in the transpacific. However, an empirical analysis identified reasons for the disruption in a real-world industrialized environment (Mithun et al., 2021). Port operators are challenged with securing berthing space at the LA-LB terminals and finding creative ways to accommodate more vessels. They have accepted ad hoc port calls along with boats that have a contracted weekly schedule. The costs associated with the ad hoc service mean the ship will pay the terminal's tariff price, which is higher than shipping lines with contracts with the Port (Mongelluzzo, 2021).

The Effects of Global Trade During Disruptive Events

Global trade is so interdependent that if one major Port is disrupted, it impacts the sum of all parts—that is, economies worldwide. In March 2021, the Evergreen Marine shipping container vessel, the Ever Given, obstructed the Suez Canal, causing a significant global trade slowdown (Almendral, 2021). Before this catastrophe, disruptions from the COVD-19 pandemic hit port upon port with reverberations that affected the consumer market (LaRocco, 2019).

Container ships that travel between major global ports are an extraordinary model of engineering—90% of the world trade moves by ocean transit. In 2019, 11.1 billion goods were moved across the sea (International Chamber of Shipping, 2020). The World's Shipping Council reported that the line industry moves more than $4 trillion in goods annually utilizing a complex global trade network.

In the late 1950s, the concept of a container being loaded onto a ship was revolutionary. They could be offloaded onto freight trains or long-haul trucks and then efficiently transported to their destination anywhere in the world (Mall, 2021). Container shipping has evolved, with the earliest container ships carrying only 58 containers. Today, Ultra Large Mega Vessels can haul approximately 23,964 containers. With these staggering expansions, there are significant concerns about vessels getting too big or holding more than their capacity by stacking containers exceedingly high. Hundreds of containers have been lost this past year from falling into the ocean when these enormous vessels hit a gigantic wave or water turbulence (Koh, 2021).

There are 5,446 active container ships worldwide that are fully cellular, specifically designed to efficiently store freight containers on a commercial vessel. Vessels are efficiently organized to haul containers, however, ocean shippers' inability to control capacity could result in thousands of possible points of failure that can severely bottleneck the supply chain system

(Alphaliner, 2021). Carriers may need to implement capacity cuts on severely impacted trade corridors. Consumers are irritated due to the enormous delays, and cargo is piling up at LA-LB ports, leaving the shipping industry vulnerable (Murray, 2021).

Politics continue to dictate the shipping industry's conditions. Port of Los Angeles officials commented that introducing U.S. trade policy and tariffs in 2018 under sections 232 and 301 has resulted in a broken-up supply chain. Section 232 of the Trade Expansion Act of 1962 gives the President broad authority to restrict imports in the interest of National Security by imposing tariffs. Section 301 of the Trade Act of 1974 gives the President broad authority to impose tariffs against countries that make unjustified, unreasonable, or discriminatory trade actions. The overall effect lies in retailers importing goods with a sense of urgency, resulting in merchants ordering large quantities of products they did not need to receive before tariffs were imposed. In 2019, this front-loading phenomenon added immense pressure to the shipping trade (LaRocco, 2021). Ports were crippled because there were not enough people to process all the containers arriving in the United States.

When the pandemic initially hit, imported cargo plunged nearly 20%. At the peak of the crisis, when the reduction of cargo brought further challenges to the imbalance of consumer spending and commercial revenues, the container shipping industry responded by cutting capacity and reducing costs to maintain profitability over market share (United Nations Conference on Trade and Development, [UNCTAD], 2020). Despite the decreased demand, freight rates stayed constant. From the shippers' perspective, these strategies signified severe space restrictions to transport goods and resulted in delays in delivery dates.

Organizations in the maritime sector were challenged with pandemic-related disruptions leading to reevaluating their operations, finances, sanitary and safety protocols, and business

operations. Additionally, in cooperation with several governments, border control, seaport authorities, and international customs divisions, reforms were implemented to avoid an interruption in trade flow while keeping people safe.

What happened next was utterly unexpected. American consumers began a buying surge (Wrede, 2021). Nevertheless, during this purchasing blitz, the Suez Canal, a critical ocean transit superhighway, was paralyzed by the stuck Ever Given ship. The 400-meter (1,312 feet) long mega-ship passed through a single-lane portion of the Suez Canal on March 23, 2020, when it veered off course and got wedged diagonally across the canal during a sandstorm (Stevens, 2021). As a result, other shipping companies had to decide whether to stay in the queue or take a much longer route to an awaiting terminal. While the Ever Given blockage lasted for about six days, the congestion at the LA-LB ports is a prolonged issue requiring structural changes. For comparison, container vessels anchored in the Pacific Ocean have experienced wait times of up to 45 days for entry into LA-LB. In contrast, a container vessel can travel from the West Coast to SeaPort Manatee in eight days at 21 knots per hour. A backlog of container vessels were stranded off the West Coast waiting to enter LA-LB ports. Ships from Asia reduced their speed in anticipation of delays (Reilly, 2021).

Port Expansion

Since 1980, there have been substantial developments in seaport operations, including upgrades to standards port operations and management spurred by the growth in seaborne trade and the escalation in shipping container use (Hanson & Nicholls, 2020). Driven by an increasingly interdependent global economy, trade deregulations under the World Trade Organization, and the opening of China's economy, approximately 90% of trade is transported by sea.

There are fiscal consequences due to the saturation of container vessels anchored off the West Coast. This study uncovered the implications of port expansion, emphasizing ocean shippers and the importance of increasing port capacity. Recommendations for collaboration among port authority officials, port operations managers, and ocean transit and freight forwarding companies are essential (Zhu et al., 2019). The results could be advantageous, leading to increased port capacity, economic resilience, a drastic reduction in delivery delays, and accommodation of consumer demand. Global port expansion is one potential resolution to relieve the massive congestion at California ports and invite collaboration within the maritime industry to consider rerouting container vessels to SeaPort Manatee. The study will analyze how the expansion will allow SeaPort Manatee to handle increased container vessel volume by implementing enhanced infrastructure and equipment for offloading cargo and intermodal delivery capabilities to distribution centers.

Alphaliner, an ocean transport database, reported that LA-LB port congestion is approaching an all-time high and forecasts that the supply chain turmoil will extend into 2023 (Miller, 2022b). With the advent of mega-vessels, containerization has led to a spike in ocean shipping, bringing substantial advancements in ocean transportation, and the need to expand seaport infrastructure (Ismail et al., 2019). However, SeaPort Manatee cannot handle vessels carrying more than 14,000 TEUs even with port enhancements. Panamax ships carrying 5,000 TEUs and Neo-Panamax vessels carrying 14,000 TEUs can travel through the Panama Canal. Therefore, utilizing SeaPort Manatee can be an alternative to dispatching container ships anchored in the Pacific Ocean for an extended period. The research will identify what is required for expansion in partnership with the Manatee County Port Authority and the Florida Ports Council to accommodate the influx of cargo from the West Coast. Further research will reveal

that terminal and berth expansion increased mobile harbor crane operations, and access to intermodal connections to interstates and U.S. highways are essential for gaining a competitive advantage in the shipping industry.

The focus of the study was on the possible economic impact of how SeaPort Manatee can be a solution in relief of the gridlock at the California ports (Bernacki et al., 2021). Due to having close access to the Panama Canal, Panamax, Neo-Panamax, and other vessel types could be dispatched to SeaPort Manatee. This study considered the port's regional location in Tampa Bay and the Gulf Coast related to port users such as shippers, drayage truckers, and rail operators. The study identified the effects on maritime transportation performance under two circumstances: container vessels deployed from the West Coast to the Gulf Coast and container vessels remaining anchored in the Pacific Ocean awaiting entry into LA-LB ports. The study introduced a shipping route alternative for ships with berth feet no more than 1,361 feet and a 14,000 TEU capacity. According to the Panama Canal Authority, the maximum allowable length has increased to 366m, up from 294.1m indicating that 96.8% of the world's fleet of containerships can travel through the Panama Canal (Labrut, 2021).

Calculating incremental costs associated with each scenario was influenced by the fluctuation in marine heavy fuel oil (HFO) prices, which is essential for any marine engine to drive a ship and generate power onboard. HFO is the most widely used fuel for commercial vessels. Cost calculation also considered the breakdown of toll fees affiliated with passage through the Panama Canal compared to the threat to economic growth due to supply chain disruption at California ports (Khan et al., 2019). The study did not quantify actual financial damages since each container carries items of equal value. For example, an electronics container

has a different commercial value from a container full of agricultural food commodities, such as soybeans and rice.

Climate Change

Global supply chains and seaports face the threat of climate change and its environmental impact due to the mass production of goods and the distribution of those goods sourced worldwide (Becker, 2020). There is a direct correlation between the piloting of container vessels through nearshore zones and climate change. Several factors, such as the velocity and direction of the wind, height of the waves, levels of the tide, and depth of the water, along with the edifice of shipping channels combined with vessel characteristics, influence the maneuverability of secure and methodical vessel transit routes (Meyers & Luther. 2020). It is expected that future climate change will transform environmental variables directly affecting coastal navigation. Vessel handling guidelines (VHG) were developed by the Tampa Bay Pilots Association in collaboration with the U.S. Coast Guard Captain of the port, and others in the local maritime community to avert vessel accidents and other maritime occurrences. These standards restrict navigation based on specific vessel characteristics. Ship length, draft, tonnage (weight), and destination are a few examples. The VHG for SeaPort Manatee shows that vessels with a draft of more than 35 feet can enter or exit the port only to the Gulf of Mexico when the weakest currents occur between the flood and ebb currents, known as slack water (Gomes et al., 2020). VHGs limit specific marine traffic for deep drafted vessels, resulting in conflicting schedules with other vessels. Numerous studies on the effects of climate change concerning maritime activity and the impact on coastal navigation were not explored in this study.

The leading cause of climate change is excess greenhouse gas emissions (GHE), resulting in mass consequences, including the rise in sea levels in recent years (Church & White, 2017;

Liu et al., 2019). Manufacturing and distribution contribute to environmental damage through toxic waste, water pollution, biodiversity loss, deforestation, long-term damage to ecosystems, hazardous air emissions, energy consumption, and GHE. Two specific areas of concern affecting the supply chain are the GHE released during shipping and international ocean transit. The International Maritime Organization (IMO) plans to establish regulations and introduce new emission standards (Wan et al., 2018). They are encouraging shipping companies to build new energy-efficient ships according to the energy efficiency design index, which estimates grams of CO_2 per transport work per ton-mile. Freight containers shipped across a mass ocean body have these implications to consider when distributing goods across the globe.

Even with significant advances in ground logistics, container ships remain at the heart of global freight transport, with thousands of vessels operating worldwide year-round. Ships continue to be built larger to carry more containers, with ultra-mega-vessels able to transport 24,000 TEUs per shipment. Although these ships have a high-tech interlocking system to secure each stack of containers, containers are occasionally lost at sea, especially since improper stowage, ship design, and cost-cutting have enticed ship owners to load vessels as full as possible. However, seaports are designed for resiliency, yet they are vulnerable to extreme weather, disrupting port operations (Christodoulou et al., 2019). A rise in sea level and severe storms significantly impact shipping reliability, especially for vessels carrying hazardous materials which can ignite, causing onboard fires that can last several days. Marine salvage crews would be unable to extinguish the flames due to structural damage and instability safety concerns. Therefore, they would need to wait until flames burned down on their own before recovery operations could begin.

Climate change has a profound effect on global terminal operators. In 2017, two category four hurricanes wreaked havoc on ports on the Gulf Coast, leading to the catastrophic ruin of port service and colossal financial losses for ocean carriers (K. Wang, Yang et al., 2020; Yang et al., 2018). Ports worldwide are more aware of climate change threats and are working to implement improvements and technological enhancements.

The Panama Canal

It has been suggested that ships off the coast of Southern California should be rerouted to the ports in Florida. If this is considered, ocean carriers must measure many factors. The ports in Florida have the capacity for additional traffic. Many of the ships from Asia are contracted with the Ports of LA-LB. Ocean carriers must assess the additional demurrage fees for empty container storage at the LA-LB ports against the cost of reconfiguring their sea-based trade route. For instance, the price of fuel and Panama Canal tolls could lead to a hefty increase in cost for each ocean carrier. To consider this a viable solution, shippers must calculate a benefit analysis of fuel, time, and tolls through the Panama Canal.

Florida's government and port authorities have urged ships to redirect their service routes to one of their 15 seaports. While some consider this a good option, the monetary and time costs would be considerable. Many ocean carriers have reached out to SeaPort Manatee inquiring about available warehouse space when faced with a possible delay in docking at their initially scheduled port. Being the closest U.S. deepwater seaport to the Panama Canal, a 48-mile-long waterway that connects the Pacific Ocean to the Atlantic Ocean, it is one of Florida's significant and fastest emerging seaports that processes a range of international cargo (SeaPort Manatee, 2021). Transportation logistics are rapidly changing; established efficient supply chain management must offer alternative trade routes to alleviate the backlog in Southern California.

They must ensure merchandise reaches distribution centers and warehouses instead of drifting on cargo vessels hundreds of miles off the West Coast (Kim et al., 2020).

