



TRENDS OF SMART PORTS TECHNOLOGY COMPANIES: AN ONLINE PRESENCE PERSPECTIVE

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ABSTRACT: Nowadays digital technologies such as the Internet of Things are part of a broader digitalization of ports, introducing new opportunities that were just envisioned a decade ago. Ports all around the world are starting to focus on technology implementation into daily operation in order to become more time and economically efficient. IoT represent an attractive technology field in the maritime industry, as follows many companies in the electronics, electric and technology development area have operational divisions and dedicated centers for developing smart connected ports. With increasing IoT connectivity huge amounts of real-time data can help port stakeholders to obtain insights and valuable information in order to make data-driven business decisions and optimize port operations at all levels. The proposed research aims to discover and analyze if the technology companies that develop and implement digital and IoT solutions for the maritime industry have an online presence in order to reach more customers. Also, the research identifies if past online searches of the selected maritime technology can influence the future trends of their online presence. As maritime technology product and service providers online presence as does the shipping sector opportunities evolve.

INTRODUCTION

In the first part of our research we conducted a literature review in order to identify previous studies regarding the use of IoT technology in smart ports and in the maritime sector. Thus, we have discovered that there are several research approaches that consider the integration of complex systems to bring huge benefits in increasing logistics and operations speed in ports.

We continued to define the concept of smart ports and analyzed how value is created by using technology that improves the quality and speed of logistics processes. The analysis was followed by identifying how the B2B segment uses such systems and also identifying the most visible companies



that offer technology hardware and software solutions in the maritime sector by analyzing their presence in the online environment.

LITERATURE REVIEW

Smart ports

Literature has offered many definitions of seaports. The Port Working Group of the European Commission has defined a seaport: ‘an area of land and water to permit, principally, the reception of ships, their loading and unloading, the storage of goods, the receipt and delivery of these goods by inland transport and can also include the activities of business linked to sea transport (Sorgenfrei, 2018).

Digital technologies like the Internet of Things, alongside with increasing availability of data, will allow for an exponential growth of automated processes in ports. The combination of enhanced digital and physical connectivity will help carriers, seaports and transport providers to integrate processes, providing a better visibility of shipments at any given time (United Nations Conference on Trade and Development, 2019).

Smart ports are considered to be eco-friendly ports that optimize logistic flows automatically and autonomously, utilize energy efficiently using 4th generation technologies such as Artificial Intelligence, Internet of Things, Information Communication Technologies (United Nations Economic and Social Commission for Asia and the Pacific, 2019).

Examples of challenging projects related to smart ports in the IoT area are found in Europe, Asia, Australia and North America, these smart ports are using new architecture implementations, smart sensors playing a major role (Yang, et. al, 2018)

As IoT technologies are becoming more used in various activity domains, ports are also adopting this new beneficial technology, measuring physical characteristics of objects and transforming them into data which can be processed, read and analyzed by computers or cloud technologies and used by the final users. A network of smart sensors, actuators and wireless devices, data centers compose the infrastructure of smart ports, allowing port authorities to use predictive maintenance, gain real time data about port operations in a more time and economical efficient manner (Yang, et. al, 2018).

Through a rapidly increasing number of connected devices, embedded sensors, and analytics technologies, companies in the sector can enjoy unprecedented visibility into almost every aspect of their business, from operations to finance, enabling new sources of value creation (Kooimey, 2012).

Value creation

The Internet of Things technologies aim to transform almost any physical object into data. This creates a new way of differentiating products and services and a source of value that can be analyzed and used for taking the best business decisions. By acknowledging the full potential of IoT, companies can create valuable business insights by using information (Deloitte Insights, 2015).

Value creation is linked to the purpose of an IoT application in shipping services. Figure 1 presents the potential of using IoT for obtaining information value. Business needs such as sensing environmental aspects imply little value creation and it can be obtained with relatively narrow-scope

IoT applications. To adapt the whole supply chain to change requires more value creation and a wider scope of IoT applications. To create new business models and generate new revenue implies involving customers into the ecosystem and it is the widest application of IoT technologies (Jardas, et. al, 2018).

