Shaking up the Maritime Industry through Open Data and Crowdsourcing

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Abstract

Shipping is an industry that has achieved its growth on solid but conservative steps over the past decades. It is strongly linked with major macroeconomic metrics worldwide and its ecosystem includes all major business sectors. Information Technology has been leveraged by the shipping industry mainly for optimising its processes, thus reducing operational costs and contributing to the competitiveness and the growth of the sector. The evolution of the Internet though has not influenced the shipping industry in the same way it has influenced other industrial sectors. This is largely because the maritime industry is a closed ecosystem that requires significant effort to penetrate. While such barriers prevent most players to address the shipping industry, others consider this as an opportunity for disruption and focus on creating services and applications around the benefits deriving from the openness of the maritime industry. MarineTraffic is one of these players, a catalyst for transparency that has become a game-changer to the traditional practices of the maritime industry.

Keywords: Maritime, Ship Tracking, Open Data, Crowdsourcing.

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1 Introduction

Approximately 90% of the world's trade is being conducted by the shipping industry. The total value of seaborne trade is estimated at US$9 trillion [1]. Clearly, it is a very important industry, affecting virtually everyone across the world, where every small inefficiency makes a difference. The shipping industry traditionally has been opaque, with arguably intentional complexities, always keeping a high barrier of entry. In the past, opacity was evident even concerning the actual whereabouts of a vessel, thus creating inefficiencies on every step of the operations flow; starting from a captain who for various reasons could alter voyage details when reporting to the shipowner, or the latter not being very accurate while dealing with a broker and so on.

Then, MarineTraffic started as an experiment in late 2007, based on the newly introduced Automatic Identification System (AIS), for the first time showing ship positions on the map in real time. The system leveraged **open data** -the AIS data, which is open but not consolidated-, **internet technology** -the novel back then "mashups" that looked cool but without any proven business model- and the power of **crowdsourcing** -a slightly older idea with a few successful examples, such as Wikipedia [2].

The MarineTraffic domain [3] was registered and the website was launched, with some basic functionality: an open system where anyone who had access to AIS data could send the data over and have it automatically displayed on the world map.

The MarineTraffic publicly available map with real-time ship positions was gaining popularity and gradually started to change the way business was done in shipping. On the one hand, it was getting harder for someone to miscommunicate a ship's location or its expected time of arrival (ETA) to port and on the other hand interestingly useful applications were starting to emerge. Although initially MarineTraffic faced criticism from the industry, with even the International Maritime Organization issuing a directive against the practice of providing ship positions publicly [4], it slowly became apparent that it was here to stay and the industry made peace with the idea and started embracing the benefits.

This paper is organised around eight sections. Section 1 is the introduction to the niche market, where MarineTraffic acted as a catalyst to shake up the shipping industry. In Section 2 the technology fundamentals of MarineTraffic are presented, focusing on best of breed Internet and IoT technologies. Section 3 is dedicated to a significant stakeholder of MarineTraffic that is the community and its crowdsourcing paradigm. In Section 4, the business

models that have been applied, since the first steps of this startup are presented, highlighting the pivoting throughout its lifetime. In Section 5 the customer segments and the current revenue streams are presented around the freemium models that MarineTraffic is built upon. Section 6 provides a brief outline of the competitive landscape. In Section 7 the major challenges are discussed, including user diversity, data management, quality assurance, AIS coverage, as well as company growth. Finally, the paper ends with conclusions in Section 8.

2 MarineTraffic Technology Background

MarineTraffic is based upon an open, publicly available system called the Automatic Identification System (AIS) [5]. All large ships (passenger vessels and commercial vessels above 300 Gross Tonnage) are required to broadcast their position through this system, for navigational safety and operational reasons. MarineTraffic has setup a proprietary network of AIS receivers along the world's coastline, through which these AIS signals are picked up and, via the Internet, sent to the company's servers for processing. Then this data, along with a wealth of information about the vessels or the ports is delivered to MarineTraffic users through the web and mobile applications.

