Logistics and Smart Technology National Scan

We continue to see new developments of profound technological enhancements nationwide that are contributing to how businesses operate. The LIVE Zone will serve as the epicenter of Voltage Valley and a model of an entrepreneurial environment that supports a sustainable and resilient economy. Eastgate has identified the initiation of the LIVE Zone as an opportunity to use Ohio's existing infrastructure as a building block for economic recovery. Lordstown's location at the intersection of multiple modes of transportation, broadband, and electrification positions the area as the premier regional warehousing and distribution hub.

What is a Logistics Hub?

Logistics management is a practice that has been around since the 1800s, deriving from the military functions of the army. Fast forward to the modern day, the coordination of complex operations, including our transportation system and the transport of people and goods, is still a critical part of our economy. *Logistics Hub* refers to large-scale structures through which different service providers collaborate to increase the efficiency of involved transportation systems. Since transportation systems directly affect the flow of goods and services, strategic positioning can provide the best connections, allowing for the best use of the transportation infrastructure available. Four common characteristics exist concerning global logistics hubs:

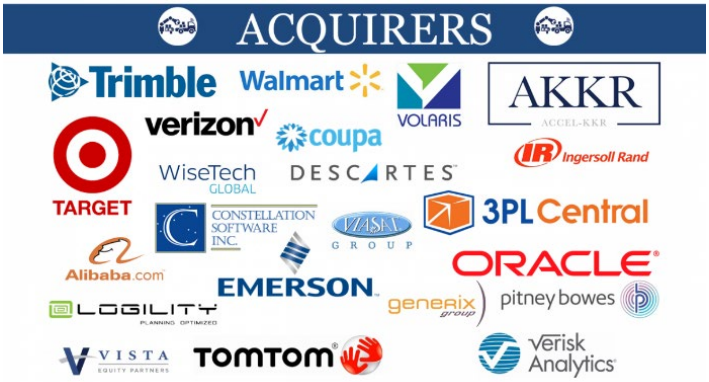
1. They offer several options for transportation forms, such as air/ocean freight, significant highway interchanges, and intermodal facilities.
2. They offer plenty of facilities to process, store, and distribute products.
3. They have access to international locations that operate with global logistics hubs.
4. Local economies and political environments are low-risk for exchange in the international trade of goods and services.

Global trade has significantly increased over the last 50 years. More recently, the COVID-19 pandemic ignited a record trade value of goods and services due to recovery from subsiding pandemic restrictions, economic stimulus packages, and increases in commodity prices. As global trade rises over time, we have seen an increase in the discussion and significance of logistics hubs in virtually every country worldwide. Some of the most influential logistics hubs largely support and contribute to today's global supply chain movement. These significant hubs include Hong Kong, Vancouver, Tokyo, London, Chicago, and Los Angeles.

What are Smart Logistics?

Incorporating smart logistics into our transportation hubs and distribution processes is a technology-driven logistics management approach. This concept implements smart devices and data accumulation to facilitate the automation of logistics operations. Data analysis provides logistics managers with comprehensive information on what is happening in the warehouse and beyond before making decisions. As technology continues to emerge parallel to the increase in the global distribution of goods and services, an opportunity arises to find solutions for issues that occur during goods and service distribution. Smart logistics solutions improve transport and warehousing and connect various logistic networks.

Smart Logistics Today



Consumers and business owners alike believe that delivery is critical. Therefore, logistics play a very important role in competitive advantage in the highly cluttered e-commerce and retail industry. That said, the host of new business acquisitions that have occurred in recent years is no surprise. These include Walmart's purchase of Parcel, Target's acquisition of Grand Junction and Shipt, and Verizon Fleetmatics' acquisition of TrackEasy, to name a few (Corum Group, 2018).

The surplus of acquisitions occurring within the logistics industry is proof of the paradigm shift that forces companies to think differently about the future of the most effective product distribution. The vision presented by Mahoning Valley is similar to futuristic planning and centrally focuses on bringing smart technology and emerging transportation to a significantly located hub.

