An ocean of data:

The digital revolution
and its ongoing impact on maritime industries.

CONTENTS

AN OCEAN OF DATA

The ever-growing mass of data represents a revolution for all industries, including the maritime transportation industry.

Everyday, businesses are recording and storing more and more data from more and more sources. Competition in the modern world is largely about information: Who has the best information? How quickly can they get that information? Most importantly, do they have the skills and experience to use the available data to provide value to their customers?

In the maritime transportation industry, the digital revolution has already created massive changes. Some recent examples of how technology and big data are changing the face of the maritime industry:

- The global transport company Maersk partnered with Microsoft, moving five regional datacenters to Microsoft Azure to improve performance and reduce operational risk.
- Amazon, a company known for disrupting industries, recently began coordinating its own ocean freight.
- Easier satellite-launch abilities allow companies to send maritime operators a wealth of immediate data about the state of their and others' fleets.

To stay competitive, it's necessary for maritime companies to be adept at using the currently available technology and data, while also looking toward the horizon for new, potentially game-changing technologies and applications.

This whitepaper will look at some of the ways these technologies provide value to shipping management, freight brokers, and other maritime-related services. The focus will be primarily on advances in AIS data collection and analysis, and the associated benefits. There will also be some discussion about improvements in satellite-based weather prediction.

Sections include:

- **The power of data:** Where is all this data coming from? Why is it important?
- **Fleet management, broking, chartering:** How new technology provides insight into the technical aspects of managing ships and planning routes, improving efficiencies, planning for weather, and preparing for regulatory change.
- **Market knowledge:** See how new data sources allow for improved understanding of the overall maritime industry, or of a specific market segment or region.

This paper was authored by Robert Nolker Ph.D, data scientist and principal at Dynamic Data Insight LLC. It is brought to you by Spire, a satellite-powered data company with offices in the US, Europe, and Asia. Spire provides services, including APIs, for global ship tracking, aircraft awareness, and high-frequency weather analysis.

Executives expect a rise in big data's importance, but are likely to report inadequate investment in it.

59%

of CIO's and CTO's agree:

"Analytics and data science is the most pressing digital talent need for the next 12 months"

■ ■ ■

PERCENTAGE OF DIGITAL BUDGET SPENT ON BIG DATA & ANALYTICS

Today — 12%

In 3 Years — 24%

Source: McKinsey Global Survey

THE POWER OF DATA

There is an ocean of maritime data, and it is growing every day. Satellite launches are growing in frequency as the price to launch goes down. AIS data is being collected at more and more locations, and at greater frequencies. Satellites are collecting new types of weather data, allowing for improved forecasting.

But the wealth of data is only part of the story. You might have a huge amount of data, but it provides no value at all if you don't know what to do with it. Fortunately, software advances have improved how you can parse and analyze data and use it to reach actionable conclusions.

More than 10 million satellite collected ship messages are ingested and processed each day at Spire
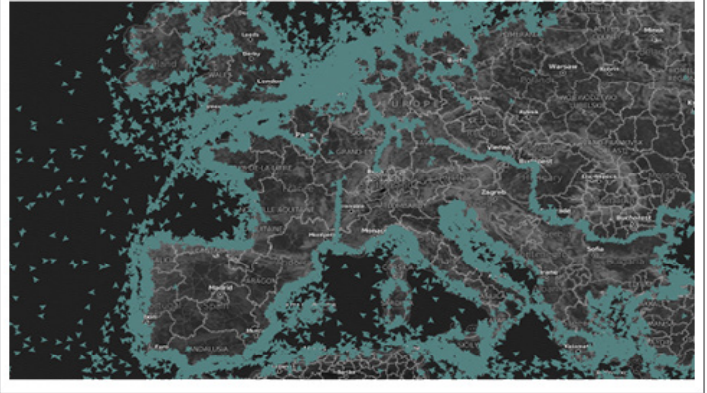
Source: Spire Global, Inc.

Digital strategy was top of mind in the 2017 Futurenautics Maritime survey

Are digital initiatives are of the most, or highest importance to the success of your organisation?

85%	**YES**	**73%**
ship operators, suppliers and industry stakeholders		ship operators alone

HOW DID RESPONDENTS CHARACTERIZE THEIR ORGANISATION'S DIGITAL STRATEGY?

DIGITAL TRANSFORMATION OR DIGITAL REIMAGINATION	75%

Source: 2017 Futurenautics Maritime survey

Easy-to-use and powerful APIs

In the past, transport and shipbroking companies have often been forced to use expensive off-the-shelf solutions, which are seldom a perfect fit for a company's challenges. Or, alternatively, they've been forced to create their own in-house data analysis solutions, which would usually require resource-intensive development and maintenance.

