



DRIVING DIGITALIZATION WITH MACHINE LEARNING

EXPANDING ACROSS THE OCEAN SUPPLY CHAIN

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Since the creation of the first maritime container port in 1956, the container shipping industry has primarily grown through scaling operations in which we've transported more than we did in the past at a faster rate. The industry is seen as slow to embrace new technologies, but could now be on the precipice of some big advancements.

We appear to be ready to implement digital technologies and tools to support the aggressive business plans that terminal operators are planning. The need to increase efficiencies, reduce costs and drive revenue throughout the entire ecosystem is driving the adoption of these new tools and technologies - all of which involve the data that resides inside this vast ecosystem.

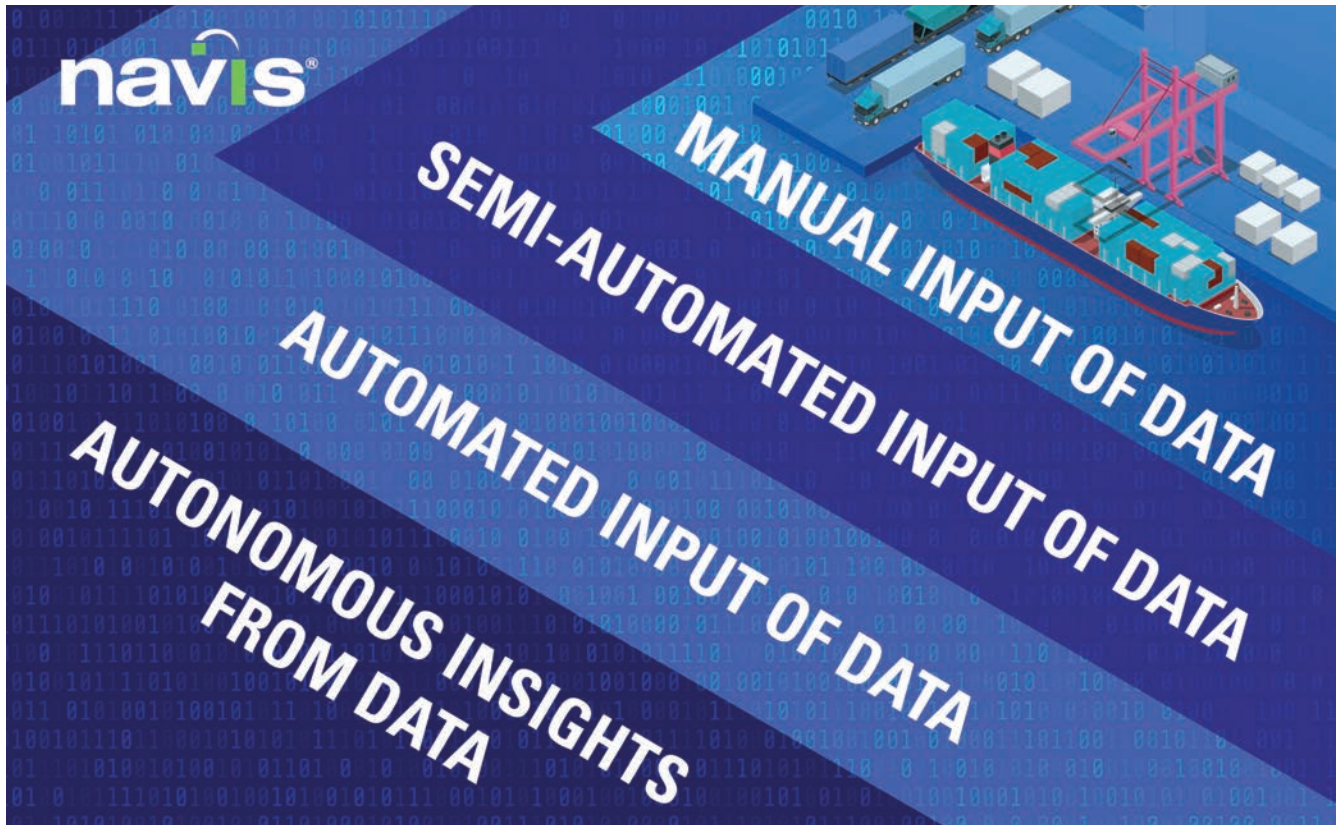
Data and information circulating around these terminals can be categorized into 4 distinct segments. Each of these segments

represents a step along the path to achieving sustainable growth and efficiencies across your terminal(s). These segments are:

1. **Manual Input of Data**
Manual input of data simply means that the data and information being circulated within your terminal is being collected and analyzed manually. There is a significant amount of paper involved, and your staff is constantly updating and moving this paper to ensure your operations run smoothly. These terminals also tend to have complex processes in place which require training and mastering to ensure smooth operation of the terminal. Overheads of this kind can become expensive to maintain and retain.
2. **Semi-Automated Input of Data**
Semi-automated input of data means that your terminal has made some effort

to start migrating some of the paper they use on a day-to-day basis over to using computers to input and share data. The staff you have on hand is leveraging information technology to enter the data and share it across the terminal electronically with the appropriate folks to analyze and make decisions. This is an inflection point for your terminal because you now have the ability to reliably store, process and reference the data you have collected and circulated to your benefit.