Coastal AIS data is delivered and processed from the receiving stations at real time. This location information is blended with descriptive information

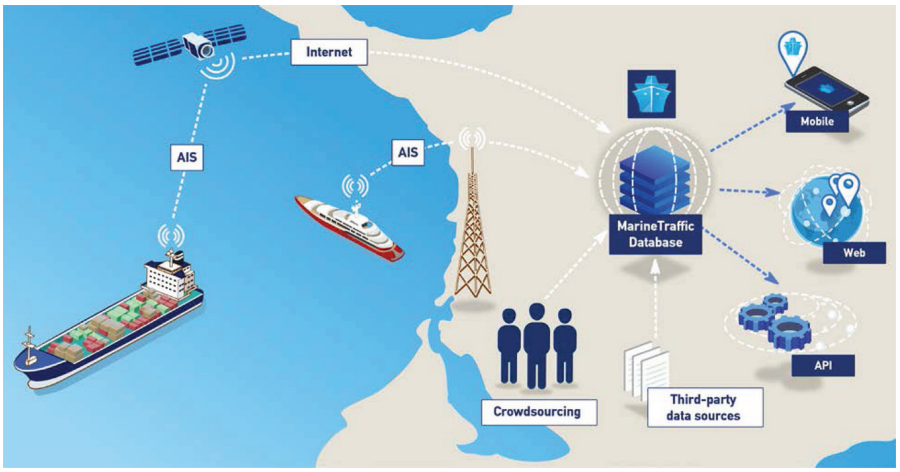

Figure 1 High level representation of the system topology.

that originates from MarineTraffic users and numerous third party data sources into a master ship database, which in turn feeds the applications (website, mobile apps and API services).

Due to its popularity, MarineTraffic has become synonymous to the AIS, which is the only system that can provide one with a global picture of maritime movements and thus allows one to monitor the global fleet, follow trends, optimise operations and decisions.

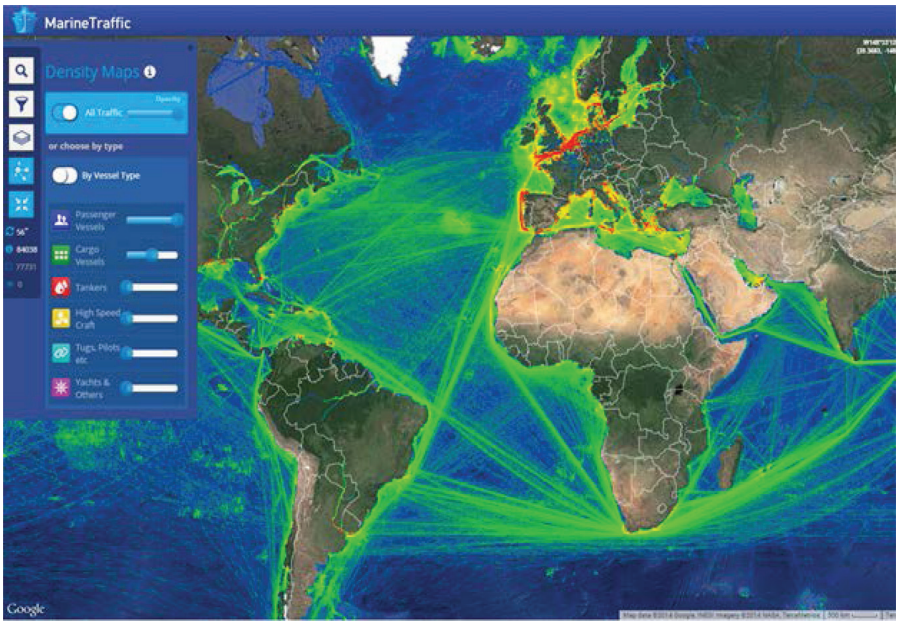

Figure 2 MarineTraffic density maps.