Global Examples of Incorporating Smart Logistics

Port of Shanghai

One of China's largest commerce companies, Alibaba Group, works with local governments to improve logistics. Cainiao, its logistics arm, is partnering with the government of Hainan, a city in southern China, to help establish it as "a trade center and pilot model for the digital economy" (AirCargo News, 2021). This example isn't the beginning of China's trending focus on mastering the art of logistical management. The Port of Shanghai, which owns the title of the world's largest container port, has massive-scale automation at the Yangshan Port. The Shanghai International Port Group (SIPG), the public terminal operator of the city, opened an automated cargo wharf in 2018, which has led to a vastly increased port capacity and docking space, as well as decreasing energy consumption and emissions. SIPG also created a set of 12 standards

for Chinese port automation in the future, as the country aims to scale up its smart logistics operations (Enterprise Iot Insights, 2019). In addition to China, ports in Singapore, Rotterdam, and Hamburg are also taking advantage of what smart technology can do for productivity, redefining how cargo and services move through shipping stations.

Port Optimizers

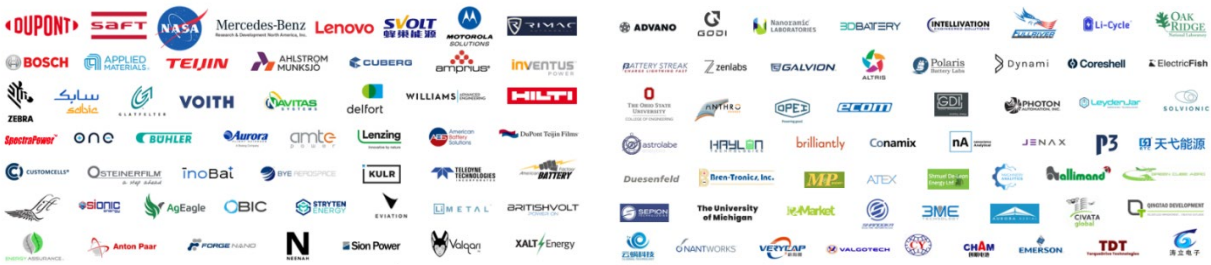
In the U.S., Los Angeles houses one of the largest ports in the country. Although not quite tech-savvy as its international counterparts, port authorities are making strides to enhance port logistics daily. In 2017, the port launched a shared data portal called "Port Optimizer" with GE's transportation arm. The portal "…give[s] cargo owners, shipping lines, terminal operators, and every other wharf-side player a way to manage and plan their interactions with the port. They get a two-week planning window, to book in, and organize inbound and outbound supply chain around their cargo" (Enterprise Iot Insights, 2019). The Netherlands uses a similar concept, called Portbase, within Dutch ports. As of January 2022, the Los Angeles program includes all container terminals and shipping lines. Many examples of smart technologies and collaborative platforms, like Port Optimizer and Portbase, are being applied as intermodal logistics optimization solutions. Huijsman, CEO of another intermodal logistics company called Cofano, presented some of his company's smart logistics optimization solutions. Cofano "…resembles map navigation and enables the planning of routes for barge or inland shipping. Data includes all bridges, locks, and storing water depths in the platform. By simply entering the origin and destination on the dashboard, the system automatically calculates all the alternative routes based on the service data provided by different suppliers and displays detailed data for each sector, including sailing time, distance, cost,

3D Visualization

carbon footprint, etc." (RailFreight.com). With rapidly developing smart technologies and platforms, cooperated with knowledgeable logistic practitioners, intermodal transport is growing in a smarter direction. Similar to Los Angeles, the state of Iowa is also incorporating ways to take advantage of existing US infrastructure. The Iowa Economic Development Authority—a part of the state government with a governor-appointed board—is advertising the state for new investment. Iowa leadership noted that they would make a fantastic transportation hub because of existing infrastructure and networks and are working toward meeting their goal of supporting "multi-modal logistics efficiently and cost-effectively" (CFO Dive, 2022).