A dilemma exists whereby some major ocean shippers deploy colossal container ships that cannot cross the Panama Canal due to the width constraints of the locks (M. Wang, 2017). A lock system is used by lifting entering vessels to a higher water level and then dropping back to sea level once they reach the other end of the canal (Dasgupta, 2021). Considered one of the modern world's engineering wonders, the Panama Canal is a vital conduit for global maritime trade. In 1881, the French engineers successfully built the Suez Canal connecting the Red Sea to the Mediterranean Sea and were commissioned to do the same across Panama. Their challenge, however, was Panama's mountainous terrain, making the endeavor more costly than building the Suez (Carse, 2012). Another major hurdle was the difference in water levels between the Pacific and Atlantic Oceans, with the Pacific Ocean positioned 26 meters higher than the Atlantic Ocean. Therefore, the difference in sea level forces ships to rise over the Panama region above sea level to make it to the other end of the Canal. A Lock Gates system helps vessels enter the canal at the Pacific Ocean by lifting them to a higher level and lowering them down to the sea level of the Atlantic Ocean at the other end of the Canal. The Panama Water Lock System is considered one of the most significant engineering endeavors to provide safe passage for ships and save transit time. After $350 million in construction, the Panama Canal opened in August 1914 and held the title of the most expensive construction project in U.S. history during that time (Anghel, 2019).

Between September 2007 and May 2016, engineers built a wider third lane to accommodate the increase in commercial traffic and to service larger vessels carrying more

cargo containers (Ahmed et al., 2018). Even so, today's mega-ships cannot cross the Panama Canal.

Panama Canal Expansion

Consistent container ships' growth has led to the expansion of the Panama Canal. The project began in 2009, was completed in 2016, and has directly impacted global shipping systems. The expanded canal is more profound and broader than the original channels linking ocean transit and inland delivery, modifying port options for ocean carriers (Medina et al., 2021). Currently, the largest container vessel calling on LA/Long Beach ports is the mega-vessel BENJAMIN FRANKLIN. It is 1310 feet long with a beam (width) of 177 feet and a draft of 47 feet. The canal can accommodate this vessel; however, any Gulf Coast port would need the infrastructure to handle and efficiently discharge its 15,000 TEU capacity. The older locks set a limit of about 5,000 TEU boxes, while the new lane can accommodate 12,000-15,000 TEUs.

The excavation added new navigational access channels, which connect two new locks on the Pacific side and the Culebra Cut, a mock gorge passing through the Continental Divide in Panama. The new lock on the Pacific side is called Cocoli Lock, and the new lock on the Atlantic side is called the Agua Clara Lock. The Agua Clara Lock Visitor Center is open to the public. People can view the famous Gatun Lake on one side, where cargo ships and other vessels pass through the canal daily and experience a panorama view of the expansion on the other side. When both gates are closed, the chambers are 180 feet wide and 60 feet deep. The new dimensions allow larger vessels called Neo-Panamax to allow ships 1200 feet in length and 161 feet in beam and a maximum draft of 49 feet access to the gateway (Perez, 2021). Neo-Panamax vessels comply with the new expansion's dimensions, not the original locks.

Each lock chamber has three water-saving basins, which are approximately 230 feet wide and 18 feet deep, resulting in a reduction of water use by 7%. Even with the new lanes, there are challenges with the new lock system. Locomotives that generally ride alongside vessels traversing through the original locks cannot assist the larger ships through the broader chambers. Instead, ships will be maneuvered using their engines and rudders in addition to tugboat assistance. It is essential to understand that Ultra large container vessels (ULCV; Jungen et al., 2021) cannot traverse the Panama Canal. For instance, the Maersk Triple E class, operated by the Maersk Line, is approximately 400 meters long and can carry more than 18,000 TEUs. The ULCV Maersk Triple E has a beam (the measurement of the ship's width at its widest point) of 194 feet, making it too wide to navigate through the Panama Canal.

Even a routine journey through the new Panama Canal expansion is a complex and meticulously executed process. With the assistance of tugboats, the vessel will be secured inside the lock chambers heading south from the Atlantic to the Pacific Ocean through the new locks of the Panama Canal. The Panama Canal pilot, the boarding officer, and all other inspectors have responsibility aboard the vessel (Beyond Cruise, 2016). Inspectors on the ship are the transit vessel inspector, the industrial hygienist, the sanitary inspector, and the canal port captain. These inspections verify that requirements are met to guarantee a safe transit for the vessel and all persons involved. The master, responsible for the vessel's safe navigation, is required to provide documentation to receive approval for transit. The documentation required for transit is published in the operations notice to shipping along with vessel requirements (Beyond Cruise, 2016). Some of the documents required are the International Tonnage Certificate ITC 69 PC, documentation of total volume or suitable substitute load line certificate, ship classification, and minimum crew and fitness certificates, among others listed. Once the documentation and

approvals are obtained, the voyage through the canal can begin its zig-zag pattern. One trip takes about eight to 10 hours for the ship to complete its passage through the Canal and continue to its destination.

The expansion of the Panama Canal can accommodate Neo-Panamax vessels (Park et al., 2020). Gulf Coast ports such as SeaPort Manatee, the closest Port to the Panama Canal, can significantly resolve the shipping container congestion at the Port of LA-LB. Building a layer of trust and transparency increases the potential for efficiency and drives economic growth while simultaneously supporting consumers purchasing products beyond domestic borders. Cost perspective may be a significant deterrent to rerouting vessels from Southern California to SeaPort Manatee. Panama Canal toll rates (Table 1) discourage this option from such a voyage. SeaRoutes Maritime Data calculates that a one-way trip from the Port of Long Beach to SeaPort Manatee will take 8.3 days traveling at a speed of 21 knots (Ho & Bernal, 2021). The Norwegian maritime group Wilhelmsen provided a Panama Canal calculator, a laden (fully loaded) Panamax vessel with 52,500 deadweight tonnage (DWT), 950 feet in length, 190 feet in length height. A beam (boat width measured at its widest point) at 106 feet carrying 5,000 TEU containers (Wilhelmsen, 2021) and consuming an estimated 1200 metric tons of fuel will pay a toll plus fuel costs of $1,254,725.11.

Table 1

Panama Canal Cost Breakdown from Long Beach to SeaPort Manatee

Type of Fee	**Amount of Fee**
Tolls	$450,000.00
Tug Assistance	$13,005.00
Linehandlers	$5,825.00
Locomotive Wires	$4,800.00
Canal Inspection	$118.00
Security Surcharge	$1,000.00
AIS Rental	$161.00
Launch Hire (Estimated - Billed On Actual)	$525.00
PC Oil Pollution Prevention Fee	$525.00
ADCS Charge (Input / Transfer / Upload)	$250.00
Bank Commission	$1,281.11
Fumigation (Compulsory)	$385.00
Vessel Communication (Estimated - Billed on Actual)	$250.00
Auto Hire	$100.00
Petties & Incidentals	$125.00
Fresh Water Surcharge	N/A
Transit Booking Fee (Optional)	$35,000.00
Grand Toll Total USD	**$513,725.11**
Fuel Consumption (metric tons)	1200
Fuel Cost	$ 741,000.00
Total Cost	**$ 1,254,725.11**

Marine oil prices fluctuate daily. The fuel pricing in Table 1 was listed at $610 per metric ton according to World Bunker Prices (Ship & Bunker, 2021) at the time of this writing. However, ships that are anchored off the West Coast continue to burn fuel to keep the ship's necessities functioning, adding to the rise in the cost for a berth at LA-LB. Ocean carriers and their customers need to determine whether it is feasible to delay delivery at LA-LB or divert to another port to ensure continuity of the flow of goods.

Methods and Framework

A feasibility study identified how SeaPort Manatee's infrastructure could handle the increase in cargo traffic and how its port channel is perpendicular to the main channel in Tampa

Bay along with the main tidal flow. It also shows how vessels entering or exiting the port can be at risk of being swept away into the shallow sandy ocean ridge encircling the port (Meyers & Luther, 2020). Processes must ensure the continuity of containers reaching their local destinations or distribution centers. Communication is critical if the supply chain is to thrive, especially during a crisis. For vessels to be rerouted from the West Coast to the Gulf Coast, the Panama Canal is one way ships can reach SeaPort Manatee. The homogeneity of all actors involved is crucial to ensure the crew's safety and to maintain the integrity of the containers on board.

Port terminals serve as multifunctional entities characterized by a combination of specified responsibilities, each handling specific goods and cargoes. SeaPort Manatee has six port terminals: break-bulk, dry bulk, liquid bulk, containers, Ro-Ro, and passengers, whom all share universal maritime and inland infrastructure (Notteboom et al., 2022). The demand for commercial cargo directly correlates to the port terminals they access since explicit equipment types are required and require specialized equipment configuration. Not all terminals are outfitted with highly commodity-distinct tools and cranes. Therefore, there are limited terminals to manage one commodity or a narrow range of cargo. Each terminal is vital in the maritime-land interface allowing for the interaction between the two systems. Equilibrium between market demand, ship capacity, and the recurrence rate is crucial (Notteboom et al., 2022).

Reliance on Overseas Manufacturers

The United States has long relied on overseas manufacturers for less expensive supplies outside the U.S. Contracts with foreign manufacturers have resulted in lower production costs. However, extrinsic geopolitical conditions have contributed to supply chain disruptions (Castellan Solutions, 2021). The U.S. does not have all the resources needed to develop

technologies for the maritime industry, including digital route management of ships, integrated control systems, and digital cargo and bay arrangement optimization (Gulley et al., 2018). It is overly dependent on imports relying on materials beyond its borders, particularly electronic devices such as smartphones, computers, cameras, and more. Notably, heavily depending on supplies from China, as it may be the most comprehensive production force in the world has resulted in numerous delays at the Port of Long Beach as vessels struggle to enter terminals for unloading (Gulley et al., 2018).

Supply chains have always had issues and challenges. According to FreightWaves CEO Craig Fuller: "weather, economic cycles, capacity, pricing fluctuations, labor strikes, war, terrorism, policy changes, and other factors have been with us since trade first began, and those issues (and others) have always been a part of managing cargo flows" (Fuller, 2021 p.1). Nevertheless, 2021 has presented an unforeseen enigma unlike anything in years past. To simplify, the U.S. is experiencing a steep and colossal swell of demand that the global market cannot manage. The existing global supply chain platform cannot move the volume of merchandise flooding the economy. In the view of many the fundamental reason is a direct link to the staggering government stimulus that has motivated consumer behavior.

At this time, empty containers at LA-LB ports are not being brought to port container yards to be loaded back at the terminal to be shipped overseas. Instead, more containers are being brought in than are needed for export. Ideally, some containers would return to their point of origin, and some should be reloaded and sent back with exports. In that case, they can be used straight away, which translates into faster turnaround times for exporting goods. Regrettably, this is not being done, which has led to a pile-up of empty containers at the terminals. Returning empty containers should be the priority, and ports should make rules limiting the number of

empty containers. The Alameda Corridor, a 20-mile freight rail expressway, connects LA-LB ports to transcontinental Burlington Northern and Santa Fe and Union Pacific railways that end close to downtown Los Angeles and are vital as it deploys approximately 35% of the containers transported through there. Rail handles 9%, and the off-dock rail yards transporting containers to local distribution centers move 23%. All other containers are transferred through trucking.

Ultimately, better coordination between terminal and trucking operations would ensure that empty containers and chassis are returned to the ports allowing for the efficiency of import loads in one trip (Ozkan, 2021). The chassis shortage has been directly linked to the growing chaos at the Port of Long Beach, with the increase in street dwell time of more than seven days resulting in chassis held at warehouses and truck lots for a week. Another contention in intermodal transportation is whether to permit rail systems to hold more containers and stack them more than two high.

On May 16, 2022, Rear Admiral, Ann C. Phillips, U.S. Navy (Retired) was sworn in as the 20th Administrator for the Department of Transportation Maritime Administration. A maritime administrator exists within the U.S. Department of Transportation and is concerned with waterborne transportation as well as the feasibility of the merchant marine. One solution to ease the marine traffic at the U.S. West Coast might be to regulate the sailing of vessels into congested ports with the possibility of temporarily halting arrivals until the bottleneck has been resolved. The maritime administrator could also establish a policy that disallows ships from carrying empty containers back to their port of origin, allowing the port to reduce the number of mega-vessels. An overcapacity of empty containers causes most container jams at the LA-LB terminals. It could prove helpful in providing more space for anchored vessels to unload full containers.

Leadership

Deficiencies in the U.S. cargo transport industry include financial shortcomings at critical ports, contentious railway labor cuts, and a lack of collaboration between principal leaders. Over the past few years, disruptive events have directly affected global trade and exposed vulnerabilities in supply chain networks. The ocean transit industry and maritime community have been severely impacted by inconsistent attempts to resolve shipping delays and equipment shortages.

Affiliative Leadership

In part, this paper will focus on how logistics leadership at SeaPort Manatee could advocate for opening additional lanes by illustrating the need for cargo to reach their destination faster via this Florida port. This could be seen as a better option than a vessel sitting at anchor off the West Coast which would further delay the discharge of goods (Bjekić et al., 2021).