Currently, the MarineTraffic data acquisition network consists of more than 3,000 AIS receivers, even in the most remote areas of the world. Mid-ocean coverage is achieved through receivers mounted on satellites. In total, MarineTraffic currently processes over 500 million vessel position reports every day and uses them to produce actionable events regarding the vessels' voyages.

Although MarineTraffic cannot guarantee absolute global coverage due to the nature of the AIS, nearly 90% of the global commercial fleet reports at least one position update every day through the system, which, along with a significant number of smaller vessels, now accounts for over 150,000 vessels on the MarineTraffic map at any given time.

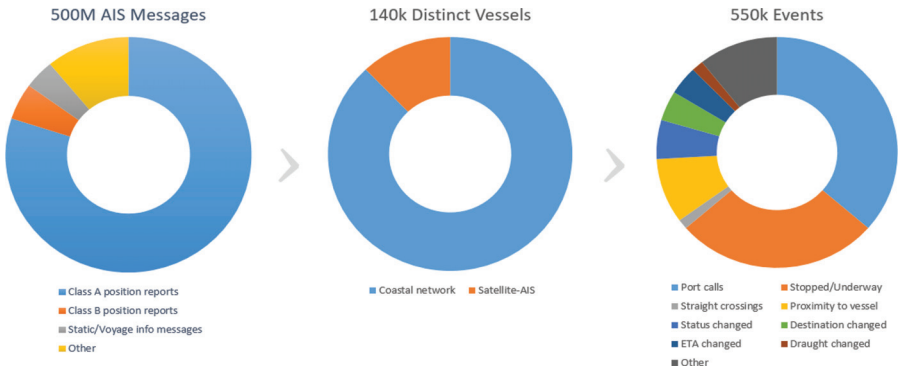

Figure 3 Data processed on a typical day.

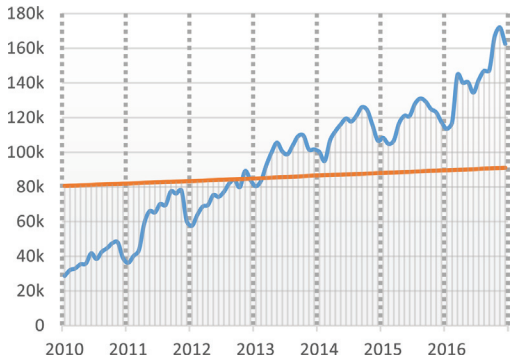

Figure 4 Distinct vessels per day (blue), growth of commercial fleet (orange) [6].

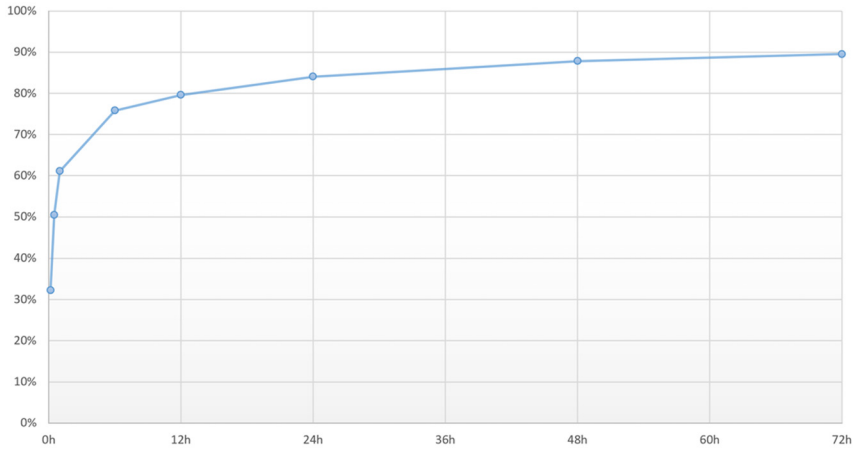

Figure 5 Current coverage of the global merchant fleet.

Apart from the map-based tools provided by MarineTraffic, an increasingly important part of the company's activity has been using this data to generate intelligence useful to the shipping industry.