Battery Electric Technology Epicenter – Greenville, SC

Major manufacturers alongside new, strategic partnerships, have recently chosen Greenville, South Carolina as their dwelling, supporting the Greenville County Council and Greenville City Council's stance that Greenville is the prime, "pilot site for the research, development, testing, and deployment of multi-modal, intelligent automated transportation systems and management technologies" (Carolinas Alliance for Innovation, 2022). The Carolinas Alliance for Innovation is a non-profit public benefit corporation whose mission is to promote innovative solutions in transportation, infrastructure, engineering, and education for the purpose of economic development. The leading partner to the Carolinas Alliance is Clemson University's International Center for Automotive Research (CU-ICAR), who through their partnership with Soteria's Consortium have made Greenville the epicenter of battery electric technology in the



Members of Soteria's Consortium (Sorteria)

USA.

The Carolinas Alliance has launched a phased plan for autonomous vehicle deployment in Greenville. The deployment also includes other focuses including but not limited to digital infrastructure, the autonomous vehicle business model, and electric vehicles and charging stations.

In parallel, Proterra is adding their EV battery Factory in Greenville, as the demand for commercial electric grows across the US and around the world. The factory is expected to create more than 200

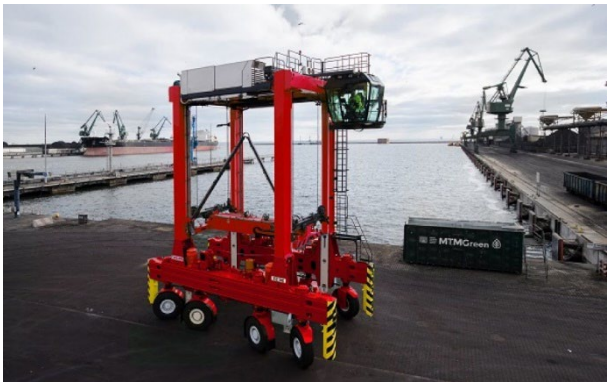
Plans for EV battery system manufacturing plant in South Carolina

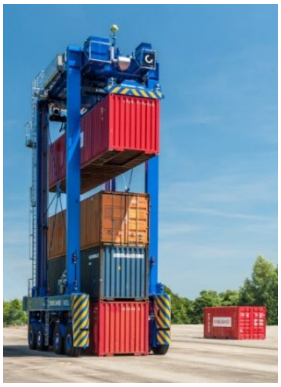
new jobs at the 327,000 square foot plant, with the goal of additional battery system capacity, as well as the production of ancillary systems incorporated into electric medium-and heavy-duty electric vehicles and equipment by 2025 (Proterra, 2021). South Carolina Governor Henry McMcaster claims that the “announcement by Proterra is further proof that South Carolina is leading the charge in the electric vehicle revolution,” commending the company for, “the work they’re doing to create a more sustainable future for the transportation industry.” (Proterra, 2021) Proterra’s announcement follows BMW’s pledge, only weeks earlier, to award an electric vehicle model to its Spartanburg plant in South Carolina, “…underscoring the growing U.S. demand for zero-emission cars” (Fortune, 2021).

Autonomous Electric Yard Trucks

In 2018, Boston company ISEE put their autonomous AI to work in the logistics space and has since logged over 5,000 hours of driving in addition to delivering their first customer load. Just a few years later, in June of 2021, ISEE announced the launch of its groundbreaking AI-powered autonomous driving system to enhance performance and safety in transportation and logistics hubs (Business Wire, 2021). ISEE also announced a joint project with Lazer Spot, the largest yard operator of distribution centers in North America. The two companies will collaborate to deploy ISEE's autonomous driving technology to increase driver health and safety and improve transportation efficiency across Lazer Spot's 400 international warehouse locations, where they operate more than 1,300 trucks for the world's top Fortune 500 and CPG brands. "The logistics industry needs to add supply chain resiliency and predictability. Compounded by the pandemic, there is urgency in our industry to find solutions that help enhance our warehouse employees' safety and wellness," said Adam Newsome, CEO of Lazer Spot. "By launching our pilot program with ISEE, we expect to gain the knowledge necessary to dramatically improve our throughput, avoid on-the-job accidents, and free up our skilled workforce to provide the management and oversight needed to increase the effectiveness of our operations and maximize output" (Business Wire, 2021).

