Sea change

How digital is transforming shipping

orange™ Business Services

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Shipping faces technological revolution

Digital transformation has had a profound impact across many industries. Now the shipping sector is experiencing a technological revolution that will change traditional working practices forever. Digital tools and solutions are delivering a range of benefits, which include increased efficiencies and vital cost savings, lower emissions, increased visibility of cargo, and enhanced crew welfare.

Shipping companies and operators can make the shift to smarter business approaches and practices enabled by enhanced connectivity and content delivery services. Big advances in satellite technology mean shipping companies can move large amounts of data back and forth faster and more conveniently than ever, while data analytics can be used to improve their operational efficiency. In an industry where companies work to narrow margins, having tools to reduce costs and improve the bottom line is a clear benefit.

The financial imperative remains crucial in the shipping business. It is an industry with long development cycles and extremely high asset costs. Operators can't afford to lose money by having ships in ports for too long and predictive maintenance can help minimize this. And more affordable, reliable connectivity makes ships more effective, more enjoyable workplaces.

This paper outlines the digital technologies that will transform the shipping industry over the next decade.

New innovators, new opportunities

Digital transformation in any industry is powered forward by innovation, and that creates a fertile environment for new start-ups, new technologies and new approaches.

Connectivity is key to digital transformation of the shipping industry, and ways of connecting ships to the internet are multiplying. In addition to bandwidth improvements from existing satellite networks, such as high-throughput satellites (HTS) and improved antennas and modems, new satellite networks are being planned. Companies such as OneWeb are planning launching "constellations" of hundreds of satellites into low-earth orbit with a goal of providing far greater access to connectivity for vessels at sea. The networks will operate in the satellite Ku-band and could effectively bring LTE-style coverage to ships for an on-land user experience.

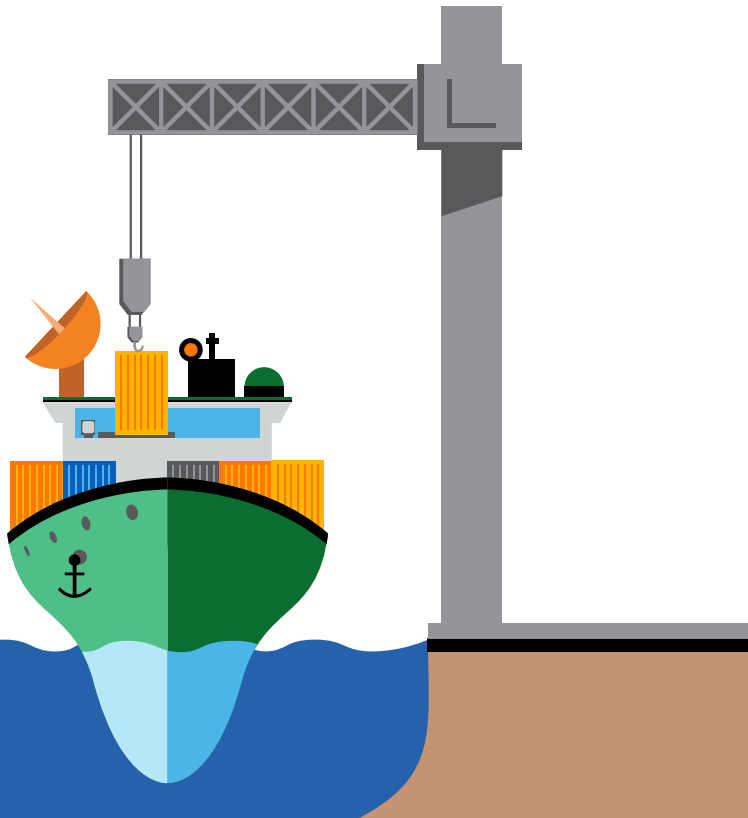
Digital transformation has created new business models, and start-ups are bringing new-economy thinking to shipping. Interesting examples include:

- A start-up that allows slow-to-adopt logistics companies to maximize the space in their shipping containers by making it easy to share space between multiple customers.
- Using blockchain technology to offer end-to-end bill of lading access by all entities in a supply chain, from freight forwarders and shipping carriers to port operators and regulators.
- A solution that allows customers to search for and filter shipping options on filters like price, time, route, fees and more.
- A start up dubbed "the Uber of the oceans" that offers a digitalized shipping experience via a web based platform to manage international trade, giving users real-time visibility of shipments plus navigation through customs and logistics challenges.

With the shipping industry facing challenges in the shape of digital start-ups and over-the-top (OTT) players, and environmental regulations, it needs to embrace different technologies that can disrupt traditional business cases and encourage innovators to develop new solutions to help revolutionize the industry.

"Through digital transformation, our vessels are also better equipped to manage safety issues and ensure regulatory compliance, in close contact with the headquarters, quickly and effectively."

– Mert Oruz, CIO, Arkas Holding



Digital transformation solutions and innovations

The traditional nature of shipping operations makes it an industry ripe for change. Better connectivity enables all kinds of new tools and solutions previously unavailable at sea.