3 The Role of the Community

MarineTraffic has been heavily dependent since the beginning on its very active and dedicated community. Apart from the open system, the company has been developing an open and transparent culture, with the community cultivation as a priority. This openness has been the main reason MarineTraffic is the most popular maritime-related online service in the world, being used by millions of users, building a very strong brand and giving it an edge against competition. The community engagement is multi-dimensional:

- **AIS Receiver operators**: MarineTraffic has built the AIS receiver network with the support of volunteer station operators. Leveraging the service's exposure, MarineTraffic has been accepting applications from people around the world who want to improve coverage in their area. Following a screening process, successful applicants receive the necessary equipment for free, agreeing to keep the AIS station online and connected to the MarineTraffic system.

Figure 6 Geographical distribution of the AIS receivers.

- **Photographers**: Since 2009, MarineTraffic users have been encouraged to upload vessel photos on the website (and since 2015 are able to do it directly from their mobile app) to enhance the ship database. Today, the MarineTraffic gallery has over two million photos and is a very important asset for the platform. Moreover, the photos are moderated by the community, ensuring quality.
- **Data curators**: Tapping on to the single most expert community, MarineTraffic encourages its users to submit improvement requests for various asset details on the platform, such as vessel details, route forecasts etc. – in a streamlined way.
- **Word of mouth**: Possibly the most important contribution of the user community to MarineTraffic has been the recommendations to friends and colleagues, which has been the main growth engine of the platform.

MarineTraffic has built a sense of ownership and belonging to the community, which is reflected in the commitment and engagement that the company sees in return. As a token of appreciation to the contributors, MarineTraffic, along with public acknowledgment for their service, offers them several privileges, ranging from free plans on the website, to promotion of their businesses and data for their own use.

4 Business Model and Timeline

MarineTraffic has been operating in various modes so far, because of its startup nature and the rapidly changing landscape, mainly deriving from the Internet evolution. Initially, MarineTraffic didn't have a clear business model, as the main focus was the creation of the infrastructure and the proof of concept. At its first major pivot, MarineTraffic leveraged website traffic and created a revenue stream through that. Later, MarineTraffic performed a new pivot, this time towards the Software-as-a-Service (SaaS) domain. In the following sections these phases are presented.

4.1 No Business Model

At the beginning, there was no business model (not even a plan for one). Built in the founder's basement without any financing, MarineTraffic initially was an open, research project- or a cool experiment. The marinetraffic.com website encouraged anyone who had access to AIS data to share it and then displayed

on the map all data collected. Initially, it gained traction mainly within the radio amateurs' community, who started connecting their AIS receivers to the MarineTraffic website. Coverage was very limited and as a result only a few thousand vessels could be seen on the website (see Figure 7).

Figure 7 The MarineTraffic website in 2008.

Being a novel application, MarineTraffic quickly gained momentum through word of mouth and some press coverage and the website started attracting noticeable traffic. This resulted to the website's authority being boosted, which, in turn, produced good search engine rankings and more inbound, organic traffic.

4.2 Leveraging Website Traffic

Seeing an opportunity for some monetisation, MarineTraffic (still running as an "one-man-show") decided to introduce advertising on the website. The straightforward solution (easy to implement and operate) was AdSense, Google's advertising network based on real-time bidding. Given the steady increase in impression volumes (see Figure 8), this started generating some revenue that could support the operating expenses and some expansion projects, such as the development of the first mobile applications.