Organizational culture must be considered when new policies, procedures, and agendas are implemented to support employees' quality of corporate life (Paz et al., 2020). Shared values reflect the organization's core values, which permeate all aspects of the organization and reinforce the mission that the organization is trying to achieve. Leadership is not naive to think that all employees are satisfied with their job situation. It is important to note that style does not always come from leadership. Workers’ morale and attitudes also shape the style of an organization.

Developed in the 1980s by McKinsey consultants, the change model can identify the health of an organization's business performance, including its internal factors (Nandy & Lu, 2017). With increasing internationalization and globalization, each area of influence examined presents a better understanding of the human relationships within the global culture and the many

needed layers of management. Interrelationships could be friendly yet influential, fostering a healthy and productive organizational structure between different worker groups. The atom-shaped model distinctly conveys all components' dynamic and evident interconnection. Any modification within one facet has repercussions for all the others. This model does not have a hierarchy, and all areas are equally important. Significant is uniformity and the ability to change the entire organization (Fabac, 2021). Organizational change is often met with resistance which can be visible through its employees due to inadequate corporate design.

Due to COVID-19 shutdowns in 2020 and the continued surging demand for online ordering, workers fear there is no end (Kay, 2021a). Extraordinary images of ships waiting to dock at LA-LB ports emphasize the high volume of containers coming into the United States at these gateways. These images exhibit the chronic disorganization and confusion of long-distance and local deliveries. Lack of leadership has resulted in record-breaking delays. If a machine malfunction or a scheduling error occurs, along with other countless issues dependent on each factor of port operations, it wreaks havoc on the entire system.

Research into the relationship between leadership traits and the organizational environment influencing business results is evident at SeaPort Manatee in Palmetto, Florida (Lindbeck, 2004). While ships wait offshore for weeks to unload cargo in Southern California, SeaPort Manatee soared to record-setting heights at their seaport for moving a total cargo tonnage of 135,660 TEUs (SeaPort Manatee, 2021). Even throughout the supply chain crisis, it was reported that its containerized cargo increased more than 53% by the end of September 2021 (Jones, 2021). One assumption could be that employees feel more at ease with an effective affiliative leader instead of employees subjected to aggressive or nonexistent leadership (Liu, 2020).

Nevertheless, there is proof that businesses can combat the unique circumstances when combining supply chain acumen, network communications, commitment from their leadership, business continuity, and the ability to examine their resilience (Yamin, 2021). Leaders must exude tenacity and communication when making organizational changes for effective corporate development intervention (Devie & Finkelman, 2018). Analyses substantiate that fast-moving consumer goods under trade significantly contribute to the growth and competitive nature of the global economy (Jacobs & Mafini, 2019). They can attest that solid leadership in the supply chain is crucial and will improve the overall supply chain shared network (Zhang et al., 2018).

A blueprint for developing leadership competency has a primary goal to assist and support leaders' development, knowledge, and practice of applying the tools and skills related to emotional intelligence (Waglay et al., 2020). These would be combined to enhance functional expertise and strategy, building upon capabilities connected with coaching and advising the organization's leaders. Topics discussed might include the manager’s role in leadership development, the challenges involved, approaches and elements to leadership development, and techniques and leadership diversity. Simulations provide a safe space that links theoretical learning while training in a self-paced environment (Gurley & Wilson, 2011). Simulating real-life situations will assist in identifying issues and addressing competency gaps among current and potential leaders to be selected for further development. Stress management is another vital component of a healthy and prosperous work environment (León-Pérez et al., 2021). Job pressures and work overload will lead to mental and physical health problems with myriad negative consequences. Leaders are faced with making harsh decisions knowing that uncertainty and ambiguity have become the new normal.

Port operations managers could integrate a resilient supply chain planning framework to promote efficiency regardless of a disruptive global economic environment. A two-stage decision process exists within the supply chain network model. The first has to do with strategies that determine the location of shipping and distribution of resources (Kungwalsong et al., 2021) and the capacity to store containers waiting for distribution and empty containers waiting to be shipped back to their point of origin. The second manages tactical considerations (Kungwalsong et al., 2021), such as manufacturing volume and delivery routes. These decision-making stages are symbiotic since one may directly affect the other, meaning leadership cannot evaluate each phase individually.

Leadership in the global supply chain (SC) ocean transit industry faces unique challenges due to the constant and often costly evolution of product development, not to mention the broad expansion of industry across global sectors. Understanding the SC leader's role during a crisis provides insight into the strategic managerial relationships amid stages of disruption. This study collected and analyzed data to highlight emergent themes reflecting the importance of specific traits required to lead SeaPort Manatee in its expansion and development program, including communication, collaboration, and competence. At the core, a leader must illustrate resilience among SC network members while exhibiting confidence and expertise to make immediate and concise decisions (Shin & Park, 2021). SC leadership positively correlates to corporate performance as the transformational SC leader possesses a higher level of influence than the transactional leader.

This study aimed to provide insight into leadership characteristics in the global ocean transit industry. Researchers have defined international ocean shipping as the grouping of shipping companies that analyze current global economic trade systems and provide projections

of trends, in commodity transport, products, and platforms, and as a generator of significant economic activity worldwide. According to Knowler (2022), profits for global ocean transportation container companies are on pace to reach $300 billion in gross value in 2022, showing no slowdown in the immense earnings by ocean carriers during the heavily disrupted shipping environment (Knowler, 2022). While the ports of LA-LB are significant gateways in the U.S. and a supply chain indicator, American Shipper reports data from the Port of Los Angeles that in late 2021 export performance decreased by 41%, to 70,872 TEUs. It is the lowest monthly amount since October 2002, and the Port of Long Beach is down by 12% to 358,687 TEUs, (Miller, 2022a).

Leadership in this industry merits investigation due to global trade's rapid (and continuous) expansion, including the constant evolution of port and land development and the changing need for global leadership capacity (Mendenhall et al., 2018). According to the 2011 DDI Global Leadership Forecast, more than 70% of the leaders who hold global team responsibility consistently struggle to meet their global goals & objectives (Boatman et al., 2011). This statistic indicates a substantial challenge for leaders working in global ocean shipping due to the acceleration of change and the increased frequency of doing business in this industry. Exploring how global leaders perceive changing leadership requirements could impact global results.

An exciting element in global shipping is just how important people are to its success. The fast pace, rapid change, and constant innovation mean that engaged, productive, and empowered leaders are essential to the success of any organization (Medcalf, 2017). However, amidst the maelstrom and duress in the shipping industry, leaders can often be unpredictable rather than intentional in developing organizational culture and productivity (Medcalf, 2019).

These leaders must balance complex, expanded responsibilities requiring different skill sets and broader strategies to excel in a fast-paced, global marketplace. The best and the brightest leaders are expected to facilitate rapid development to drive durability and exponential growth in this specific industry. This study sought to isolate critical characteristics and traits for port leadership and better understand what today's leaders perceive as necessary for future leaders to succeed in the rapidly evolving global ocean shipping environment.

While examining leadership styles, strengths, and strategies that have enabled current leaders to advance into the executive ranks, it is also essential to investigate factors that impede and support innovative advancement for leaders in seaport operations. Leadership within this field tends to be more authoritative and transformational. A unique perspective in the global landscape on organizational culture could foster high-functioning teams competing at the highest levels of excellence. Leaders in this industry should be collaborative, innovative, agile, observant, and forward thinking.

Transformational Leadership

The four elements of transformational leadership, known as the Four I's, are popular approaches to examining leadership. The Four I's are individualized consideration, intellectual stimulation, inspirational motivation, and idealized influence (Bass & Avolio, 1994). Individualized consideration demonstrates genuine concern for followers' needs and feelings, which brings out the best efforts from each person. Intellectual stimulation challenges followers to be innovative and creative. Inspirational motivation exhibits how transformational leaders can encourage and embolden followers. Idealized influence reveals how the transformational leader serves as an ideal role model for followers.

To ensure workforce confidence, leadership needs to be attentive to the employees' needs and motives, helping them reach their fullest potential within the alignment of organizational goals. The transformational leader will oversee global SC operations focusing on regulatory and financial operations to help establish system processes in these areas. Caution is warranted to ensure pseudo-transformational leadership does not occur (Northouse, 2019). Pseudo-transformational leaders, which the American Psychiatric Association characterizes as grandiose narcissists, focus on their interests rather than the organization's, leading to potentially dangerous fallouts (O'Reilly & Chatman, 2020). Pseudo-transformational leaders demonstrate the vision and charisma that induces people into action, although their goals, which are often masked, are ultimately egocentric and deficient in integrity.

Transactional Leadership

In contrast, the transactional leader believes job performance impacts negative feedback or contingency rewards. In a 2018 study in China on transformational and transactional leadership in employee creativity in entrepreneurial business, researchers found that transactional leadership influenced employees' creative performance (Ma & Jiang, 2018).

A simple way to understand the differences is that transformational leadership pertains to the mission, strategy, leadership, and organizational culture, which are deeply rooted in the corporate culture's organizational characteristics. Transactional transformation focuses on management practices and techniques, including the division of departments. However, it might not lead to a permanent change. Lastly, specific factors apply to both individual and organizational performance. Outputs are measured by employee attrition rates and corporate performance due to the impact of SC turbulence.

Supply Chain Operations Reference Model

The supply chain operations reference model (SCOR) is an analytical approach that aids companies in assessing whether to implement extreme changes in their supply chain processes (Raman et al., 2018). The SCOR model was established in 1996 by the Supply Chain Council and is regularly updated with advances in supply chain technology and business practices. They offer a distinctive methodology that connects port operations, benchmarks, and applied science into a composite structure. Due to evolving advances in ocean transportation logistics, port managers require knowledge and expertise on up-to-date global standards of operations and practices.

External, strategic, operational, and individual factors are assessed to implement the change model to address leadership and corporate performance capabilities related to global port expansion and development. SeaPort Manatee's operations and corporate culture were observed by reviewing the historical port performance and global supply chain partners to assist in detecting deviations in timelines, precision, and reaction. Reduction in manual labor could institute digitalization in the SC by utilizing tools such as electronic forms and file exchange (Moazzam et al., 2018). This technology could streamline workflow and apply collaboration tools, activity tracking, process validation, and alerts to bring control and reliability to SeaPort Manatee's global supply chain shipping infrastructure assisting in cost control and eliminating human errors.

Several areas significant for managing vital operational adjustments during SC disruptions and the potential for increased shipping activities resulting in port expansion were the focus of the study including: point-to-point services, vessel scheduling, container sales, and transportation services. A needs assessment would focus on individuals who occupy a leadership

role and their current competency level, skill, and knowledge, determining the difference between the present and future competencies. The assessment would help determine whether the four main company objectives of optimizing processes, increasing the quality of functionality, reducing costs, and enhancing client satisfaction might require organizational realignment (Dissanayake & Cross, 2018).

Strategic Environment

SeaPort Manatee's organizational strategies have been set up for success despite the global SC crisis. A CIP expansion and development is a multi-project that reflects four distinct enhancement structures and helps gain a competitive advantage over LA-LB ports throughout SC instability. The blueprint for strategy deployment must come before all the other elements since it is a form of the seaport’s response to shipping industry challenges. Practical land usages for the Port's numerous trade regions include, but are not limited to, bulk, container, and cold logistics, along with its interrelationship with intermodal cargo transit and entry of finished goods, which will determine each phase of the project. It will concentrate on the growth of shipping activities and serve as a draft plan for Port expansion due to increased demand for commodities (SeaPort Manatee, 2022). Therefore, the strategy will pilot choices regarding investments and geographical location and cannot change abruptly. Three types of strategy were considered: SC leadership, diversity of value, and project goals. If the design is not straightforward, SeaPort Manatee could lack unity, and specific skills could be overlooked. There would not be a distinct point of differentiation from other global seaports. The core mission must be successful with strategic relevancy, or it could struggle to reform and maintain its relevance in the shipping industry.

Today, in many ways, global trade allows countries to expand their markets by accessing goods that may not have been available until the first commercially successful container ship, the SS Ideal X, was introduced in 1956 (Levinson, 2016). The converted tanker departed from Newark, New Jersey, on April 26, 1956, hauling 58 cargo containers on the specially designed vessel. Manual paper-based procedures are still conventional, and the information regarding the status of finished goods is unattainable within organizational silos. The complexity and volume of port-to-port communication across a labyrinth of inland transport providers, freight forwarders, customs brokers, governments, ports, and ocean carriers have been decelerated. SeaPort Manatee County Port Authority has partnered with several state and federal agencies to address transportation logistics and economic systems that will increase county revenue with bulk cargo tonnage and containerized cargo in the supply chain ecosystem.

Senior management's leadership characteristics affect how an organization's members interact during a crisis. Relying upon the divergence of all levels, specifically calling attention to senior leadership, can reveal a contrast between senior managers and employees which can be unfortunate since it separates the two groups. Workers' morale and attitudes also shape the style of an organization. This conceptually refers to the broader global team and incorporates the skills, knowledge, training programs, motivation, behavior, wages, hierarchy, evaluation, and job growth. In essence, it refers to human capital management, theoretically linking the people's qualities to the strategic segment. Transformational leaders work interconnectedly to develop those who contribute to the organization long-term. A transactional leader applies short-term planning while adopting reward and punishment motivation (Lee, 2020).