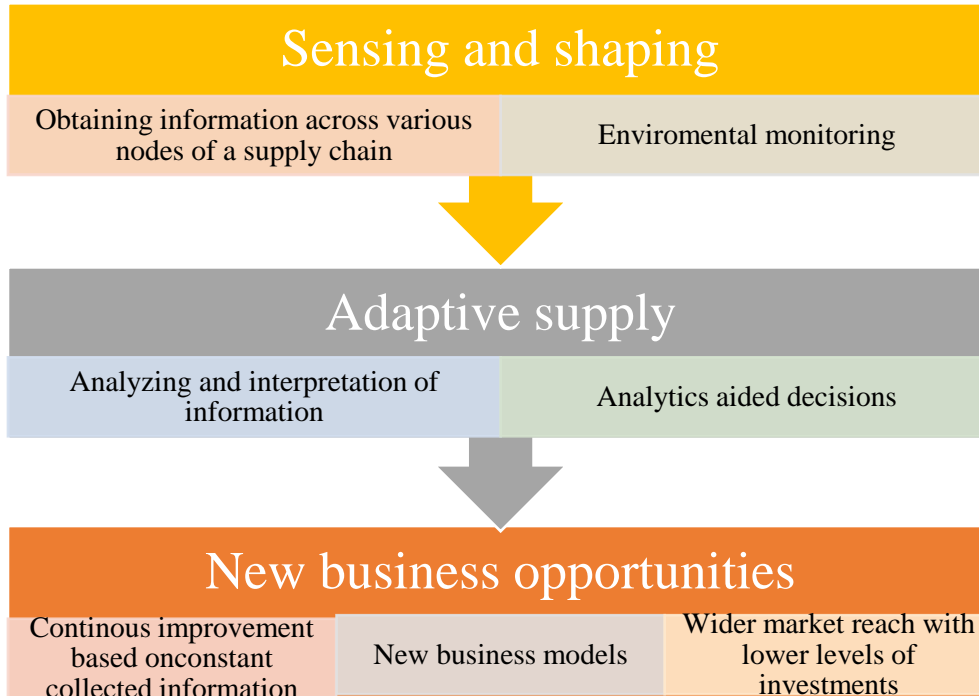


Figure 1: Value creation of IoT technologies for shipping

Source: Adapted from Deloitte Insights, 2015

In Figure 2, Deloitte (2015) proposes an information value creation loop for IoT technologies in the shipping sector. In order for information to complete the loop and create value, information should pass through all the steps, each step being enabled by technology. Action is monitored by a sensor that creates information. The information created passes through a network with permitting the information to be aggregated. Augmented intelligence refers to analytical software used for analyzing information. The drivers of information can be divided into three categories: magnitude, risk and time.