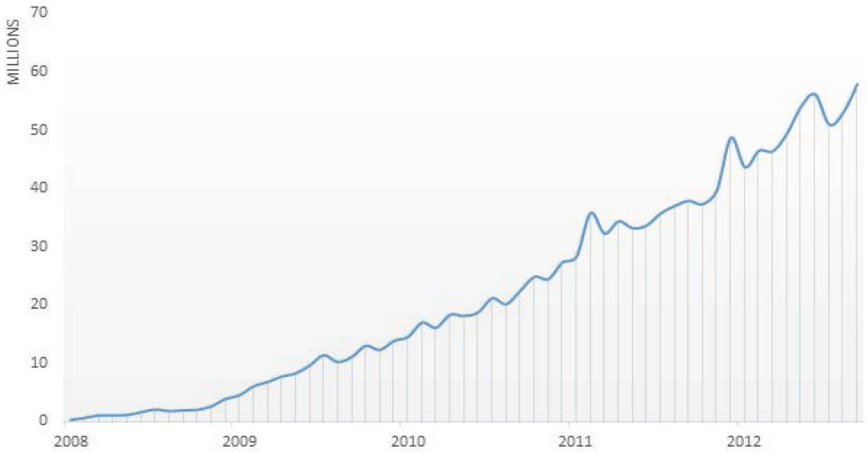

Figure 8 Traffic increase on marinetraffic.com the early years (pageviews, monthly).

The iOS app was built in 2010 as a premium (paid) app. Like the website, it gained traction fast, reaching top positions of the AppStore's Travel category in several countries. The Android app followed in 2011 as a free app with advertising. At the time, here were relatively poor due to very low returns for the advertising inventory.

4.3 Turning to SaaS

The big change regarding the business model started in late 2012, following the restructuring of the company and the expansion of the team. In an effort to better serve the shipping industry with professional-grade applications, while at the same time continuing to appeal to the many private users, a decision was taken to move to a **freemium Software as a Service (SaaS) model** [7]. On the one hand, this meant that part of the service would remain free, but an extended version would also be made available and charged on a monthly or annual basis. In SaaS, since subscriptions are compounded and, as long as one can maintain customer churn at manageable levels, the business benefits from being able to build predictable revenue. On the other hand, charging for services also requires streamlined systems and a solid customer support infrastructure, which involves significant effort and investment.

The official launch of the "new MarineTraffic" took place in November 2013. Although a few months of closed beta testing and user feedback

collection preceded the event, the transition was challenging. The main issue was that some of the until then free service features were retracted and from that point forward only offered as part of a paid subscription. As expected, this sparked a backlash from existing users and required a lot of effort in communicating the rationale behind the decision before everything was stabilised three months later.

Following this eventful initial period, MarineTraffic was finally geared to offer professional services to the industry and leverage the huge exposure to the market and brand awareness.

The first step in that direction was about positioning and credibility building, given that the general perception about MarineTraffic was still about a free, research project. This was tackled by a total overhaul of the service: redesign of the website and applications, revamp of the MarineTraffic social media channels and open and transparent communication, coupled with PR activities, which helped boost MarineTraffic brand credibility in the shipping industry. Today, subscriptions compose the largest of the four revenue streams for MarineTraffic, with a CAGR of over 150% since launch. Moving forward, MarineTraffic will be moving up the value chain with more sophisticated processing and data intelligence offerings, along with new ways for the industry stakeholders to collaborate around them, further promoting efficiency and transparency.

Given the rate of innovation and the dependency of the company in new products and services, in a sense, MarineTraffic is still a startup, according to the definition of Eric Ries in 'The Lean Startup' [8].

5 Customer Segments & Revenue Streams

Today, people use the MarineTraffic website and mobile apps both for private and business reasons, with a wide range of use cases, such as those listed below:

- **Shipowner monitoring the competition**: by following specific segments or even creating fleets with competitors' vessels, one can monitor supply in a specific area, view speed profiles and other data and draw conclusions regarding commercial strategy.
- **Port tracking incoming traffic**: a port can obtain updated expected arrival times for incoming vessels and optimise operations based on this information.
- **Tugboat operator planning rendez-vous with incoming ship**: for time and fuel optimisation a tugboat will use MarineTraffic estimated times

of arrival (ETAs) and the mobile app to meet incoming vessels just on time.