Overall Value

The organization's core values permeate all aspects of the workforce and reinforce the mission. Optimizing the use of the SCOR model requires looking closely at the criticism that structuralism disregards employees, perceiving them as expendable. Leaders are not naive to think that all employees are satisfied with their job situation; however, they hope there is a minimum of shared values such as service quality or organizational commitments. Applying the SCOR model at the beginning of the project may determine where the company started and where it wants to be in the future. Supply chain management principles can be revised to reduce the detrimental effects of port operations, especially using the SCOR model (Akkucuk, 2020).

The model spans the entire organization to succeed; therefore, buy-in from the Manatee County Port of Authority is vital to achieving positive change. Introducing varying motivations, goals, and rewards for productivity and quality could help the port's values and principles. Undesirable modifications in strategy and management could have severe consequences and generate staff resentment leading to strikes, a rise in absenteeism, lower productivity, decreased quality of work, staff resignations, and more. As SC competition expands beyond domestic borders, the emphasis on the caliber of leadership is vital (Teoman & Ulengin, 2018). Therefore, training may be necessary to inspire innovative solutions to existing and future challenges and to avoid using outdated leadership philosophies.

Leadership Training

When new leaders are in place at SeaPort Manatee, an assessment identifying leadership qualities within the workforce may facilitate a future training program to develop balanced, engaging, and self-reliant leaders. The port’s leadership will then establish whether logistics improvements are needed for port operations and how extensive the training will be. The

potential analysis could also provide insight into all areas within the scope of leadership responsibilities and the organization to define what is needed for strategic change or when organizational changes are necessary (Turner et al., 2018). It may be beneficial to perform this assessment periodically to determine training needs, leadership knowledge and skills, and training program effectiveness. Interactive group discussions within the management team may sufficiently synthesize leadership and change management's conceptual and theoretical aspects, cultivate innovation and momentum within port operations, and enhance effective communication. In a complex, cyclical, dynamic, and often unpredictable industry, executives must acquire diverse skills and competencies to lead port operations personnel and local government administration (Gagnon, 2013). Organizational culture and climate are equally significant.

The primary goal of this study was to assess whether it is feasible to engage with ocean shipping lines to allow for adjustments to sea trade routes and accommodate deployment from Southern California ports to SeaPort Manatee. The port's leadership must consider many variables which will have a global impact. It is a very complex situation since there could be a multipurpose vessel that has five, twenty, or hundreds of different customers. If the ship is scheduled to dock at the Ports of LA-LB and there is no room for the containers, the ship must adjust its route and dock at another port. The complexity of having multiple customers creates a dynamic between the customer and the ocean carrier and how that decision is made. It is essential to point out that vessels operate on a tight schedule.

Nevertheless, suppose a vessel carrying plywood from Asia is destined for a port in Southern California and will be delayed for 30 days. This would create a domino effect. The ship is scheduled to arrive at another port, a decision must be made as to which ports to call, and often

the call comes to SeaPort Manatee. Leadership at SeaPort Manatee receives weekly calls from ocean carriers asking for warehouse space. Unfortunately, there are times when the port, like many other ports, is at capacity and cannot accommodate the cargo.

Chapter 3: Research Methodology

This feasibility study explored the prospect of reconfiguring sea trade routes between Asia-U.S. West Coast ports to Asia–Gulf Coast ports, specifically SeaPort Manatee in Florida, as a supply chain solution. The synthesis of a nonexperimental analysis and insight from maritime leaders at SeaPort Manatee, ocean carriers, and customs brokers identified overarching objectives of relieving the supply chain turbulence. The focus was on the global economic impact the United States is experiencing while cargo ships are awaiting berth at Southern California ports. The study addressed the primary question, can redirecting cargo vessels from the West Coast to the Gulf Coast work to alleviate the bottleneck at California ports? The in objective was to assess ocean carriers' scheduling commitment to their contracted ports and the capability to travel through the Panama Canal concerning their size and the number of containers they carry. The data and simulation model drove sample vessel characteristics, data collection from an online questionnaire, and outcome measures. Each objective identified follow-up questions created to contribute to understanding barriers to the ultimate success of the research and future research into other solutions to relieve U.S. port congestion.

Los Angeles and Long Beach ports are severely overburdened, with sometimes over 100 ships anchored off the West Coast waiting for a berthing spot. The impact has had devastating consequences on the global economy, causing significant delivery delays, increased shipping costs, and equipment shortages. SeaPort Manatee has the potential and the capacity for land and port infrastructure development. This study examined existing logistical port infrastructure and what is needed for port expansion to increase productivity at SeaPort Manatee. The 2016 expansion of the Panama Canal combined with the expansion initiative of SeaPort Manatee may help relieve overwhelmed California ports and prevent further difficulty for the U.S. economy.

The centerpiece of a $75 million capital improvement plan is the $13 million project to expand SeaPort Manatee's dock container yard to 23.5 acres (SeaPort Manatee, 2022). The goal is to boost port expansion and land use development within the Florida International Gateway, encompassing approximately 5,000 acres of undeveloped land adjacent to SeaPort Manatee. A nonexperimental analysis will outline costs associated with fuel consumption, toll fees, ocean freight charges, and deploying anchored vessels off the California coast to SeaPort Manatee in Palmetto, Florida. These costs vary depending on vessel size and the amount of TEUs transported. After these costs are outlined, a determination can be made based on the benefits of rerouting vessels to SeaPort Manatee versus waiting for berths in California ports.

Leadership within the global shipping industry tends to be more transactional than transformational. A unique perspective on worldwide landscape concerns building distinctive organizational cultures, creating high-functioning teams, and competing at the highest levels of excellence. The fast-paced industry calls for leaders who are collaborative, innovative, agile, and mindful. While the two leadership styles concentrate on attaining organizational goals, transactional leadership aims to generate employee opportunism in achieving the goals. In contrast, transformational leadership encourages employees to transcend their vested interests. Therefore, transactional leadership entails using provisional incentives and penalties, compelling employees to engage in their professional gain while contributing to organizational achievements (Jensen et al., 2019).

Methods and Procedures

Data were collected through interviews by way of face-to-face, online meeting platforms, or an online questionnaire. Questions were preselected and approved by the Institutional Review Board (IRB), and participants received the research questions in advance. A nonexperimental

analysis in reconfiguring sea-based trade routes between California and Florida created a complex model of analysis between multiple variables, including the type of vessel, amount of containers being transported, fuel cost and consumption, and travel time between the suggested trade routes.

The sample pool consisted of ten maritime executive-level leaders with various industry leadership experiences. The study addressed challenges and opportunities for global port expansion. Selected leaders were not exclusively from ocean shipping companies but also from customs brokers, port authority officials, oceanographers, and port operations managers, based on their experience within the global ocean transportation industry in South Florida.

This feasibility study revealed essential elements to be considered as logistics leadership at SeaPort Manatee explores land development opportunities to open more lanes by illustrating the need for improving the import and export of goods. The central premise of altering ocean trade routes from California to Florida may be a temporary solution to relieve the strain at the ports. However, many variables must be analyzed to ascertain whether this is optimal for economic recovery. From reviewing this data, SeaPort Manatee could consider increasing their participation in global trade given their unique location as well as being a congestion-free port. Therefore, the results of this research can be used as a starting point for the logistics leadership to engage and invest in SeaPort Manatee to enhance their infrastructure, invest in gantry cranes, and build container yards (Segerman, 2020).

One supplementary benefit of this study brought attention to how leaders could showcase their capabilities of the port with actual data exhibiting the reduced transit time instead of vessels sitting at anchor on the West Coast only further delayed once the goods are discharged.

Research Questions

This feasibility study considers the complexity of reconfiguring sea trade routes during a supply chain disruption and how the deployment of SeaPort Manatee may be a solution to a vulnerable global market in a volatile economic environment. A nonexperimental analysis involved direct interaction with participants through in-person interviews, web-based video platforms, and an online questionnaire if participants preferred. A feasibility study assesses the viability of a proposed plan or project. I analyzed the practicality of this project to determine whether it would be likely to succeed in terms of leadership, logistics, port expansion, and infrastructure, leading to the following three questions:

- RQ 1: To what extent can the leaders of Port Manatee address the supply chain disruption?
- RQ 1a: To what extent can ocean carrier leadership teams make strategic decisions to reroute cargo vessels to Port Manatee to alleviate the bottleneck at California ports?
- RQ 2: To what extent does the Panama Canal impact Gulf Coast ports allowing for increased global cargo traffic and the transit time from the West Coast to the Gulf Coast?

The global shipping industry's combination of high-velocity competition, complexity, global talent, and interconnection among rivals makes it a truly unique environment, requiring a distinct set of leadership skills that makes it both challenging and full of opportunity. Dense geographic concentrations of leaders with global responsibility (such as China, Europe, and India) foster a workplace culture where diversity and inclusion work together in the international ocean transportation segment (Grenny & Maxfield, 2016).

However, despite a dynamic environment full of potential, global shipping companies have not realized these opportunities due to a shortage of competent and effective leaders. Before the Covid-19 pandemic, Florida had been trying to entice additional cargo routes to their seaports. At that time, standard demand patterns determined the number of international export ships. They separated them by the types of goods they were transporting and deployed them to their respective coast (George, 2021). Production was progressing per schedule, and the global supply chain links worked together. Florida has 14 deep water ports, but only two are deep enough to handle most cargo ships, Port Everglades and SeaPort Manatee, with SeaPort Manatee having the best access to the Panama Canal.

A simulation model has been created to explore all variables associated with rerouting vessels from California to Florida via the Panama Canal. It categorizes vessel type with TEU capacity, travel time from the West Coast to the Panama Canal, travel time through the Panama Canal and associated toll costs, and travel time from the Panama Canal to SeaPort Manatee. It is also essential to consider the type of cargo being rerouted since not all finished goods are meant for the country's eastern half. Intermodal transportation from SeaPort Manatee to the western half of the country must be considered as it will add more time and cost to product delivery.

While this might provide an immediate resolution to the supply chain bottleneck in California, the analysis may indicate that the mediating role of two governance mechanisms, California and Florida, should emphasize organizing, monitoring, and enforcing exchange rules between the appropriate port authorities (Mokhtar et al., 2019). Unfortunately, the financial, consumer, and internal targets are disregarded, costing companies millions of dollars since the beginning of the current supply chain crisis in early 2020.

Hypotheses

The study intends to determine whether deploying container vessels anchored in the Pacific Ocean to SeaPort Manatee is feasible, time-saving, and cost-effective in relieving Southern California ports' stress during supply chain turbulence.

- H1a: A feasibility study is expected to predict a significant positive impact on the global economy as container vessels are deployed from Los Angeles and Long Beach ports to SeaPort Manatee.
- H1o: A feasibility study will not predict a significant positive impact on the global economy as container vessels are deployed from Los Angeles and Long Beach ports to SeaPort Manatee.
- H2a: Vessel characteristics such as vessel length and draft, alongside tidal conditions, may restrict navigation between SeaPort Manatee and the global maritime community.
- H2o: Vessel characteristics such as vessel length and draft, alongside tidal conditions, do not restrict navigation between SeaPort Manatee and the global maritime community.

Participants

For a balanced analysis, this study uses the term *leader* to refer to anyone who holds the position of managing director or higher within a global seaport organization. The research represents executives who have earned top leadership positions, oceanographers, and educators in maritime logistics within a global seaport logistics environment.

This study does not restrict the type of ocean transit logistics, freight forwarder, port authority leader, education level, age, or gender of the participant allowing for diversity within

the responses. In the request for interviews, participants were informed in advance of the research intent, briefed on what to expect via email, and given the interview protocol or online questionnaire along with the Informed Consent for Participation in Research Activities (see Appendix A) to support their preparation and set appropriate expectations. Based on availability and scheduling, participants were briefed on informed consent up to two weeks before the interview, while other participants may be briefed shortly before the interview. All conversations were held in confidence and audio recorded with participant permission. The interview duration was an average of 45 to 60 minutes.

Before selecting a targeted participant pool, the study identified the best criteria for participation. Interview guidelines were established by location demographics, position within the company, and years of leadership experience. The exclusion criteria were determined by location as the sample pool focused on individuals within South Florida. Participants were identified and selected using a combination of accessibility and availability sampling. The interview style required both direct and free-flowing conversation. Participants who did not wish to be interviewed were given an opportunity to complete a five-question online survey. As a result, the following criteria were established.

Each participant:

- held a leadership position in a global seaport organization with at least 30 employees
- had five or more years of leadership experience
- had knowledge of port operations and vessel traffic management
- were located in South Florida

Variation criteria were:

- gender
- race/ethnicity
- port operations responsibility
- knowledgeable about supply chain demand and coastal ocean monitoring, including vessel draft, ocean currents, and tidal influences

The data have been stored on a password-protected computer and will be stored for three years, after which they will be permanently destroyed. The study abided by the appropriate IRB and human subjects' safeguards.