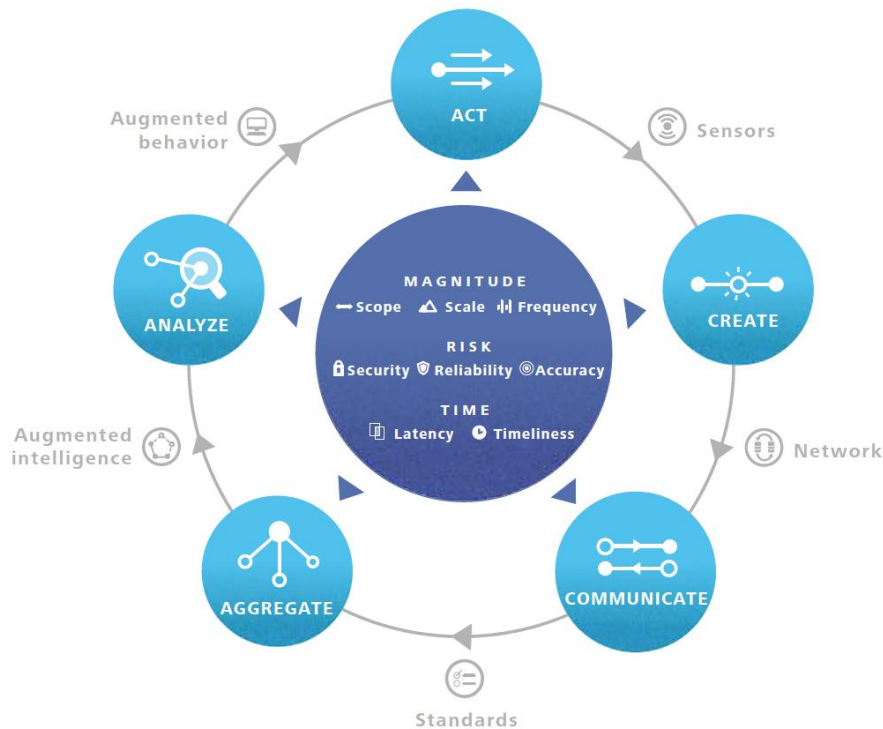


Figure 2: Value creation of IoT technologies for shipping

Source: Adapted from Deloitte Insights, 2015

According to Jardas et. al (2018) the main goals of IoT in the shipping sector and port systems are to prevent unforeseen breaks in transport, increase energy efficiency and reduce maintenance costs. IoT aids in constant cargo monitoring by implementing smart containers, predicting the exact arrival time in a port and handling automation in port terminals by collecting and analyzing data such as humidity, location and temperature. For unpleasant situations such as bad weather conditions, port delays or damages containers, smart IoT devices are used to identify and diagnose the cause of the unforeseen situation. The data collected about the shipping cargo is analyzed by software and used to making the right business decision (Jardas et. al, 2018)

TECHNOLOGY COMPANIES IN THE MARITIME INDUSTRY RESEARCH

Having an online presence can bring important benefits to a company. According to HubSpot (2019) 71% of Business-to-Business (B2B) researchers start their research with a generic search (Hubspot, 2019). The Internet is one of most used research tools for reaching new customers, 81% of



people look firstly on the Internet for researching (Hubspot, 2019). Reaching more people is another benefit of having an active presence online. B2B companies that blogged the latest news or industry related articles more than 11 times per month had almost three times more traffic than companies who did not blog at all or just one or two times per month (Hubspot, 2019). By having an online presence, maritime technology companies can reach a global market, being online means having access to powerful marketing tools such as Google Ads or social media. No offline marketing channel having more global reach than a good online presence (Hook, 2017).

Having an online presence can build the brand confidence. Potential B2B buyers who feel a high brand connection are 60% more likely to consider, purchase and even pay a premium product or service (Hubspot, 2019). Also, most customers conduct an online research before making a purchase, thus having a good online presence can increase the company credibility. Quality products and services contribute to a company's reputation, 85 % of people would pay more for services from a company with higher ratings and reviews (Shrestha, 2020).

Table 1 presents the technology companies selected in the study conducted. As it can be observed, some of the companies selected such as ABB, Ericsson, OOCL and Maersk are technology giants with experience in the maritime technology sector. Still, start-up companies such as Shippabo or Globe Tracker are analyzed as well, thus demonstrating their business potential in the maritime industry.

Table 1. Maritime technology companies analyzed in the conducted study

Company	Year founded	Headquarters
ABB	1988	Zurich, Switzerland
Ericsson	1876	Stockholm, Sweden
OOCL	1969	Hong Kong, China
Maersk	1904	Copenhagen, Denmark
Globe Tracker	2016	Copenhagen, Denmark
Traxens	2012	Marseilles, France
Shippabo	2015	Los Angeles, California
Far sounder	2001	Warwick, Rhode Island
Ascenz	2008	Singapore
Higgstec	2002	Taoyuan City, Taiwan

Table 2 offers a brief activity and technologies used by the maritime technology presented above. Most of the companies presented developed IoT centered technologies because of the huge development and improvement potential of such technologies in the maritime sector.