Augmented/virtual reality

The potential for AR and VR is huge. According to Global Market Insights[1], the market for AR products is set to exceed $165 billion by 2024, and it can play a significant role solving many complex shipping challenges. There are a wide range of duties to be performed on a ship, and a company cannot train every crew member in everything. AR technology such as connected goggles can help crew members on board perform maintenance, such as repairing of satellite antennas, by accessing online training information or remote experts. VR is already being used to re-create entire simulated ships for training exercises, allowing trainees to walk around the simulated ship and familiarize themselves with the safe operation of systems and equipment.

Route planning/optimization

Electronic Chart Display and Information System (ECDIS) is a geographic information system that ships use for navigation and it is required by the International Maritime Organization (IMO) as an alternative to paper nautical charts.

ECDIS was a step along the path to what today's connectivity enables – real-time route planning and optimization. Ships can receive up-to-the-minute data and information about weather, incidents, potential obstacles and more, letting them re-route to a safer or calmer path if necessary. Route planning also impacts fuel consumption and helps shipping companies save money.

"Data can be collected on ship to assist with predictive maintenance, but data from off ship is also vital. This provides information on weather updates, wave data, safest routes and even security."

– Emil Regard, Managing Director, BlueTide Communications

Fuel costs account for around 46 per cent of operating expenses[2], and using predictive analytics tools that factor in weather forecast data lets ships optimize route planning, manage propulsion levels and thereby reduce overall fuel consumption.

IoT technologies

Internet of Things (IoT) has a big part to play in shipping, where tracking and tracing cargo in real time is vital. But companies need to ensure they have a clear business case in place and are tracking and tracing for the right reasons. With IoT in shipping, the main challenges are often not necessarily about technology, those solutions are being rapidly resolved: the challenge is in making the IoT business case and trying to bridge the gap between communications and connectivity providers.

IoT sensors are one technology that can help ships improve fuel consumption – and much more. Sensors can be used to monitor everything from a ship's speed to the temperature of the cargo it is carrying. That data can then be analyzed, optimized and sent to captains and crew, other ships or the shipping company's communications headquarters on land, all in real-time. All of this helps ships reduce running costs and, ultimately, can enable an optimized shipping ecosystem.

1. Global Market Insights, 2017 (https://www.gminsights.com/pressrelease/augmented-reality-ar-market)
2. Drewry Shipping Consultants (https://people.hofstra.edu/geotrans/eng/ch3en/conc3en/containeroperatingcosts.html)

Digital technologies in IoT are improving the traceability of cargo, down to individual container level. Remote container management (RCM) is a relatively simple new technology that uses a modem, GPS, wireless SIM card and satellite connectivity to create "smart" containers that can be monitored for faults or defects in real time. RCM is changing the concept of supply chain visibility in shipping, and offers great potential cost reductions.

IoT is also prompting new digital business models. A technique that is popular in the aviation sector could be extend to shipping. Condition-based maintenance has enabled an approach where companies do not sell you an engine, but they lease it to you. The engine owner uses IoT sensors to have real-time visibility of its condition, effectively turning the ship into its own profit and loss resource. This digital transformation-inspired model also shifts the business approach to OPEX instead of CAPEX and even helps reduce insurance premiums.

Maintenance drones

Unmanned aerial vehicles (UAV) or drones are playing an increasingly important role in ship surveys. Ships need regular inspections to ensure that they meet the safety requirements required by shipping legislation. Traditionally ship inspections are carried out manually, but this work is long and dangerous because of the sheer size of ships. Drones equipped with high-resolution cameras can make this work much easier by filming and recording the entire ship. Image recognition can also allow it to automatically detect and focus on any damage.

"By enhancing the communications capabilities of our vessels, we are able to synchronize and manage our integrated business operations more effectively."

– René Kofod-Olsen, Chief Executive Officer, Topaz

Automation

Unmanned vessels and autonomous logistics operations could even become a reality, if only for part of the journey. However, in most cases, ships will more than likely always need a certain number of human crew members on board. But technology is changing the ways people and goods are moved around. Digital tools can enable more automated processes and performance monitoring, condition-based maintenance and shore-based assistance that makes ships safer and more efficient. Automated processes like collision detection are already a reality.

Tomorrow's fuel optimization today?

Emissions and environmental impact remain areas of concern for shipping companies, and it is possible that technological developments could have a positive impact. According to one report[3], the 15 largest ships now emit as much pollution as all the world's cars.

This environmental impact can be mitigated by technology. Smart navigational tools can help ships save fuel and costs by taking shorter routes and adapting speed to match the availability of port services. Similarly, the availability of day-to-day environmental data can assist ships in lowering emissions.

3. The Guardian (https://www.theguardian.com/environment/2009/apr/09/shipping-pollution)

The land-user experience at sea

One of the most significant areas of digital transformation in shipping is making the at-sea user experience more comparable to that on land. This includes the ability to connect ships up to corporate networks and systems to effectively create an "office at sea".