Participation and Withdrawal

Participation was voluntary. Refusal to participate had no penalty or loss of benefits to which the participant was otherwise entitled. Participants had the opportunity to withdraw consent at any time and discontinue participation without penalty. They did not waive any legal claims, rights, or remedies because of participation in this feasibility study.

Alternatives to Full Participation

The alternative to participation in the study was not participating or completing only the items in the questionnaire with which the participant felt comfortable. If they chose this alternative, their relationship with the employer was not affected. It was not the intent of this study to examine the individual performance of port leadership or its employees but instead to determine the feasibility of implementing Port Manatee as an alternative trade route destination to ease the container vessel congestion at Southern California ports.

Forty potential participants were contacted via email (see Appendix A) using an IRB approved consent form (see Appendix B). Many were introduced through those who had

contributed to the study. However, due to the turbulence in various supply chain networks, there were only ten responses. They represented various aspects of the ocean transit industry and provided valuable insight to the challenges and possible solutions to the logjam at Southern California ports.

There was no age, education, or gender exclusion criteria and provided distinctive perspective based on the participant's role in the maritime industry. There was, however, a geographical location requirement and it was necessary for each contributor to be based in South Florida. This allowed for the specificity of how Gulf Coast ports in Florida could be a solution to alleviate the congestion on the West Coast.

Chapter 4: Findings

Chapter 4 is organized into five sections: supply chain demand, reconfiguration of sea trade routes, oceanographic considerations, port infrastructure, and a summary. The reconfiguration of sea trade routes section discusses the feasibility of altering the movement of cargo vessels away from LA-LB ports to other U.S. seaports, specifically Port Manatee. The port infrastructure section addresses the benefits and challenges Port Manatee faces in handling goods leaving and entering their port and their port expansion initiatives. The oceanographic section exposes the maritime challenges of container vessels concerning the draft, which is the minimum depth a vessel can safely travel through the main channel in and out of Port Manatee without hitting the bottom of the hull on the surface below the water. The supply chain section will identify potential difficulties with expanding the global supply chain and the availability of ships to the port to determine whether it is practical and profitable to go through the Panama Canal.

A nonexperimental analysis was conducted of data collected through interviews, both in-person and an online video platform, or a five-question online Qualtrics survey. The grouping of questions addressed in this chapter can be seen in Table 2. The research questions stem from the role SeaPort Manatee would play when sea trade routes are reconfigured, and cargo ships are sent to the Gulf Coast port. Participant responses are based on their experience and knowledge of the port and the port's perceived limitations and successes.

Additionally, the decision to transit through the Panama Canal in lieu of waiting at anchor in the Pacific Ocean must be considered as toll fees can be excessive.

Table 2

Research Questions with Corresponding Coding

Research Questions	Corresponding Codes
RQ1: To what extent can the leaders of Port Manatee address the supply chain disruption?	• A unique location and congestion-free port • Expansion of available land for docking of more ships • Showcase PM capabilities by presenting reduced transit time
RQ1a: To what extent can ocean carrier leadership teams make strategic decisions to reroute cargo vessels to Port Manatee to alleviate the bottleneck at California ports?	• Provide accurate assessment of cargo volume the port can handle • Develop and invest in infrastructure • Engage clients to determine the feasibility of shifting sea trade routes from Southern California ports to PM • Accountability for ships being shifted from transfer points to correct delivery point
RQ2: To what extent does the Panama Canal impact Gulf Coast ports allowing for increased global cargo traffic and the transit time from the West Coast to the Gulf Coast?	• Allows vessel to transit quickly • Increase cargo flow and reduce transit time • Better reliability and delivery time • Allow larger container ships to transit the canal

Supply Chain

It was a tense environment for shipping lines during the lockdown in 2020, and cargo ships were backed up, resulting in massive delays at LA-LB ports. The spatial structure of a port system needs to consider marine traffic flow to and from ports when tracing spatial structures.

That would significantly impact the U.S. gross domestic product (GDP) since a high percentage of goods flow through LA-LB ports (Jung & Thill, 2022). In 2022, commerce started diverting to other ports to avoid further delays. However, a new problem exists where new shipping companies have difficulty finding space for containers on vessels. In general, the container market is growing resulting in limited space on cargo vessels. Sea trade routes are reconfigured, cargo ships are becoming larger, and companies are trying to figure out how to serve their clients best to optimize the available container space onboard. Placing containers within the cargo space on a container vessel must be allocated explicitly into a stowage location (Wilson & Roach, 1999). The container market is growing, and generally a high percentage of goods are shipped via containers meaning there is limited space to put containers. Adding that it takes months for a ship to transfer from point A to point B, a backlog occurs as consumers expect immediate delivery of products. Companies like Amazon build business models on the concept of immediate satisfaction. Therefore, people assume those larger ships should be able to serve each of the new individual online markets. Furthermore, these larger ships, like the post-Panamax, cannot dock at a smaller port, particularly SeaPort Manatee.

Due to the high logistics costs in the U.S., there has been a pivot to Mexico. The connection from Mexico to Florida allows SeaPort Manatee to import goods that can be sent to Chicago, for example, via intermodal transport. Once a container is loaded onto a truck, it can reach Chicago in 16 driving hours. On the other hand, a truck leaving LA-LB will have a 40-hour drive time to Chicago. Therefore, the proximity of coming through the Gulf and reaching the Midwest means faster delivery to Midwest consumers.

Beneficial Cargo Owners (BCOs), which is the importer of cargo and responsible for taking possession once the cargo reaches its final destination, want to add flexibility to their

distribution systems and cut down their warehouse inventory. BCOs are faced with the decision to pivot and save time by going through the Panama Canal and incurring excessive toll fees or being delayed for 30 days. Often, they will decide to incur the cost if it means saving 15 days of demurrage time, which is a fee attached to cargo that has overstayed its time at a terminal.

In the view of many in the maritime industry, SeaPort Manatee does an exceptional job managing the goods leaving and entering via their port. A way to further assist would be to expand their available land, allowing more ships to dock and bypass the West Coast, where supply chain disruption is prevalent. Leaders at SeaPort Manatee can look to increase their participation in international trade given their unique location and congestion-free port. As the closest port on the Gulf Coast to the Panama Canal, their connection to Asia is critical in these times of disruption as it can serve as an outlet to the current congestion seen at non-Florida ports nationwide.

Reconfiguration of Sea Trade Routes

Maritime networks support commercial shipping with strategic logistical locations and are vital points of passage serving as major global trade markets, and many influential maritime hubs. They are susceptible to disastrous weather events, political conflict, a health pandemic, and capacity constraints due to a severe supply chain disruption (Saeed et al., 2021). From a general trade perspective, the reconfiguring of sea trade routes is working, but it is not working for everyone, and since it is not working for everyone, the perception is that it is not working at all resulting in the entire redistribution of the maritime network. Since the Panama Canal opened its third set of locks, shipping companies have conducted independent feasibility studies to determine whether it is practical and profitable to go through the Panama Canal. The benefit is to

serve particular clients versus the normal traditional loads of East Coast, West Coast, or Gulf Coast ports.

The challenge is the number of goods coming into the U.S. because it is vastly a consumer nation, which create additional bottlenecks. The COVID-19 pandemic placed an additional burden on the already then- overburdened supply chain bringing production to a slowdown. Therefore, producers are trying to keep pace with demand. Additional groundwork could be implemented to satisfy the U.S. markets through an up-and-coming container market. Shipping clients cannot receive the type of service they desire because the carriers are allocating the container space on vessels to account for distributing cargo around these reconfigured trade routes.

There is an ebb and flow of particular commodities in the U.S., and although the rerouting of cargo vessels has been implemented, it is not working at the perceived pace the citizenrt expects. Therefore, should expectations be adjusted to be more practical, or should the supply chain be optimized to meet expectations? With additional supply routes, there will be additional demand, causing a race to optimize logistics strategy by ocean shipping lines. That new strategy will not work well for everyone, forcing others to create innovative models to enhance shipping logistics that might be sustainable and replicated across the entire supply chain. Nevertheless, the supply chain is not equal. Certain countries have an overabundance of particular products leading to a market advantage. Vendors must determine how to transport those goods from point A to point B. The frontier to logistics expansion must satisfy the needs of developing technology as new trade routes are established (Zheng et al., 2019).

The decision to reroute cargo is a very complex process. Multipurpose vessels could have five different plywood customers originating from Asia, yet one accounts for 50% of the freight,

and the other four combined account for the other 50%. The complexity of having multiple customers creates a dynamic between the customers and the ocean carrier on the decision to reroute to a different port. For instance, the multipurpose carrier runs on a tight service schedule and tries to stay on schedule by booking their vessels 12 months in advance. Suppose one of their vessels is scheduled to offload in Houston and will be delayed for 30 days in Houston. This would generate a domino effect since they were scheduled to offload at another port after Houston producing a backlog for other delayed vessels, which has a global impact. Operations managers at SeaPort Manatee receive weekly calls from ocean carriers requesting warehouse space on the dock. Unfortunately, the port does not always have the space to accommodate these containers; however, off-dock warehouse space within a 20-mile radius of their port might be available as an alternative. Often, port operations have had to store a lot of break bulk cargo outside and place a protective tarp over the load.

Rerouting is not as easy as simply having a ship change course. It is a factor in the shippers getting their cargo to the correct delivery point. Most ocean containers are not shipped to final offload sites but go to transfer points. Much of the cargo coming into LA-LB goes to Ontario, California, for repacking into 45- or 53-ft trailers. The same must be accounted for when ships are deployed to SeaPort Manatee. Ocean carriers can collaborate with and invest in Florida ports, such as SeaPort Manatee, to create container yards and engage their clients to determine the feasibility of shifting the supply chain from California ports. Port leadership could participate in dialogue with the vessel-operating common carriers (Shipping Lines) to encourage the creation of new routes to alleviate the congestion on the West Coast. Another means would be to continue to make investment decisions for infrastructure enhancements to allow the

efficient movement of cargo. Nevertheless, costs and timing will need to be calculated to benefit their Beneficial Cargo Owners' needs.

The Covid-19 pandemic was a trigger for the global phenomenon that happened in the maritime shipping industry. Other underlying issues impacted the transit of imported goods long before the pandemic, particularly the global ocean transportation system. The top ten shipping companies control 85 percent of ocean containers moving around the world, meaning that ocean shipping companies can pool their resources together, share sea transit routes, and have control over more ocean traffic than in previous years. Another element is the growth and size of the vessels. Since 2006, ocean container ships have increased substantially in size. With the introduction of Maersk's e-class, TEU capacity jumped from 10,000 TEUs up to 15,000 TEUs. In 2013, Maersk introduced the triple e-class, which increased TEU capacity to 18,000; in 2016, the ultra-large mega ship with a capacity of 20,000 TEU containers. xxxx

When the great recession hit in 2008, there was greater control of ocean shipping in the hands of fewer companies, and they had larger vessels. When ocean shipping slowed down in the 2010s, ocean shipping companies loaded less cargo on their ships and slowed down the shipment of containers. When the Covid-19 pandemic hit in 2020, shipping lines were able to increase their speed, but more importantly, there was capacity. In other words, ships had more room onboard cargo, significantly changing ocean shipping logistics. September 2022 shows a diminishing number of opportunistic small container shipping lines. These small ships from Asia would jam LA-LB ports because they were not regularly scheduled vessels entering those ports.

One factor is that U.S. retailers were concerned they would experience delays similar to 2021. Therefore, they ordered merchandise earlier than expected and ordered more goods than usual. LA-LB ports have difficulty getting containers out of the yards and terminal and into the

interior. Most ocean shipping containers that arrive in LA-LB go to warehouses and distribution centers close to LA-LB, or they go on rail cars and ship across the country. Much of the freight that comes into Southern California does not stay there. The trans-pacific trade routes are serving California's large population. However, the population is mainly in the mid-Atlantic, New England, and the Southeast portion of the U.S.

A contributing element for directing cargo away from the West Coast was the labor talks in July 2022 between the International Longshoreman Warehouse Workers Union (ILWU), representing approximately 22,000 dock workers along all West Coast ports, and the Pacific Maritime Union (PMA). Talks between the two parties have historically been contentious. It led to work slowdowns causing significant delays in cargo distribution. Fortunately, in late July 2022, the ILWU and PMA released an announcement stating that they had reached a "Tentative Agreement" on the Maintenance of Health Benefits and were subject to agreements on other negotiated issues.

Another issue causing delays has been the storage of empty cargo containers at LA-LB ports. Pre-Covid, the ports made agreements with companies, shippers, and ocean carriers that they would be able to keep their empty containers on the terminal for more than nine days which was appealing when terminal traffic was slow. The problem of overloaded container yards developed as warehouses became full in the interior of California, resulting in no room for containers fully loaded with imported goods. In mid-2022, it is unclear what post-Covid economics will impact the supply chain. E-commerce and people working from home have changed consumer buying patterns. Cargo vessels are still coming into West Coast ports at a consistent level and fully loaded with 10 – 15,000 boxes on board, which is overwhelming the

interior transportation system, which consists of hinterland yards, terminals, warehouses, and intermodal transportation.