Table 2. Maritime technology companies analyzed description

Company	Description
ABB	Electric, digital and connected solutions for the marine industry, technology solutions from vessels and automation. By providing electric, digital and connected solutions that maximize the full potential of vessels, enabling safer, more efficient and sustainable ship operations. Preventive maintenance, system enhancements, shore connections (ABB, 2020).
Ericsson	Ericsson’s Maritime ICT Cloud will connect vessels at sea with shore-based operations, maintenance service providers, customer support centers, fleet/transportation partners, port operations and authorities. At the same time, the offering enables services used to manage fleets, monitor engines and fuel consumption, oversee routes and navigation, and ensure the wellbeing of the crew (Ericsson, 2015).
OOCL	Orient Overseas Container Line, commonly known as OOCL is using information technology in the container transportation industry and has been a leader in the use and development of IT solutions for well over two decades. It is also an industry leader in the use of information technology and e-commerce to manage the entire cargo process (OOCL, 2020).
Maersk	Maersk’s remote containing management program employs internal sensors to gather and broadcast real-time on temperature, humidity and CO2 levels. It also facilitates real-time 24/7 GPS tracking of containers, provides automatic notifications that keep cargo owners aware of any deviations in temperature or pull-down rates, enables cargo rerouting and improves security (Thomas, 2019). The world’s largest container shipping company, Maersk manages the entire product journey including inland services, custom house brokerage, ocean freight and warehouse management (Maersk Solutions, 2020).
Globe Tracker	By combining cellular and IoT technologies like Bluetooth and LoRa, Globe Tracker is addressing end to end cold chain visibility for logistics companies. Its suite includes remote temperature monitoring, compliance, and visibility tools in an effort to make the cold chain more efficient, reliable, and improve the quality of perishable transport around the world. Its main solution is in the maritime sector for refrigerated containers or reefers. For this sector, they provide two-way communication to refrigerated containers no matter the brand or model – even if the reefers were created over 20 years ago (Transmetrics, 2020).
Traxens	Traxens is a supply chain visibility company helping to implement IoT technology in sea, road and freight rail operations around the globe. Its solution allows local interconnection of different devices without wiring, which creates easier ways to conduct condition and composition monitoring and improve overall operations. Its innovations have been noticed by some of the big players: Maersk recently announced it will be joining as a key shareholder and customer of Traxens. The



	shipping giant has also committed to ordering up to 50,000 Traxens devices. (Transmetrics, 2020).
Shippabo	Shippabo provides IoT-enabled supply chain management solutions, including order management, customs insights, shipment tracking, SKU level product visibility, automated notifications and more (Thomas, 2019)
Far sounder	Far Sounder is a sonar technology solution provider whose products ensure the safety of the vessel. It is a tool that guarantees where the ship should navigate to stay safe. The company is recognized in 3D FLS technology from all around the globe. Far Sounder’s sonar system helps prevent costly damage to the environment marine and human lives alike (APAC CIOoutlook, 2020).
Ascenz	Ascenz offers digital solutions for the marine industry such as fuel consumption monitoring, engine performance, real time visualization of vessel’s performance metrics. It also uses technology such as shipboard analytics that can be integrated with onboard sensors such as flow meter, torque meter, accelerometer, GPS, wind/water sensors for data collection and aggregation (Ascenz, 2020)
Higgstec	Higgstec touch solutions has advanced materials, latest technology and outstanding supply chain management applied to the products which withstand adverse marine circumstances, salty mist and sunlight. The products are applied to all sorts of ships, such as the yacht, naval vessel, ferry, cruise liner, battle cruiser, and fishing boat. They can also work well with other devices like the GPS, WIFI, radar, sonar and navigation system (Higgstec, 2020).