Now, some maritime data service providers offer easy-to-use APIs, which allow companies to quickly create flexible, customized data sets and solutions that match their specific needs.

Smarter software programs

New software can learn to recognize patterns, adjust to shifts in data, and make predictions about ship operation and location. In the past, companies that analyzed data were required to do a lot of work to filter out meaningless data noise, adjust data for seasonal fluctuations, and do other manual calculations. But smarter software solutions will mean a lot of that work is eliminated, leaving companies more time to focus on their strengths.

Learn how a maritime services company is using machine learning to predict and troubleshoot ship maintenance issues for its customers

Cleaner data

Raw AIS data has many errors and redundancies, and this has hindered out-of-the-box use of the data for some applications. Data parsing improvements allow for cleaner data, so that you can confidently use it immediately.

FLEET MANAGEMENT, SHIPBROKING, CHARTERING

In the modern world of maritime transport, companies often play multiple roles, from the owning and management of ships, to shipbroking, to chartering, to market analysis. The interplay of these various pursuits is complex, and today there is already a wealth of data to analyze. As time goes on, more data will be combined in unforeseen ways to reach new insights. The companies that survive and prosper will be those that actively prepare for change; those that can quickly understand both the current and near-future state of the market.

Now let's look at some of the areas where fast, reliable data analysis is already providing value for the maritime transport industry:

Improved ship tracking

A growing number of AIS-reporting satellites means that it's increasingly easy to track fleets. You can check locations, headings, speed, draft, and more. APIs will allow you to filter down to specific views you want to see: for example, all of your ships, or all of the ships that stopped in a specific Shanghai port within the last two days. Predictive software will continue to improve at providing educated guesses, based on travel patterns and weather data, of where ships will be in the next few days or even weeks.

Learn about how Odyn, a logistics analysis provider, uses Spire ship location APIs to improve their analytic abilities.

Route and speed optimization

With an extended history of the AIS data for your fleet and other fleets, you can analyze routes and make long-term strategic changes or last-minute adjustments. You can also analyze decisions made by your crew members. For example, knowing how a ship's speed changed along a route can give you insight into navigation decisions, and this can lead to ongoing analysis and improvement.

Port wait time analysis

There are many creative ways to use in-depth AIS data. One example of a new application of this data is analyzing specific port waiting times in order to optimize trip scheduling. Examples of port measurements that can be made: wait time outside a port, wait time inside port barrier, and wait time at a specific pier. This data can also be used to generate better in-port routing plans for when ships visit multiple piers to unload.

Fuel usage analysis

Minimizing fuel costs is a fundamental goal for all transportation companies. Even small changes to speed and distance can lead to big swings in fuel costs over the long term.

Detailed route and speed data can help you create operating procedures aimed at minimizing fuel use.

Regulatory adherence and preparation

Improved fleet tracking means easier preparation for regulatory changeovers. Having a history of your fleet activity lets you run models of how hardware replacements and downtime will affect revenue, and give you options for choosing the best strategy. Flexible APIs will let you easily keep track of upgraded inventory and status of ships.

Environmental impact and emissions analysis

It's also possible to make approximate calculations about chemical emissions for your ships. Knowing the type of ship, its weight, its speed, and its standard emissions profile, you can make approximations about fuel usage and expected emissions. This could be valuable for showing improvement in emissions issues over time, or as proof of environmentally-conscious practices. (For an example of how this might be done in practice, see this 2015 study on using AIS to determine emissions.) This kind of data could also be used to do an analysis of how emissions-improvement proposals impacted costs and ROI.

The 2020 Sulfur Cap

The International Maritime Organization (IMO) has given 2020 as the deadline for switching to low-sulfur fuel oil. Fleet managers will have to make decisions on whether it's best to switch to the more expensive (and potentially harder to source) low-sulfur oil, or continue using the same fuel while investing in remediating technology, like exhaust scrubbers. Having historic AIS data about fleet activity would help you run models about which option would be best financially and operationally.

Weather prediction

The farther out you know the weather, the more successful your business will be. Weather forecasts are improving due to more satellites and more sources of data. One of those new data sources is GPS radio occultation (GPS-RO), which measures atmospheric radio waves to get insight about the state of the weather. (To learn more, read this Scientific American blog post explaining how GPS-RO works.) This technology has already demonstrated it can surpass traditional weather data's impact on forecast accuracy, and will continue to improve.
Companies like Spire incorporate this new and improved weather data into their APIs and services. For example, Spire's ship-location-predicting algorithms use the weather data in their calculations.