Rerouting a ship is a process. The inland distribution system must be set up ahead of time to handle the redirected cargo. Shippers decided to diffuse their network when shipping containers were backed up in 2021. Cargo still goes to LA-LB, but shippers choose to use other vessel types and sea trade routes. Not all ultra-large container vessels that carry over 18,000 TEUs come to the U.S. They travel westward from Asia to Europe through the Malacca Strait, the Suez Canal, and into the Mediterranean to European ports. Cargo is then transloaded from European ports onto other vessels that come to the U.S. East and Gulf Coasts. Another sea trade route shippers utilized was sending Neo-Panamax vessels, the maximum-size ships able to go through the Panama Canal, to U.S. ports. Instead of boats with a capacity of 5,000 TEU that used the two old lanes of the Panama Canal, the new lane allows 15,000 TEU vessels to come in. Even though it is a longer route and more expensive, it is reliable.

Oceanography

Rerouting cargo ships and reconfiguring sea trade routes are the main focal point of this feasibility study. In the process of collecting data, another important element was discovered. The right oceanic conditions must be present for ships to enter and exit SeaPort Manatee safely. Oceanographers who work closely with SeaPort Manatee were interviewed and presented illustrative and detailed evidence of ocean characteristics vital to this study. The role of an oceanographer is to investigate and interpret all aspects of ocean processes using modern and sophisticated scientific techniques (Pinet, 2019). One of the issues seaports have is the depth of the ship channel. For example, the China Ocean Shipping Company (COSCO) Neo-Panamax vessel coming into port is drafted at 41 feet and needs at 41 feet of water. When a ship

approaches Tampa Bay offshore, the main channel is very narrow at 600 feet wide and 43–45 feet deep. If a ship veers outside that channel where the water is only 20–25 feet deep and possibly less in some places, it will hit the bottom of the ocean.

It is a particular problem going into SeaPort Manatee. It is one of the critical locations where the harbor pilots have specific guidelines or restrictions on what ships can do in that area under the other wind, currents, and tidal conditions. For ships to turn that point A into SeaPort Manatee, the currents must be below a certain threshold, or else the ships get pushed sideways by the currents out of the channel, run aground, and get stuck (Meyers & Luther, 2020). When large ships make a hard 90-degree turn, they must go at a relatively fast speed to have control of the ship, known as "steerage." If they go too slow, the rudder and the hull will not glide through the water resulting in their inability to steer the ship.

A ship's draft must be less than 40 feet to safely enter and exit the port. Figure 6 shows the topography and bathymetry depth of the bay. Bathymetry is the measurement of water depth in the ocean. The section in red indicates where the water is very shallow. The yellow and green areas are deeper at approximately 10 to 12 meters, and the small blue area is very deep at approximately 15 meters. Therefore, inside the bay, there is only one spot right at the mouth that is greater than 15 or 20 meters, whereas all the other areas are draft limited (Vallée et al., 2019). The water is very shallow to the south of the Port Manatee channel.

The Harbor pilots have the final say on bringing vessels in and out of the Port. The Tampa Bay Pilots Association, along with the U.S. Coast Guard (USCG) and the National Ocean Service (NOS), created the VHG. In collaboration, the USCG and NOS go to great lengths to chart and measure ocean depths in the bay and create nautical charts. The Office of Coast Survey, now part of the NOS, was founded by Thomas Jefferson in 1807. It is meant to map out

all the ports in the U.S. to chart ocean depths and communicate them to port operators, ship agents, harbor pilots, vessel owners, and others who may need to know oceanic conditions before entering or exiting the port.

Since a ship's depth can vary the depending on type of cargo, time of year, and the water denseness confronted with at port and sea, ships have a reference mark located on the hull that indicates the maximum depth the vessel may be safely submerged in water when loaded with cargo (Rangarajan, n.d.). The reference mark is the Plimsoll line named after Samuel Plimsoll, a British politician and merchant reformer. He devised a way to measure the waterline at the level where it sits in the water. The British Parliament enacted the Merchant Shipping Act of 1875 to provide for the marking of a load line on the hull of every cargo ship. Certain environmental factors need to be accounted for (Table 3) so that a ship's captain can determine the appropriate Plimsoll line needed for the safe passage from port to port.

Table 3

The Plimsoll Environmental Factors

TF	Tropical Fresh Water
T	Tropical
F	Fresh Water
S	Summer
W	Winter
WNA	Winter North Atlantic
AB	Letters indicating the registration authority (American Bureau of Shipping). The circle with the line through it indicates whether or not the cargo is loaded evenly.

The NOS is currently studying how to deepen the entire channel to 47 or 48 feet to handle the Neo-Panamax ships that can fit through the Panama Canal that were not able to before. Until completion of the study, cargo ships are offloading some of their containers at Port Houston, then the Port of Mobile (Alabama), so that by the time they arrive at SeaPort Manatee, they are only drafted at 40 to 41 feet. If the ship is more than these numbers, the pilot will only

be able to bring the ship in a quarter of a knot of slack water, which is when the currents are less than a quarter of a knot in speed, the water is completely unstressed, and there is no movement either way in the tidal stream (Gomes et al., 2020).

Another concern for vessels entering and exiting SeaPort Manatee is that there is no place to turn around when they pass buoys nine and 10, six miles offshore of Egmont Key. The ship channel is only about 600 feet wide and is 43 to 45 feet deep. Therefore, due to its width, the channel is a one-way traffic lane when entering or exiting the port, meaning there are no passing zones or emergency anchorages in the bay. The Army Corp of Engineers is doing an environmental study to determine how to deepen and widen the channel in the middle of the bay. This will allow for two-way traffic when cruise ships or container vessels must pass each other and have emergency anchorage in the upper bay in case something goes wrong. Ships can pull over and throw down anchor. The challenge is that the bay is only 12 feet deep. For SeaPort Manatee to improve container flow, it could mean the dredging of the ship channel to be deeper.

Infrastructure

This feasibility study aimed to determine whether reconfiguring sea trade routes will alleviate the congestion at Southern California ports and how the SeaPort Manatee infrastructure would handle an increase in cargo volume when more ships are diverted to their port. It recognizes the operational efficiency within its niche market and how the small seaport is moving more containers than ports of availability (Cho et al., 2018). Not all ports can service the same clientele but this seaport in Palmetto, Florida has been able to satisfy the demands of its customers. SeaPort Manatee has no container gantry cranes, a large overhead crane that uses legs to support the bridge, trolley, and hoist. The legs of the crane travel along the ground on wheels or can ride on rails embedded in the ground.

Instead, the port uses basic Gottwald mobile harbor cranes. These mobile harbor cranes in service at the Port are manufactured in Germany. The port uses only mobile harbor cranes for two reasons: (a) with only ten berths in the port, mobile cranes allow for flexibility to move cranes between berths as cargo dictates without dedicating a berth solely to a gantry crane. Using a gantry crane would limit that berth's availability for noncontainer cargos, and (b) gantry cranes are made in China, and the cost is very high. Port operations are marginally more efficient with its current port infrastructure since they process inbound and outbound containers efficiently without the added cost of a gantry crane.

Figure 1

Gottwald Mobile Harbor Cranes Used at SeaPort Manatee

Note: From SeaPort Manatee launches new era for Florida Gulf trade gateway by SeaPort Manatee, 2022 (https://www.seaportmanatee.com/2022/02/seaport-manatee-launchesnew-era-for-florida-gulf-trade-gateway/). Reprinted with permission.

Maritime professionals outside SeaPort Manatee expressed that the port could consider investing in Post-Panamax-sized container gantry cranes. Installing gantry cranes to

accommodate larger ships carrying a more considerable amount of TEU containers could increase their container business. However, SeaPort Manatee leaders explained how that type of investment would not be in their best interest since gantry cranes are costly and would not allow flexibility. Once installed, gantry cranes cannot be moved to another terminal. Mobile harbor cranes are less expensive and allow flexibility to travel between berths as cargo dictates.

In comparison, the Port of Tampa, which is twice the size of SeaPort Manatee, bought two gantry cranes in 2020 and will be adding three more in the future to satisfy the increasing demand in cargo. Towering at 170 feet tall, Chinese-made gantry cranes are transported to seaports by a special ship where the sole function is to deliver gantry cranes to different ports.

Warehousing demand is climbing throughout the U.S. as the fourth quarter approaches despite forecasts of recession, and there is no indication that demand will slacken in the foreseeable future. Consumer demand is forcing warehouse operators and customers to create innovative solutions as freight continues to accumulate not only in warehouses but also in trailers and containers. The warehousing market is overwhelmed. SeaPort Manatee port operators receive calls from ocean carriers weekly looking for space to offload containers. The port has new customers that need warehousing space and existing customers who want to expand their space. New customers mostly want temporary storage for three months, six months, or less than a year as nobody can predict what will be coming in the marketplace.

Many customers are among the importers that pulled imports forward by several months in 2022 to prevent potential supply chain disruption and stock-outs later in the year. However, long-term customers, including food product manufacturers, need more space. Food ingredient manufacturers are expanding exponentially. Del Monte Fresh Produce N.A., Inc. reached an agreement in October 2021 to keep the company’s fruit imports coming into the seaport until

2026 and possibly through 2036. It is suitable for consumers throughout the U.S. Southeast, which relies on the efficient flow of bananas, pineapples, avocados, and other in-demand fruits. Del Monte has been importing fresh fruit into SeaPort Manatee since 1989 and agreed to lease the port's warehouse facilities through August 2026, with a two-year extension option of five years. The agreement is valued at approximately $1 million per year. Del Monte has its needs covered by having its own chassis. Therefore, the chassis shortage experienced on the West Coast has no impact on its fresh fruit distribution.

What is happening across the U.S. is that the standard warehousing vacancy rate is 3.4 percent, and pre-pandemic, a rate of 6 to 8 percent would have been more typical (Stauber, 2022). Space is extremely tight near major seaports. For instance, the vacancy rate at Port of Savannah is 0.1 percent, new space is unavailable, and there is barely any space in Southern California's Inland Empire. Compacted capacity at ports is sending goods inland and squeezing warehousing there. It is creating complications for interior warehouse and distribution companies that want to satisfy existing customers in the transportation landscape.

In 2021, many transportation companies decided to refuse freight from new customers, putting freight caps on existing customers and banning freight that did not fit their networks. Warehousing and distribution companies are finding themselves making similar decisions. SeaPort Manatee offers more than 1 million square feet of public warehouse space featuring 207,000 square feet of refrigerated space, yet they are near capacity. Port leaders have found available warehouse space within a 20-mile radius of the port for its customers.

With a recession possible in late 2022 and early 2023, the trajectory of warehousing demand will not change too much. Demand will continue for flexible warehousing space, and it is clear that the trend of ocean carriers needing to have freight closer to customers is not just a

pandemic-driven factor. An increase in localized transportation will keep urging the need for more distributed warehousing sites, from small storage and fulfillment centers to large e-commerce centers.

In 2016, the Manatee County Port Authority approved a $750 million 20-year master plan encompassing a strategic vision for continued diversified growth with a concentration on generating local, regional, and statewide economic benefits. They have undeveloped land to the north of the port, which will ultimately have three additional berths. The first initial berth expansion will allow the port to bring in larger and more ships. In 1970, when the port was completed, the average ship size calling on them was 300 to 500 feet maximum. In 2022, they can bring in vessels regularly that are 700 feet and at times 800 feet. The limiting factor for the ports in Tampa Bay is water depth. Only ships with a maximum draft of 41 feet can enter the channel. Vessels with a draft deeper than 41 feet will go to other ports in Florida, Houston, Savannah, or Mobile, Alabama.

In the fiscal year ending September 30, 2021, the SeaPort Manatee celebrated processing a record high 135,660 TEU of containerized cargo (SeaPort Manatee, 2022). In collaboration with a vast array of industry and community stakeholders, a $74 million capital improvement plan has been approved, whereby $13.1 million will be apportioned to expand the port's dockside container yard to 23.5 acres.

Additionally, on September 15, 2022, the U.S. Department of Transportation announced that SeaPort Manatee was awarded a federal grant of nearly $12 million to advance another 16.5 acre expansion of their container yard facilities. The vital SeaPort Manatee project is one of 26 projects wherefore a total of $1.5 billion in Infrastructure for Rebuilding America (INFRA)

competitive grant funding was announced by U.S. Transportation Secretary Pete Buttigieg, who described the grants as “transformative investments.”

The federal investment of $12 million is earmarked toward the blueprint and production of 16.5 acres of additional cargo-handling space and a new container yard access road, along with the installation of electrical systems for two new mobile harbor cranes that arrived at the port in April 2022. The INFRA money is supplemented by state and local funds, comprising the equivalent sum of $2,147,650 each from a Florida Department of Transportation funding and SeaPort Manatee proceedsm. The port will begin construction in 2023 to complete the work in 2025.