Online visibility and popularity of maritime technology companies

The study conducted has identified the most present companies in the online environment. In order to identify the online presence and popularity of each company, we have used Google Keyword Planner. Google Keyword Planner is an online tool developed by Google, used for creating search network campaigns that are relevant to products, services or target customers of a company. Keyword Planner will show historical statistics such as search volume data for the keywords used (Google, 2017).

In order to select the top 10 most online present technology companies, we have used broad matches. Broad keywords matches are variation of keywords as well as related topics. Broad matched indicate similar keywords or phrases, close variations of a keyword term, related searches and other relevant variations. (Google, 2017).

Historical data presented in Table 3 were divided by year quarters from 2016-2019 and it presents the average quarter searches for each company analyzed in the conducted study. As it can be observed, the top three companies that has the best search average results are ABB, Ericsson and OOCL. Companies that had the lowest search volume average are Ascenz, Higgstec and Shippabo, indicating that their online presence is not so powerful. Ascenz, Higgstec and Shippabo were founded after 200’s indicating that their industry and business experiences has not yet matured compared to older companies.



Table 3. Google Keyword Planner historical search volumes of analyzed companies

Average quarter searches	ABB	Ascenz	Ericsson	Far sounder	Higgstec	Maersk	OOCL	Shippabo	Traxens	Globe Tracker
1 st quarter 2016	345.667	150	165.000	197	197	20.833	60.500	307	1.100	5.067
2 nd quarter 2016	301.000	187	165.000	210	227	20.833	60.500	300	960	4.733
3 rd quarter 2016	323.333	183	189.000	203	210	20.833	69.500	317	1.600	4.400
4 th quarter 2016	345.667	203	182.000	213	187	22.200	69.500	553	1.200	6.200
1 st quarter 2017	368.000	197	177.000	183	203	22.200	79.500	530	1.200	5.467
2 nd quarter 2017	368.000	183	155.000	263	187	25.833	79.500	597	1.500	4.400
3 rd quarter 2017	368.000	210	165.000	243	163	25.467	79.500	480	1.060	5.067
4 th quarter 2017	345.667	273	167.000	280	180	25.467	69.500	517	1.400	9.900
1 st quarter 2018	395.333	210	155.000	263	160	27.100	69.500	867	1.400	6.900
2 nd quarter 2018	368.000	213	145.000	260	170	27.100	74.000	920	1.600	5.067
3 rd quarter 2018	368.000	213	165.000	243	173	27.100	74.000	907	1.400	5.067
4 th quarter 2018	422.667	227	155.000	213	140	27.100	65.000	813	2.067	5.067
1 st quarter 2019	422.667	300	177.000	227	190	27.100	69.500	1.300	2.067	5.067
2 nd quarter 2019	422.667	243	165.000	260	197	29.100	69.500	1.060	3.300	5.067
3 rd quarter 2019	422.667	320	165.000	280	140	31.100	74.000	560	2.967	4.733
4 th quarter 2019	422.667	300	165.000	307	150	31.100	74.000	443	2.400	5.067



The data collected by using Google Keyword Planner was analyzed by using a statistical software, namely SPSS version 20, in order to identify the minimum, maximum, sum and mean values of the data collected for the study. Table 4 presents the descriptive statistic of each company analyzed in the proposed study. The results were ordered descending by their values.