3. **Automated Input of Data**
The third segment is the "automated input of data" where all of your terminal operations are performed electronically with the help of technology such as IOT and other mechanisms that capture and store data on their own. There is absolutely no paper involved and far



more data is being collected, processed and stored than ever before, giving rise to the adoption of digital infrastructure that we all refer to today as the cloud. The cloud enables one to seamlessly scale the infrastructure with the demand without having to worry about the costs associated with maintaining an on premise infrastructure.

4. Automated Insights from Data The fourth segment is “autonomous insights from data”. Now that data is being collected and processed automatically it’s important to start structuring and prepping the data to train a machine learning model. The more you train this model the better it gets at not only providing foresight beyond the terminal but also enabling autonomous decision making to take place within the terminal.

SUSTAINABLE GROWTH

Figure 1 depicts how better foresight can be achieved as terminals move from one segment to another, getting better at capturing data and leveraging technology to process that data. Eventually getting to a point where autonomous insights help bring the most foresight setting terminals up to scale and be productive well into the future. Though there are many examples that illustrate how sustainable growth and increasing efficiencies can be achieved, we will begin by exploring the ones listed below. These touch key aspects of the current maritime ecosystem and can bring significant foresight to the industry leading to sustainable growth:

1. Container Predictability
2. Predictive Maintenance
3. Vessel Path Prediction

Containers are the forefront of modern-day shipping, but are simply just a steel box that holds merchandise as it moves from one place to another. There are currently over 20 million shipping containers in the world, and five or six million of them are currently shipping around the world on vessels, trucks, and trains. In total, they make around 200 million trips a year.¹

CONTAINER PREDICTABILITY

The only way to track them is to physically read the identifier text on their door. OCR scanners have been utilized to do this a bit more efficiently, but still lack full visibility since the location is only known once it’s been registered by this scanner. This puts an unnecessary constraint when it comes to optimizing the container path, for example. Not being able to know the exact location of the container at all times, or what terminals it is near, eliminates the potential to fully optimize its route on its way to its final destination.

Another aspect of container predictability is when the container will be available to use. Correlating this with where the container currently is and what type of merchandise needs to be transported inside that container brings a sense of foresight that allows terminals to be far more productive than before. Once this data starts to flow and is captured in a consistent manner, machine learning can be applied to make decisions using container predictability more autonomous.