- **Charterer monitoring ship supply in a certain port**: supply and demand forecasting is critical to the rate fluctuations and the basis for commercial transactions.
- **Ship supplier generating sales leads**: a supplier can filter vessels in a particular area based on ship characteristics and present them with a targeted product or service offering.
- **Engine manufacturer providing after-sales service**: monitoring customers' fleets, an OEM can produce usage reports that will drive service and maintenance schedules.
- **Logistics company tracking containers**: a freight forwarder will link containers to specific vessels and track them to their destination, receiving notifications for events on the way.
- **Global manufacturer tracking raw materials or finished goods**: again, cargo is linked to specific vessels and ETAs and delays reported so that the whole supply chain is up to date and optimised.
- **Insurance company looking into an accident**: following an incident, historical position data can be played back and provide full visibility on the movement of involved vessels.
- **Commodity trader looking for trends**: analysing large volumes of vessels movement data for the past few years and correlating them with specific financial events, a trader can develop forecasting algorithms.
- **Small boat owner checking traffic around him**: on a boat with no proper AIS installation, the MarineTraffic app can prove particularly useful, especially in low visibility conditions or during the night.
- **Seafarer's family tracking their loved one**: seafarers are often at sea for months, with very little access to communication. Tracking their ships' whereabouts via MarineTraffic provides some reassurance to their families.
- **Ferry passenger checking for possible delays**: delays are usual whereas information is limited. Passengers often use MarineTraffic to check for delays instead of waiting for the ferry on the dock.
- **Shipspotter checking out ships passing by**: using the Augmented Reality feature of the MarineTraffic app, one can identify ships around him, along with details about them.

Many of the business customers also leverage MarineTraffic data services, using the available APIs to feed relevant data directly into their own systems.

Across all MarineTraffic users and customers, the company has developed the following four revenue streams:

1. **Subscriptions**: premium online services (added-value tools and data) for the website and mobile apps.
2. **Data services**: raw and processed data, via APIs or custom reports.
3. **Mobile applications**: one-time installs of MarineTraffic premium apps.
4. **Advertising**: mainly targeted advertising on the website consumed by free users.

The focus of the company is currently on further growing the subscription part of the business (online services and data), which is also evident from the sales trends displayed in Figure 9.

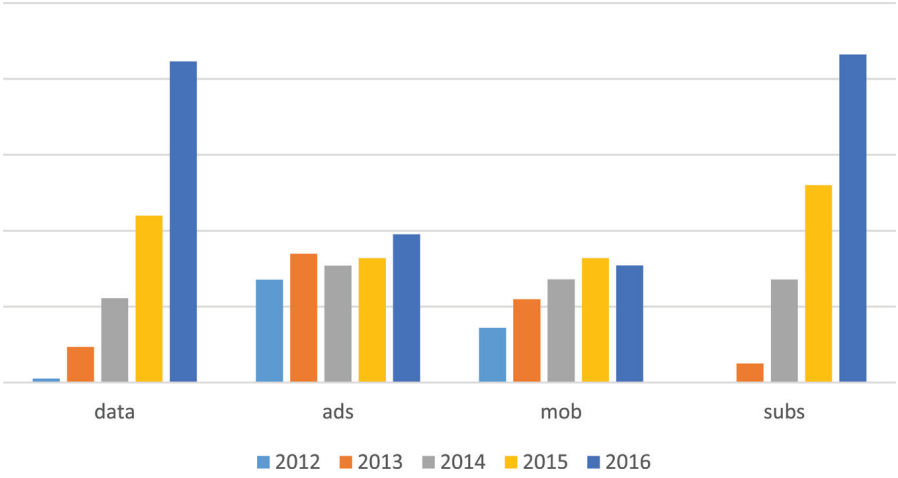

Figure 9 Growth per revenue stream over the past years.

6 Competitive Landscape

The online ship tracking market is a niche but expanding space, with a few established players and several upcoming, specialised companies.