Competitor analysis

It can be valuable to study skilled competitors for insights about their practices. You might use APIs to create filters for the fleets of specific companies to see their routes and broader strategies. This is especially important for smaller companies who want to understand the strategies of larger, better-resourced companies.

Security and safety

For known high security risk hotspots, APIs can analyze traffic patterns and identify anomalies in motion patterns that could potentially indicate danger. Additionally, shifts in historical sea lanes can provide insight that potentially impacts security, safety and operational efficiencies.

MARKET RESEARCH AND ANALYSIS

Showing only oil tankers in the Persian Gulf
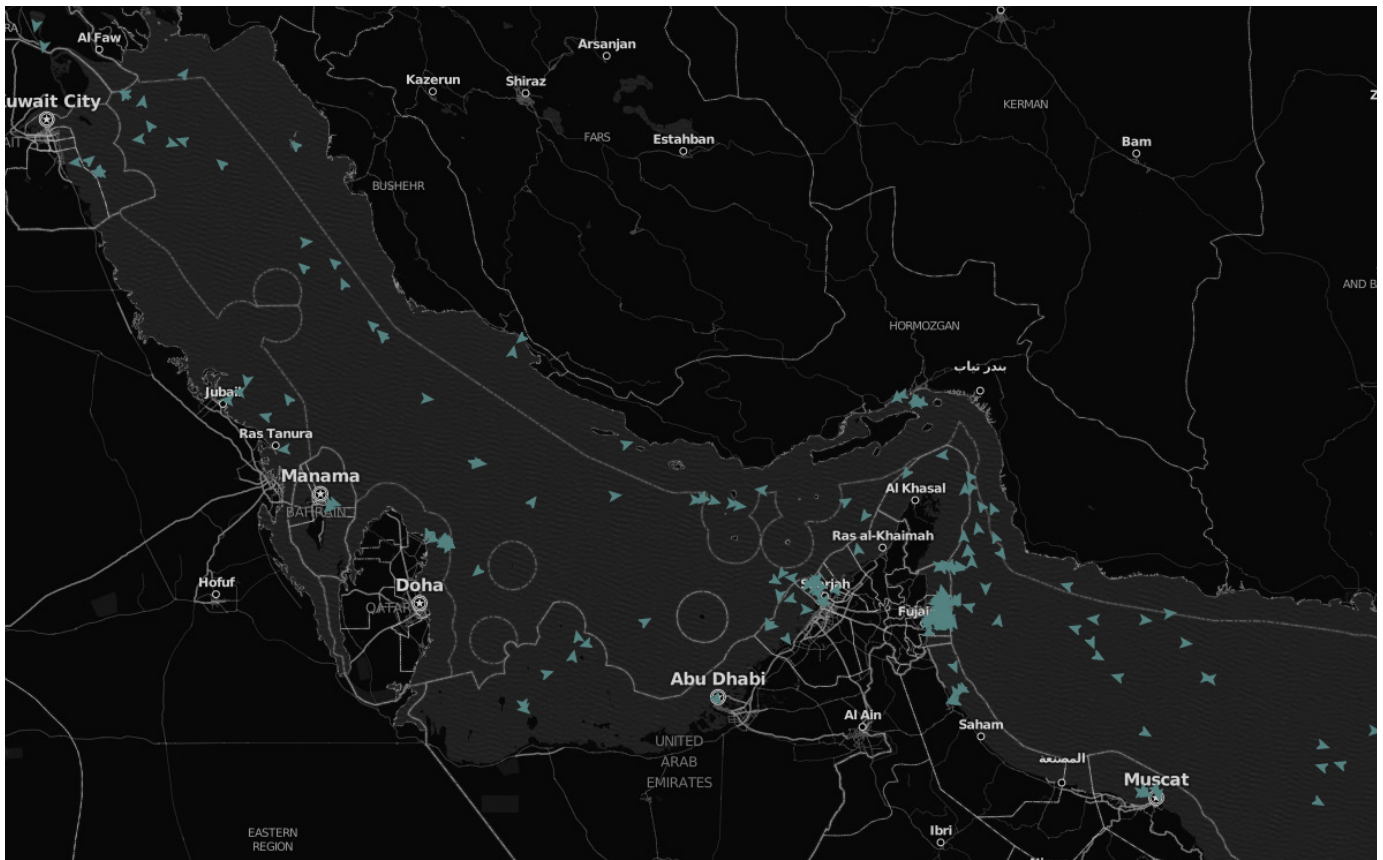
Source: Spire Global, Inc.