Table 4. Descriptive statistic of search volumes

		Mini mum	Maxi mum	Su m	Mean
ABB	6	3010 00	4226 67	601 0002	3756 25,13
Ericsson	6	1450 00	1890 00	265 7000	1660 62,50
OOCL	6	6050 0	7950 0	113 7500	7109 3,75
Maersk	6	2083 3	3110 0	410 466	2565 4,13
Globe Tracker	6	4400	9900	872 69	5454, 31
Traxens	6	960	3300	272 21	1701, 31
Shippabo	6	300	1300	104 71	654,4 4
Far sounder	6	183	307	384 5	240,3 1
Ascenz	6	150	320	361 2	225,7 5
Higgstec	6	140	227	287 4	179,6 3
Valid (listwise)	N 6				

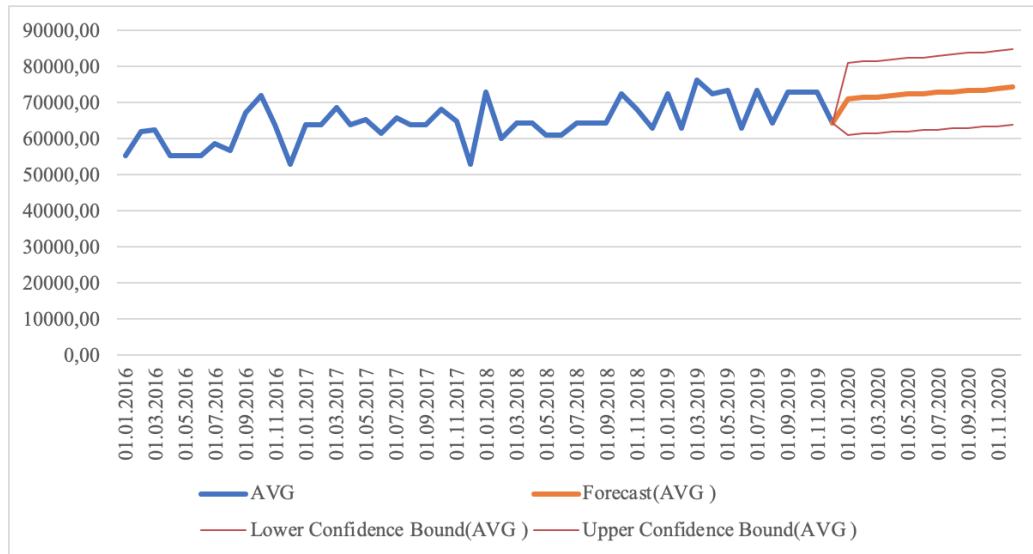


Figure 3: Search forecast of analyzed technology companies

Source: Author’s own research

Figure 3 presents the forecasted total searches of the analyzed technology companies in the maritime industry for 2020. The figure represents the aggregate results of the analyzed companies in order to highlights a trend that considers seasonality regarding the interest presented by Google searches of the top companies that provide IoT and digital solutions in the maritime and port sector.

The forecast was made considering the following analysis parameters: estimated clicks on the Google result, estimated impressions, estimated click through rate, estimated cost-per-click for advertising campaigns on Google, devices used for browsing the companies on Google.

CONCLUSIONS

After conducting the qualitative and quantitative research we have drawn the following conclusions:

- (1) There is a significant discrepancy between the selected companies when referring to their online visibility.
- (2) Thus, we noticed that older companies with boarder experience and expertise in the maritime industry have a much greater visibility in the online environment compared with the newer companies.
- (3) From the ten selected companies used in the forecast, we have observed an average quarter search volume during January 2016- December 2019, ranging within a minimum of 140-year quarter searches and a maximum of 522.667.



- (4) However, although the discrepancies are significant, we observed that there is an upward trend in the evolution of searches, which indicates that there is a growing demand for these companies that implement digital solutions for the maritime sector.

The discussion can be continued and the research can be forward conducted by analyzing in detail each division that provides IoT solutions for the maritime industry and by classifying the solutions offered in order to understand their efficiency and improvement of maritime operations. The integration of digital and IoT systems for creating smart ports is a very complex process, a process in which many shipping specialists, port stakeholders, hardware implementation specialist and software developers are involved. Thus, the efficiency of complex smart port hardware and software solutions is an ongoing process where the quantifiable result can only be observed after the solutions are functional.

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