There are still many containers coming into the U.S., and the berths at LA-LB are no longer full, with a decrease in container handling at LA-LB. However, these ports continue to struggle with rail and truck productivity. Close to 30 thousand containers have been waiting for over nine days to be loaded onto rail cars. Over 60 percent of containerized cargo is destined for rail (LaRocco, 2021). Containers must be transported to warehouses and distribution centers so the economy can keep moving. Overall, consumption has not slowed down as was anticipated. Importers need longer lead time due to supply chain delays. In some cases, there will be an overabundance of inventory, and in other cases, consumers will not be able to get enough of what they need.

Due to this logjam, there is a diversification of where the cargo is going. Because of backlogs at Southern California ports and a lack of warehouse capacity, including Ontario and the Inland Empire, ocean shippers have decided to diversify where their cargo is going. Once the decision to divert cargo to another port besides LA-LB, the shipping company Maersk, for example, requires customers to complete a 'Diversion Request Changes to Final Ocean

Discharge Port' form. Requests must be submitted in writing no later than three business days before the arrival of the carrier's vessel at the port of discharge. The document outlines that the requester must have Maersk's Transport Documents. For waybills, the shipper retains the right of control until delivery. Only lawful Bill of Lading holders has the right to request a diversion. It is essential to understand that any diversion is subject to operational feasibility, and the approval may take up to 72 hours to process. Customers cannot use this form for return or re-export shipments.

According to U.S. Customs data aggregator Descartes, inbound volumes to all U.S. ports totaled 2,215,731 TEUs in September 2022. That is down 12.4 percent from August 2022 (Descartes, 2022). Descartes states that imports declined on all three coasts. In the Summer of 2022, overall U.S. imports remained high, remaining close to record levels even as West Coast volumes decreased. West Coast deficits were counterbalanced by East and Gulf Coast gains, purportedly due to shippers shifting cargo routes eastward due to fears of West Coast peak season congestion and labor contract negotiations.

Aside from vessel size and draft challenges, the SeaPort Manatee and its vendors' number one issue is the workforce. During the COVID pandemic, a large percentage of people enjoyed working from home. There have been tremendous benefits regarding the quality of life when people do not have to go into an office daily. Post-COVID, people are still seeing opportunities to work from home. The port has seen warehouse capacity grow from 200,000 square feet to one million in less than two years. However, warehouse personnel and blue-collar laborers lack the skills to work on the dock. It has been a very competitive job market, and much poaching is happening in the maritime industry. If a big ship is due to come in, they will plan to have 40 people work on the ship, yet only 20 would show up. It appears to be an employee's market, and

employers are trying to entice labor to work for them. During the Christmas season, when there is a massive increase in imported goods and the port is busy, they struggle to hire the 40 people needed and are forced to find another solution to keep pace with the incoming cargo. There are days when the port receives a bulk juice vessel to unload and a bulk stone vessel unloading on the same day, resulting in increased traffic with a steady flow of trucks in and out of the gate. Fortunately, the port does not have long queues outside their gate, so they have been able to process the cargo onto the truck and back out onto the road for delivery.

The number two issue the port is experiencing is the trucker shortage related to labor. There is not enough truck capacity to move. The main difference between the trucker shortage at LA-LB and SeaPort Manatee is that West Coast truckers lease their chassis, and Gulf/East Coast truckers own their chassis. Therefore, SeaPort Manatee does experience the backup of trucks or a chassis shortage. However, it is similar to the dynamic of the workforce at the port. A business might be planning on 150 trucks per day, but if there is a pull-out of port of Tampa or Cape Canaveral at the same time with the same product, they may only have 75 trucks even though they were expecting 125.

The main reason these Gulf ports are expanding their container business is the new Panama Canal. Prior to the opening of the new lock system, larger container ships could only go to the West Coast. Cargo was offloaded and then shipped via train or truck across the country to get to the East Coast, or they had to travel through the Suez Canal, through the Mediterranean, and then up to New York and New Jersey, which were the only ports deep enough for the giant container ships.

All these ports compete for the same business, and several ocean liner services are now doing service through the new Panama Canal expanded lock system and other gulf ports. There

are many moving parts, and it is necessary to determine what containers are optimally situated at SeaPort Manatee or Port Tampa Bay versus all the other surrounding ports. Ultimately, the goal is to minimize the time a container must sit in the yard and then minimize the distance that container must travel by either truck or rail. Ocean carriers want to drop off containers as close to their destination as possible. The IMO does not have the authority to tell ships when and where they can go. It is solely up to the ship operators.

Challenges with Data Collection

The U.S. supply chain crisis presented significant data collection challenges. Over five months, 40 leaders in the maritime community were contacted by email and asked to participate in this feasibility study. Regrettably, 30 potential participants contacted were not at liberty to discuss information on market processes and any other items concerning the bottleneck at the ports of LA-LB or the reconfiguration of sea trade routes. Some of the recruits explained that a part of their responsibilities within the purview of redirecting cargo vessels to other U.S. ports was considered confidential. Additionally, due to the supply chain turbulence, several maritime leaders were unavailable as they were busy with the logistics of rerouting cargo vessels from the ports of LA-LB to other U.S. ports.

Table 4

Sample of Respondents

Title	Organization	Type
Participant 1	SeaPort Manatee	Interview
Participant 2	SeaPort Manatee	Interview
Participant 3	SeaPort Manatee	Survey
Participant 4	SeaPort Manatee	Interview
Participant 5	Port Tampa Bay	Interview
Participant 6	Kuehne+Nagel	Survey
Participant 7	A Customs Brokerage/Survey	Survey
Participant 8	Center for Maritime and Port Studies	Interview
Participant 9	Center for Maritime and Port Studies	Interview
Participant 10	U.S. Merchant Marine Academy	Survey

During the recruiting process, it took several attempts to receive a response from anyone. Still, perseverance paid off, and the 10 people who contributed provided a wealth of information from their unique perspectives. I was mindful of the contributors' busy schedules and offered flexibility for the online and in-person interviews. For example, I met with one participant via Zoom at 6:30 on a Sunday morning. The conversation was free-flowing and highly informative. All the interviews were fluid and highly insightful. For instance, the oceanographers interviewed opened my eyes to the importance of water depth, ocean waves, and tidal currents. These data took the study in a new direction, and by what means those elements influence how and when cargo ships enter and exit seaports. These elements determine the critical locations where the harbor pilots have specific guidelines or restrictions regarding how cargo ships transit to the Gulf Coast ports under different ocean conditions.

From a general trade perspective, reconfiguring trade routes is currently occurring and going well for some U.S. ports but not so well for other U.S. ports. However, the bottleneck on the West Coast has disrupted the normal day-to-day operations for seaports on the Gulf and East Coasts. One challenge that affected the availability of participants was the COVID-19 pandemic. Due to the lockdown in 2020 and the potential for the virus to spread through contact with dockworkers from port to port, ocean carriers had issues finding enough space on their vessels for TEU containers. It led to difficulty finding people in the maritime industry with the time to participate in person, online, or via the Qualtrics questionnaire.

Summary

The main reason I created the online questionnaire was to make the research questions available in a written format to allow participants to answer questions when they had the time. I collected data from four online questionnaires with participants ranging from Customs Brokers

and U.S. Trade Control for Imports to Merchant Marines and Trade Development in Port Operations. The six in-person and online interviews resulted from my scouring maritime organizational websites and searching for leaders with ocean shipping experience.

The combination of the online questionnaire and in-person interviews allowed me to experience firsthand the difficulties port operators experience when shipping lines are in dire straits to offload cargo. These ocean carriers have had trouble finding a U.S. seaport that can accommodate the processing of thousands of international TEU containers they are transporting. Cargo vessels also carry break bulk items such as petroleum, orange juice, gravel, and salt. Not every seaport terminal has the proper equipment or warehouse space to handle the increased marine traffic into their ports. They need to ensure that the port where they lay anchor can handle the extra cargo since they were not originally scheduled to offload at that location. What needs to be considered is the ripple effect of an unscheduled cargo vessel unloading TEU containers in front of a ship already scheduled to anchor and offload.

Chapter 5: Implications, Recommendations, and Conclusion

The specific focus of this feasibility study was to consider redirecting cargo vessels at anchor in the Pacific Ocean to SeaPort Manatee and reconfiguring sea trade routes to the Gulf Coast port to alleviate the congestion at Southern California ports. A nonexperimental analysis was conducted to understand the prevalent supply chain crisis and its impact on importing and exporting international consumable goods. Free-flow interviews and a Qualtrics online questionnaire were chosen to answer the following research questions:

- RQ1: To what extent can the leaders of Port Manatee address the supply chain disruption?
- RQ1a: To what extent can ocean carrier leadership teams make strategic decisions to reroute cargo vessels to Port Manatee to alleviate the bottleneck at California ports?
- RQ2: To what extent does the Panama Canal impact Gulf Coast ports allowing for increased global cargo traffic and the transit time from the West Coast to the Gulf Coast?

It was assumed that deploying ships to the Gulf Coast might not be feasible as specific cargo may be destined for West Coast distribution points. However, the study demonstrates that due to the current logjam at LA-LB ports, cargo is being diverted from Southern California to Gulf Coast ports. The data collected from maritime executive leadership, ocean scientists, customs brokers, and carriers offer a dichotomy of ideas expressed by each participant yet supports the feasibility of the implementation of SeaPort Manatee as a solution to ease the supply chain turbulence. Confidentiality and ethical standards were maintained throughout the study, and all IRB recommendations were followed. Implications for each research question will refer to the findings covered in Chapter 4. Recommendations for port expansion, infrastructure

development, and oceanology are identified as future research opportunities for seaports to handle the historic level of goods coming into the U.S.

Implications

The following discussion is organized by each research question relating to the previous chapter's findings. The themes related to RQ1 were the port expansion using available land to handle an increase in cargo traffic, making decisions to shorten demurrage time, and the complexity of ocean carriers having multiple customers. New themes that emerged in RQ1a are how SeaPort Manatee can engage with current and potential clients to determine the feasibility of altering the supply chain from California to Florida, managing the discharge of cargo to control congestion, and dredging the main channel into the port deeper to improve container flow. Open-ended themes in RQ2 are: (a) how new-Panamax ships can carry up to a 48-foot draft through the Panama Canal, (b) the impact on SeaPort Manatee allowing for increased cargo traffic, and (c) ocean carriers determining whether it is practicable and profitable to go through the Panama Canal.

RQ1: To What Extent Can the Leaders of Port Manatee Address the Supply Chain Disruption?

Given Port Manatee’s unique location as the closest port on the Gulf/East Coast to the Panama Canal and that it is a congestion-free port, leadership can use that as a platform to demonstrate proficiency to reduce transit time and increase their participation in international trade. A 20-year master plan includes the development of land for the building of three additional berths. The first phase being developed is to the north of the port. This will allow the port to welcome larger ships over 800 feet long. Amid high consumer demand and limited supply of global products, labor shortages and transportation issues forced shippers to hold on to their chassis units longer than usual. To avoid demurrage fees, SeaPort Manatee has empty chassis

available to avoid overstocking empty containers. Multipurpose ocean carriers with multiple customers may experience scheduling issues if a port cannot offload due to the lack of warehouse space. SeaPort Manatee leadership has identified off-dock warehouse space within a 20-mile radius of its port.

RQ1a: To What Extent Can Ocean Carrier Leadership Teams Strategically Reroute Cargo Vessels to Port Manatee to Alleviate the Bottleneck at California Ports?

Deepening the main channel into SeaPort Manatee to 48 feet would mean the port could handle the larger ships. Several ports in the southeastern U.S. have completed dredging projects to get up to 52 feet deep. Although deepening of the ship channel will change how the tidal water flows in and out of the bay. It is known as nontidal, circulation, gravitational overturning across the break channel cross-section. A larger channel means more water can move in and out, meaning that bigger waves create a lot of shoreline erosion. Numerous variables must be considered, such as having a speed limit and not allowing ship operators to go as fast as they want. Ships of a specific size can only travel at a certain speed because of the physics behind how the ship and the water react. Damage will be limited if ships do not create a large wake.

Consumer behavior indicates the mindset of limitless capacity to ship cargo from Point A to Point B, and ocean carriers are challenged with finding container space on vessels (Wang, T., et al., 2020). However, ships are allocating container space to their premier customers to account for the redistribution of cargo around reconfigured trade routes. People assume that larger vessels should be able to serve each of the individual online markets. New shipping companies are finding it difficult to locate space aboard these ships. Therefore, shipping companies must find new options to overcome vessel capacity shortages.

RQ2: To What Extent Does the Panama Canal Impact Gulf Coast Ports to Allow for Increased Global Cargo Traffic and the Transit Time From the West Coast to the Gulf Coast?

With the opening of the new lock system in 2016, the capacity of cargo traveling from the West Coast to the Gulf/East Coast via the Panama Canal has changed immensely. Container traffic increased from 5,000 TEUs to over 13,000 TEUs, meaning that sea trade routes between Asia-West Coast ports can be reconfigured to Asia-Gulf/East Coast ports, and ships can be rerouted around LA-LB. There is a limitation, however, regarding canal toll fees and high fuel costs, but the tradeoff can lead to better reliability and delivery times. Without passage through the canal, transit times would increase substantially, making it more difficult for foreign trade with the Far East. The expansion of the Panama Canal has had a positive influence on the container business. Before the expansion, larger container ships could only go to the West Coast, where the offloaded containers were put on a train or truck and driven cross-country to the East Coast ports or via the Suez Canal. Ultra-large container ships carry over 20,000 TEUs and cannot fit through the Panama Canal.