Getting an in-depth and up-to-date understanding of the market is important to everyone, whether you're part of a commodities analysis firm, or in the market research department of a large shipbroking firm. Maritime service providers, such as ship repair services or port construction companies, also benefit from having as clear a picture of the market as possible.

Let's take a look at some of the ways the digital revolution is already helping maritime industry professionals understand the world around them:

Ship demand and supply

Shipbrokers study the location of specific kinds of ships to understand how in-demand ships are, and use that information to adjust prices accordingly. As predictive tools become more accurate, brokers will improve at predicting what the situation will look like in a specific region a few weeks or months down the line. They'll be able to make predictions like: "In two months, Los Angeles will likely have a shortage of large container vessels." This kind of market forecasting will give a large competitive advantage to those who have the most accurate data—and who know what to do with that data.

Improved forecasting of ship availability will also help those on the cargo side. This knowledge will give them the ability to better negotiate fair transport prices with shipbrokers and ship owners. For example, a charterer might see that there are many ships of a certain type available in their region several weeks in the future;this data will give them the power to negotiate a better freight rate.

Materials and commodities research

Market analysts use satellite data to get a sense of the comings and goings of specific types of ships. For example, a petroleum analyst might study deviations in ship traffic data to look for indicators that, when combined with other data sources, might enable market predictions or hedging. Traffic-related data will sometimes contain clues that traditional resources lack, giving an advantage to those companies with their fingers on the pulse of the market. Some analysts already use satellite AIS data in complex and proprietary ways, and the need for more data, and better tools to use that data, will only grow in future.

One example of a fairly new application of AIS data; studying the drafts of ships for clues about their contents and what they are shipping. For example, slight discrepancies in draft before and after a port visit might show which leg of the trip it was carrying ballast versus cargo. This data might be combined with general market patterns, such as what materials are typically gathered at specific ports or regions. You can start to get a sense of the unique and proprietary ways companies might combine their market knowledge with APIs to better automate their research and services.

Risk assessment

Better knowledge of a market and its supply chains also allows for better risk assessment. For example, a maritime insurance company might study the patterns of a specific region or commodity to better price insurance coverage for specific types of cargoes or for specific types of ships or fleets.

Weather-related market impact

Improved weather forecasting (such as that made possible by GPS-RO technology) will impact ship/fleet route planning and preparation, and will also have an effect on market and commodities research. Better weather prediction means that researchers and analysts more easily spot upcoming supply chain obstacles and potential business opportunities.

Predicting what is over the horizon is difficult but having the right data can help

This paper has only skimmed the surface of the many areas where the digital revolution is already offering value to the maritime industry. It would be impossible to predict what new sources of data will arise or how they'll be used, but based on current trends, we can make some educated guesses about the gist of future changes:

More satellite coverage
With cheaper satellites being made, and the cost of launches going down, we'll continue to see a large array of data, provided very quickly, from service providers.

Artificial intelligence

As machine learning algorithms improve, software offerings will become smarter, and maritime companies will get more and more value from off-the-shelf APIs and other services that can guess what you need and adjust to your specific use cases. The ability of software to automatically predict future events from past patterns will also improve.

New sources of data

New data sources will be found, and it will have unforeseen applications. GPS-RO weather data is just one example of how forecasting of all things continues to improve. Another example: there might one day be ways to use ocean current and tide data to automatically optimize shipping routes and provide guidance for autonomus shipping.
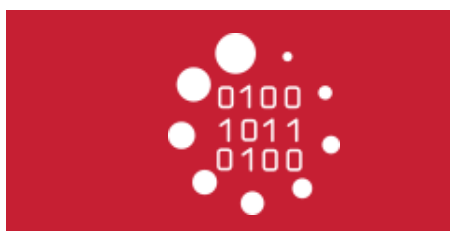
CONCLUSION

While it's impossible to predict the future, **what we can say for certain is that it's beneficial for companies to embrace technology as much as they can**. Not only does this have benefits in terms of heightening business intelligence and improving competitive advantage, it also helps companies stay knowledgeable about technological changes coming up on the horizon.

WHAT CAN SPIRE DO FOR YOU?

This paper was brought to you by Spire, provider of satellite data and APIs to a wide range of industries, including the transportation and logistics industry. This paper was authored by Robert Nolker Ph.D, data scientist and principal at Dynamic Data Insight LLC.

Have any questions about this paper or the ways Spire might be able to help your company? Send us an email at info@ spire.com or see our contact page for our regional phone numbers.