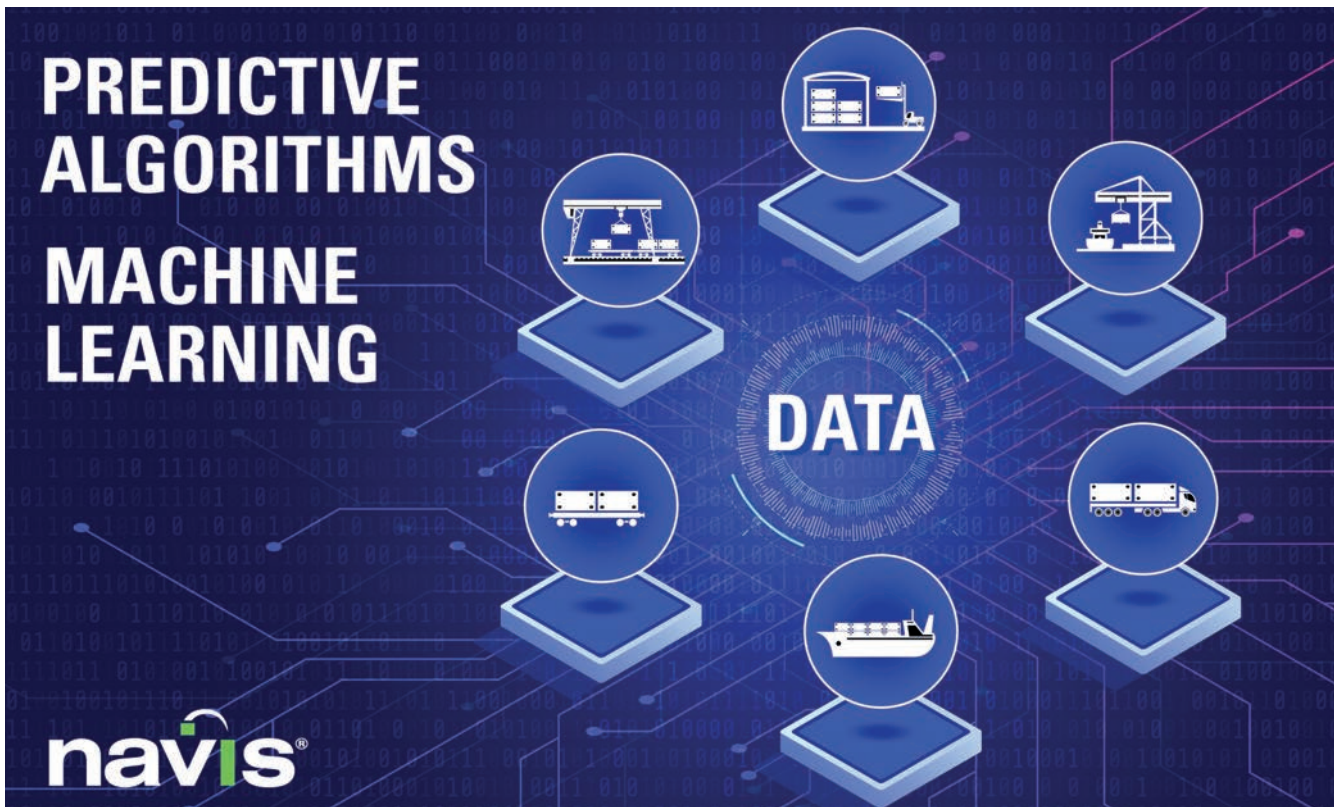
PREDICTIVE MAINTENANCE

Maintenance is another crucial aspect of terminal and vessel operations. Without adequate maintenance things begin to deteriorate, impacting terminal operations, productivity and revenue. There are many processes and procedures in place at terminals to ensure adequate maintenance takes place the required times, but this heavily relies on a schedule as opposed to insights related to the operation of the equipment that is actually being maintained. Collecting data on terminal and vessel equipment usage allows us to determine what equipment is best for the operation required.

For example, it may be slightly inefficient to utilize smaller equipment for a particular job, but it makes more sense if the larger equipment has not been adequately maintained. This foresight could save a tremendous amount of downtime and prevent productivity loss. Capturing data around maintenance and correlating it directly with the usage of the equipment in real-time allows the foresight to make the best decisions for your terminal operations. Machine learning can be applied once this type of data is being collected on a consistent basis to help make autonomous decisions on maintenance related activities both within the terminal as well as the vessel.

VESSEL PATH PREDICTION

Vessel path prediction is another aspect of the ocean supply chain that allows for a significant amount of efficiency to be built in. Today, the path a vessel takes is determined



1 – <https://www.billiebox.co.uk/facts-about-shipping-containers/>

2 – <https://www.statista.com/statistics/264024/number-of-merchant-ships-worldwide-by-type/>

beforehand and does not usually change along the way. This means that if there are obstacles ahead and the communication to the vessel is not advanced enough, the vessel will not have enough time to react leading to inefficiencies down the entire supply chain.

Fuel optimization is another aspect of vessel path prediction that is critical. The ability to tweak the path based on near real-time data can create a significant number of micro optimizations which lead to cost savings and productivity gains. There are many solutions within the industry that optimize vessel paths and are just starting to embark on the potential at hand. Capturing data that could potentially impact the vessel path and making it available near real time opens the door to optimizations that were not possible before.

There are around 53,000 vessels in circulation today.² The amount of data generated if captured accurately will be sufficient to train machine learning models and make autonomous decisions when it comes to vessel paths. As the predictability of the vessel path becomes more robust so does the efficiency of the vessel and everything it interacts with including the terminals it touches.

CONCLUSION

The opportunities for container terminals to increase efficiencies, reduce costs and grow revenue in a sustainable manner

are now a reality – regardless of where each terminal is on its automation journey. Utilizing the vast amounts of data available, along with new machine learning technologies and tools is the key to achieving these promised advancements. Everything starts and ends with accurate and actionable data.

The machine learning examples described above are just a few of the real

world opportunities soon to be available to interconnected terminal operators today. Each segment of the connected ecosystem provides compounding benefits for all involved. Terminal operators that are realizing the promise of automation as well as other tools like machine learning applications will be well equipped to handle the projected demand of the future - in a more profitable and sustainable way.

ABOUT THE AUTHORS

Ray- Director of Portfolio Product Marketing - Ray is focused on driving the Navis portfolio marketing strategy as Navis expands their businesses across the connected ecosystem of the ocean supply chain. He brings over 20 years of success in driving awareness and demand for enterprise software solutions across multiple domains including IoT software platforms, mobile app technologies, cybersecurity, data analytics, wireless networks as well as supply chain & logistics solutions.

Muneeb- Director of Product Management - As product leader at Navis, Muneeb Khadeer is focused on building products and solutions that make people’s lives less stressful, more informative, productive and prosperous. He brings over 10 years of experience working with customers

worldwide to build products and solutions for power plants, ships, offshore rigs, connectivity and cybersecurity.

ABOUT THE ORGANIZATION

Navis understands that as operational processes become more complex, efficiency, collaboration and productivity are essential. As a trusted technology partner, Navis offers the tools and personnel necessary to meet the requirements of a new, and ever-evolving, global supply chain. The Navis N4 terminal operating system is a platform that can integrate partner technologies, enabling terminals to optimise productivity and enhance the service delivered to its customers.

ENQUIRIES

<http://navis.com/>