The cost of shipping a container has quadrupled since 2020, with the most significant issue being cargo ships' ability to enter and exit LA-LB ports. One truck can take eight to 10 hours to get in and out of the Port, whereas it might take only 15–20 minutes at SeaPort Manatee.

Impact Metrics

In the ocean shipping industry, mega-global container shipping lines and vessel operators have more influence than newer shipping lines. The same strategy and approach are given to established customers versus newer customers, not in a regular rotation. Therein lies a complication that could impact the timely delivery of cargo to U.S. ports. There is lead time that must be factored into the equation. Therefore, logistical planning is essential two to three months

in advance. Shippers and port operators have begun to allocate dedicated space for 200 TEU containers from one shipper. The ports need to consider that the same company may have another 300 boxes within the next two months, yet 30 or 50 other shipping companies will also receive cargo on the land. Space must be configured onboard the vessels to accommodate all the supply-demand. It is like putting together a giant puzzle. With a new entry into the market, there is a concern that ships may not have the space to transport international goods for new unestablished customers. Port infrastructure plays a vital role in that lead time as far as the capacity at the port and storage space at the warehouse.

The question then becomes whether it is best to offload at the ports of Houston and Mobile to lighten the ship's weight so it can enter SeaPort Manatee, given that water depth in its main channel is a significant concern. Pole Star is a proprietary global maritime intelligence technology that cannot be accessed without permission from the U.S. Coast Guard. It enables complete visibility and monitoring of vessel traffic, tracking, security, and environmental risks. Oceanographers use it to collect data and send necessary oceanic conditions to harbor pilots and seaport operators. Ocean conditions are monitored when cargo is rerouted to other U.S. ports to ensure the safety of vessels entering and exiting seaports. If containers fall into the ocean due to catastrophic weather events, there would be a severe negative global economic impact. It is impossible to quantify the financial loss, as some containers may be carrying luxury cars and some could be carrying produce.

Recommendations and Conclusion

There is an abundance of bottlenecks at the U.S. West Coast ports, limiting marine terminal capacity. Trans-Pacific container lines are increasing capacity to the West Coast, but the rising congestion threatens ocean capacity as Asia imports fail to diminish, keeping supply

chains strained. According to Sea-Intelligence Maritime Analysis, from mid-July 2022 to early October 2022, ocean carriers were scheduled to increase capacity from Asia to the West Coast by 21.6%. It is believed that the landside congestion at the ports of LA-LB is primarily a rail issue. There are insufficient railcar assets at the terminals resulting in an increase in rail dwell times to almost 14 days which is more than the already high average dwell time of 11 days reported by the Pacific Merchant Shipping Association. The optimal average rail container dwell time is three to four days to prevent long-dwelling containers (containers waiting at the dock for nine days or more) from compromising port operations. Union Pacific and Burlington Northern and Santa Fe railways meter their rail car capacity sent to the West Coast to not overload congested rail ramps in mid-west locations such as Chicago, Memphis, and Dallas. The country's supply chain is at significant risk if rail service does not improve. The consequence is that more containers will pile up at the terminals in LA-LB for a more extended amount of time. The marine terminals, shipping lines, and ports need to provide critical data to prioritize cargo evacuation at these ports.

International ocean carriers transport thousands of containers per month into U.S. ports. However, they pick up only a fraction of that number, which has created an untenable situation for terminals. There are a couple of issues facing LA-LB ports: demand and fluidity. Regarding supply demand, retail, wholesale, and manufacturing numbers remain persistent. The U.S. imports have seen peak season months between 2020 and 2022. The critical point is that demand has skyrocketed. March is typically a slow month for imports in the U.S.; however, 2021 to mid-2022 have been record years for global imports. Fluidity shows that cargo velocity on West Coast marine terminals will have improved in 2022. There has not been a lull in cargo volume that allowed the ports to catch up on the backlog. The number of vessels waiting at anchor off

the West Coast has decreased from 109 to 13 as of August 2022. The 13 ships waiting at anchor in the Pacific Ocean continues to create a backlog of containers in the terminals, warehouses remain jammed.

It is essential to understand that this is not due to the ports of LA-LB processing 96 ships. It is due to many vessels being rerouted to other U.S. ports, such as SeaPort Manatee. International ocean shippers carrying cargo have opted to redirect their cargo coming into the U.S. to different ports on the Gulf/East Coasts. Cargo is now being loaded onto Neo-Panamax vessels for the purpose of going through the Panama Canal. The reconfiguration of sea trade routes has been in practice for several months and is working, although it is not working for everyone at the right time or at the same time.

Further studies into oceanographic conditions are needed to consider the deepening of the main channel into SeaPort Manatee. They will reveal issues arising from storm surges, such as hurricanes, and the rise in sea level over the next few decades, which will impact vessels entering and exiting the port. Additional environmental and economic studies could be conducted on the movement of vessels and basic port operations, plus how the infrastructure will impact the environment, specifically seagrass beds and marine wildlife. Infrastructure to accommodate the increase in cargo vessels should reflect trends in the shipping industry and its potential role compared to competing ports and land access issues.

It is essential to explore what feasibility means in the context of this study. Its basic definition is the possibility, capability, or likelihood of something being done or accomplished. The study suggests that with its current port operations, infrastructure, and even its unique location near the Panama Canal, redirecting cargo vessels to SeaPort Manatee is not feasible to alleviate the congestion at the U.S. West Coast ports. The port must implement numerous

enhancements to expand its container business and increase TEU volume to affect the supply chain disruption at LA-LB ports. The feasibility study revealed specifics of what is needed for the seaport to be considered to improve container flow into the U.S. and decrease the logjam at Southern California ports.

The first is dredging the ship channel in Tampa Bay to 48 feet. The Army Corps of Engineers has been conducting an environmental impact feasibility study concerning deepening the entire ship channel into Tampa Bay to 48 feet. Currently, the controlling depth of the channel is only 40 feet meaning that vessels can only enter the port at high tide or not enter at all. The second is to expand the berth space at the port where the ships can physically anchor. Even with the northside expansion of SeaPort Manatee, it is not clear if it can accommodate a significant amount of TEU containers to offset the bottleneck at LA-LB. The port does not have any ship-to-shore gantry cranes. Instead, they use basic Gottwald mobile harbor cranes. In speaking with executive leaders at the port, they were adamant that they were not interested in investing in gantry cranes. Participants in the study outside SeaPort Manatee stated that the absence of gantry cranes would severely limit the port's ability to increase the amount of TEU containers coming into the port. If the port is serious about expanding its container business, it is recommended that they invest in Post-Panamax-sized container cranes.

By September 2021, the Port of Long Beach processed 9,384,368 TEU containers, the Port of Los Angeles processed 903,865 TEU containers, and SeaPort Manatee processed 135,660 TEU containers (Table 5). Manatee celebrated the record-breaking amount, an increase of 53 percent from the previous year. By September 2022, the Port of Long Beach processed 6,600,560 TEU containers, the Port of Los Angeles processed 805,314 TEU containers, and SeaPort

Manatee processed 177,108 TEU containers which was another record-breaking year for the small Gulf Coast port.

Table 5

Capacity Comparison: SeaPort Manatee and /Ports of LA/LB

Seaport	2021 TEU Volume	2022 TEU Volume
Port of Long Beach	9,384,368	6,600,560
Port of Los Angeles	903,865	805,314
SeaPort Manatee	135,660	177,108

Even though Manatee has experienced an upward trend in container processing, it may not be practical for cargo to be diverted to the seaport since five Gulf Coast ports are larger and have the equipment and infrastructure to handle the diversification of freight.

The neighboring seaport, Port Tampa Bay, is located 41 miles north of SeaPort Manatee and sits on 5,000 acres. It has 66 berths, five gantry cranes, which include two Post-Panamax gantry cranes that augment three rail-mounted gantry cranes, and a 100-ton mobile harbor crane and plans for future expansion, enabling the Port to handle vessels up to 9,000 TEU capacity. Together with terminal operator partner Ports America, Port Tampa Bay has plans to quadruple the size of its capacity from 40 acres to 160 acres and expand its berth length from 3,000 feet to 4,000 feet. Their Big Bend channel expansion project was completed in 2019, one year earlier than expected. It connects the strategic intermodal system to other portions of the supply chain network inside and outside Florida.

Though the study was limited due to the challenges in recruiting participants in the maritime industry, it revealed several key areas where ongoing research would be beneficial. For example, what would the financial versus operational impact be if the port invested in a ship-to-shore gantry crane? How will land expansion at the port affect its ability to handle the increasing number of TEU containers? What are the oceanic and environmental implications of dredging the main channel into Tampa Bay?

Summary

The study gave evidence that it is not feasible to implement SeaPort Manatee as an option for ocean shippers to divert cargo to its port in 2022 and possibly 2023. By not using gantry cranes, the impact will not be sufficient since other Gulf Coast ports have the infrastructure to handle the increase in containerized cargo coming from Southern California. It also exposed the potential danger for vessels entering and exiting the port if ocean conditions are not favorable and the need for deepening the channel.

The insight provided by this study hopes to engage in the national conversation on possibly implementing SeaPort Manatee as an option to ease the strain at Southern California ports. However, investments are needed to enhance its infrastructure by installing gantry cranes and deepening the main channel allow for an increase in the container business. Larger vessels mean deeper drafts, which will increase throughput at U.S. ports. However, there are safety concerns, and deepening and widening the channel would allow more commodities to move safely through the channel. As competition within the cargo container industry grows each year and with the expansion of vessel size, the port will not be able to serve its customers the way other Gulf Coast ports can.

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APPENDIX A

Participant Informed Consent

Hello. My name is Diane MacLennan. I am a doctoral candidate in the Global Leadership and Change doctoral program at Pepperdine University's Graduate School of Education and Psychology. As part of fulfilling my degree requirements, I am conducting a feasibility study on the reconfiguration of U.S. Sea trade routes as it pertains to implementing SeaPort Manatee as a way to alleviate supply chain turbulence.

I came across your name through SeaPort Manatee's Communications Portal. You, (name) have been carefully selected to participate in my study. Participation in the study is voluntary, confidential, and involves no risk to you. Anonymity will be maintained to your satisfaction.

Participation entails a no longer than 60 minutes interview or the option to complete a 5-question online questionnaire. The questions and an informed consent form will be sent to you in advance. Your participation in this study will be extremely valuable.

I would like to ask if you are willing to be a part of this study.

Thank you,

Di MacLennan, M.S., Ph.D. Candidate

Global Leadership and Change

Pepperdine University

APPENDIX B

Electronic Informed Consent Form

PEPPERDINE UNIVERSITY

Graduate School of Education and Psychology

WEB, EMAIL, AND/OR COVER LETTER BASED INFORMED CONSENT

EXPLORATION AND IMPLEMENATION OF PORT MANATEE TO RELIEVE THE SUPPLY CHAIN DISRUPTION AT CALIFORNIA PORTS

You are invited to participate in a research study conducted by Diane Wells MacLennan, PhD Candidate, for her doctoral dissertation at Pepperdine University. You have been carefully selected because of your exemplary practices and contributions to your field. Your participation is voluntary. You should read the information below and ask questions about anything that you do not understand, before deciding whether to participate. Please take as much time as you need to read the consent form. You may also decide to discuss participation with your family or friends. If you decide to participate, you will be asked to sign this form. You will also be given a copy of this form for you records.

PURPOSE OF THE STUDY

The purpose of the study is to study your leadership characteristics, beliefs and practices as well as your views regarding reconfiguring sea trade routes between the ports of Los Angeles and Long Beach to Port Manatee in Florida.

APPENDIX C

IRB Notice of Approval

Pepperdine University
24255 Pacific Coast Highway
Malibu, CA 90263
TEL: 310-506-4000

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Date: May 26, 2022

Protocol Investigator Name: Diane Wells Maclennan

Protocol #: 22-05-1842

Project Title: EXPLORATION AND IMPLEMENATION OF PORT MANATEE TO RELIEVE THE SUPPLY CHAIN DISRUPTION AT CALIFORNIA PORTS

School: Graduate School of Education and Psychology

Dear Diane Wells Maclennan:

Thank you for submitting your application for exempt review to Pepperdine University's Institutional Review Board (IRB). We appreciate the work you have done on your proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations 45 CFR 46.101 that govern the protections of human subjects.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an amendment to the IRB. Since your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite the best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the IRB as soon as possible. We will ask for a complete written explanation of the event and your written response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the IRB and documenting the adverse event can be found in the *Pepperdine University Protection of Human Participants in*

Research: Policies and Procedures Manual at community.pepperdine.edu/irb.
Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval. Should you have additional questions or require clarification of the contents of this letter, please contact the IRB Office. On behalf of the IRB, I wish you success in this scholarly pursuit.

Sincerely,

Judy Ho, Ph.D., IRB Chair

cc: Mrs. Katy Carr, Assistant Provost for Research