Automated Straddle Carriers





This past February in Missouri, two automated straddle carriers were deployed as part of an automation pilot project at BNSF's Logistics Park Kansas City (LPKS) Intermodal Facility. The straddle carriers can transfer containers between over-the-road (OTR) trucks and a grounded yard storage grid that includes designated transfer slots for rail loading. Although this pilot currently occupies a fraction of the available

terminal length at LPKS (400 feet of a total of 8,000 feet), it represents a major milestone as the first US inland rail site to implement automated straddle carrier technology (Railway Age, 2021).

What are the Leading-Edge Concepts and Technologies?

Technology	
Automated Packaging	Autonomous Yard Technology *Trucks, Loaders, Containers and Lifts, Automated Straddle Carriers*
Machine Vision Inspection and Maintenance	
automated gates with container/chassis/truck/driver identification	
Rotterdam Additive Manufacturing LAB (RAMLAB) *On site at the shipyard 3D printing facility enabling a wider availability of certified shipping parts.*	Unmanned Wide-Span Rail-Mounted Gantry Crane *Eliminates the needs for manned drayage*
Automated Railcar Spotting	Automated Train Consist/Manifest Identification

Digital Innovations	
Cloud Based Distribution Systems	Smart Ports
Logistics and Supply Chain Management System	Terminal Operating System (TOS) *Custom system specific to the port rather than off the shelf technology. (Port of Shanghai)*
Smart Supply Chain Zones	Next Gen Vessel Traffic Management System
Web Based Scheduler System for Bunker Tankers	Maritime Data Hub *One-stop data repository with a centralized application interface gateway and data management capabilities (Singapore).*
Port Optimizer *Linking supply chain through ports.*	

Conceptual Innovation	
Operational Detail Improvements *Creating seamless logistics chain*	University Partnerships/ Research Initiatives *Cyber-Physical Security Research and Educational pathways focused on Intelligent Port Operations*
Public Private Partnerships	Pilot Projects of New Technology *Both in process and digital innovations*
Process Automation *Elimination of human-dependent processes and workflows. Both equipment and process automation can eliminate labor-intensive tasks and demonstrate significant cost savings.*	

Nationwide, the opportunities to accomplish autonomy within logistical operations multiply each day. Over time, we have seen on-site machinery and equipment become critical to seamless operations and worth the investment of entities wanting to achieve the most effective processes. With this comes important signification that the “yard” is a critical buffering space between the facility and the smart zone. Recent digital innovation growth, such as cloud-based distribution software and smart supply systems have recreated the ability to master logistics, multiplying the possibility of system or distribution management while minimizing user error. Therefore, when

the equipment and vehicle inventory within the truck yard is combined with the smart zone infrastructure, coordinated missions can be structured with EV and AV assets. Many in-yard tasked are currently constrained by labor, but with an EV and AV future it would be autonomously coordinated and optimized.

While the equipment and vehicles are taking action on-site, the future of the precise programming of software systems becomes more critical than ever. While off the shelf technology and systems have opened the door for major increase in logistical process success, the new and improved growth in this area is notably customized to the location itself, rather than the broad tailoring seen with off the shelf software systems. Technology creators and pilot systems, whether initiated as a private startup company or publicly as a university or intergovernmental partnership, are finding their significance in customization i.e., finding the logistical scenario or hub with room for growth, that their system can expand upon autonomously. With this, no two logistics hub or distribution port will be the same, creating a significant opportunity to become exclusively effective while practicing complete process automation.

New and noteworthy on-site technology including automated railcar spotting, on-site 3D printing for quick on-site maintenance parts, and autonomous yard vehicles, are continuing to be developed and mastered each day. The future of logistics and the most abundant distribution centers will accomplish surreal productivity by incorporating both the on-site smart equipment and the seamless digital capabilities, working together to create a seamless distribution system.