They can be categorised into two groups:

- AIS data providers and
- added-value service providers

The former group can be further distinguished into Terrestrial AIS (T-AIS) data providers and Satellite AIS (S-AIS) data providers. S-AIS data on a global

scale is essentially collected and provided by two companies (ORBCOMM [9] and ExactEarth [10]), with Spire [11] recently joining the group. Similarly, T-AIS data at a global scale is provided by just four organisations that collect data through their own proprietary AIS receiver networks: IHS [12], Lloyd's Intelligence [13], Vesseltracker [14] (acquired by Genscape in 2013 [15]) and MarineTraffic. These four companies, apart from providing AIS data, also provide some kind of online ship tracking facility on a subscription basis, with MarineTraffic being the only one to have embraced the freemium business model. There is a number of other companies that focus on a specific region of the world or are in the process of building a global data acquisition mechanism.

Also, there is an increasing number of companies that are offering specialised services based on AIS Data acquired from the abovementioned providers.

7 Challenges in the Horizon

The success of the past also puts the bar for the future higher and growth plans pose a number of important challenges for MarineTraffic, including user diversity, data management, quality assurance, AIS coverage, as well as company growth.

7.1 User Diversity

MarineTraffic is now in a position that on one hand wants to continue leveraging the power of the community, which gives it its edge and on the other hand wants to effectively serve the maritime industry with professional services. Therefore, MarineTraffic needs to cater for both the millions of "free" users and the relatively few revenue-generating customers at the same time. This is both a product development challenge as well as a branding one, requiring respective effort and decisions.

7.2 Data Management

The sheer volumes of data handled by MarineTraffic, both incoming and outgoing, require constant upgrade of infrastructure and optimisation of technologies and processes, for performance and redundancy. Especially the focus on data intelligence products require a major upgrade of the company's data warehouse and big data infrastructure, allowing for efficient processing and delivery.

7.3 Quality Assurance

AIS has some inherent limitations that make strict quality control of the presented data and derivatives imperative. MarineTraffic continuously works on automated controls that minimise the effect of these limitations. For example, checking the consistency of a vessel's track or cross-checking ship identities and reported destinations and ETAs is an ongoing effort requiring intelligent algorithms and machine learning. High volumes of data and AIS volatility make this a difficult technical challenge.

7.4 AIS Coverage

The MarineTraffic service is based on the location data collected by the AIS receivers' network. Although this has grown considerably, there are still blind spots in remote areas of the world. Here the challenge is to continue improving coverage in these difficult areas. For this reason, apart from growing the network organically, MarineTraffic is experimenting with autonomous AIS receivers and even high-altitude balloons.

7.5 Company Geared for Growth

Possibly the most important challenge MarineTraffic faces right now is making sure the company foundations are solid enough to sustain growth: growth of market expectations, rapid growth of the team, growth of customer and user base, growth of product scope. Shifting from a small startup to a more corporate mindset without limiting innovation and creativity requires a lot of work on company culture and systems and processes.

8 Conclusions

The shipping industry is one of the major pillars of the economy at a global level, significantly influencing several business sectors, such as transportation and trade. Moreover, it directly touches millions of people, including shipowners, brokers, ship suppliers, crew members, passengers, agents and many more. The combination of industry characteristics, overall value and volume of people involved, offers a solid opportunity for new digital concepts that can add significant value to the stakeholders. MarineTraffic has managed to be a pioneer by delivering such a concept powered by crowdsourcing and offer a variety of services to very wide audience. Although AIS has been around for some time now, MarineTraffic is applying best of breed

of Internet technologies on top of it and aims to continue transforming the maritime industry towards transparency and efficiency. MarineTraffic demonstrates how the combination of technical and business innovation can result in a paradigm shift for business sustainability in a traditional industry.

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Biography

Demitris Memos is an entrepreneur, curious about digital transformation and the opportunities it brings along.

He is currently CEO at MarineTraffic, the world's most trusted ship tracking service. Before that he co-founded and managed a successful digital agency in Greece for ten years. Prior to that he served as an IT consultant and Project Manager in large international projects in various sectors, including the health and aviation industries. He received his MEng in Electrical Engineering from Imperial College in 1998. He is currently also the President of the Greek chapter of EO (Entrepreneurs' Organization).