Crew members can often be at sea for several months, meaning long periods away from family and friends. In the digital era, the ship operator's responsibility to crew has changed: crew members now take an average of three personal devices on board a vessel, and they want to be able to contact their loved ones just as they would while working on land. They want to be able to read the news, use social media, and download multimedia entertainment files.

The importance of crew welfare

Improving the lives of crew members is an area shipping companies have always tried to make a priority – and that need increases given that crew welfare is one of the key drivers behind digital transformation.

The incentive for shipping companies is that by giving seafarers an "on land" end-user experience while at sea, they enhance crew member morale overall. This can have a knock-on effect on crew member loyalty, which in turn contributes to lower costs for recruitment, training and retention.

"Harvesting and processing fish during long periods at sea is tough work, and modern ICT technologies can help the entire crew stay connected."

– Yuri Badodin, Technical Director, Dobroflot Corporate Group

Next generation ports

In addition to revolutionizing life on board ships, digital transformation is also impacting on ports. IoT, cloud computing and enhanced connectivity are enabling new tools like vehicle booking systems (VBS), with a mobile app designed specifically for the port's haulers. Other tools include apps that help reduce pollution and enhance efficiencies by optimizing truck routes and cutting congestion around ports, using Bluetooth, Radio-Frequency Identification (RFID) and license plate readers to gather data in real time.

Ports are also using new platforms to enable improved data sharing between different port stakeholders, combining data, interoperability of existing platforms and new apps within the supply chain. All this is designed to synchronize goods and logistics processes in port and reduce costs and delays. IoT apps are being used to enable smart tracking of containers and schedule operations.

Apps for ships are evolving

With more mobile devices now present on board ships and their use enabled by satellite connectivity, apps are having a growing influence. Applications across the fleet that are helping ship owners and crews include:

- Crew training
- Condition-based maintenance
- Enterprise resource management
- Crew safety

The importance of cybersecurity

While digital technology brings numerous potential benefits to the shipping industry, better connectivity also brings more potential threats.

Being connected to the corporate network requires the same degree of emphasis on cybersecurity as it would in a land-based office. However, a recent survey by shipping security specialist CyberKeel found that 44 per cent of ocean carriers have low levels of basic cybersecurity[4].

Further, the same research found that 10 per cent of carriers and 20 per cent of ports and shipping terminals still have not patched the vulnerabilities exposed in the Poodle and Heartbleed cyberattacks that occurred in 2014. According to satellite provider Inmarsat, 43 per cent of crew members have been on board a vessel that has experienced a cybersecurity incident, while 90 per cent of crew members have had no security training at all. Factor in that 95 per cent of cybersecurity incidents are due to human error, and the challenge becomes clear.

It is difficult to overstate the importance of making cybersecurity a central part of any shipping digital transformation strategy. The potential impact of a successful attack is huge and could result in the total loss of a ship and its cargo. Some tips that can help with ensuring your organization takes the right approach to shipping digital security include:

- **On sea, think land.** More connectivity, more devices and more apps equals more potential threats. With vessels increasingly becoming extensions of the corporate network, a change in philosophy is needed. Think of them as branch offices rather than isolated silos.
- **Ensure crew are trained on cybersecurity.** The human error element can be, if not eliminated, at least mitigated and minimized through smart training.
- **Appoint a cybersecurity officer to each ship.** This may be an existing ship safety or security officer who is familiar with regulation and compliance, but nominating a cybersecurity officer on board each vessel and giving them responsibility within the corporate structure is a smart move.
- **Adopt a "cybersecurity first" philosophy.** For example, more crew personal devices on board a ship is the same as more personal devices in any office. Companies need to implement BYOD policies and the appropriate security processes on board ship too.

4. CyberKeel (https://www.linkedin.com/pulse/44-carriers-show-cyber-weakness-lars-jensen/)

Checklist: five steps to digital transformation in shipping

For those companies that want to thrive, be successful today and tomorrow and compete against old and new rivals in the marketplace, digital transformation is essential.

To make digital transformation as smooth and successful as possible, we recommend following these five steps.

- **Think inclusively.** You are setting out to build a digital organization, not just digital processes or digital ships. Focus on the benefits to the whole company of having your fleet connected to your operations on land and develop accordingly.
- **Always be open to new ideas and innovations.** For example, blockchain has big a future in the shipping sector, because it can help reduce the complexity of shipping transactions and maintaining security. Be open to the potential of new digital technologies and focus on both the long-term benefits as well as perceived short-term ones.
- **Embrace big data.** Data analytics tools are essential to an effective shipping digital transformation strategy, and are key to making cost savings throughout the organization.
- **Establish who "owns" digital.** Many shipping companies have problems with digital transformation projects because they do not have a digital leader in place. Appoint a dedicated Chief Digital Officer who can lead projects forward with clarity and help address the aforementioned issues of roles/ responsibility and vision.
- **Practise in the sandbox.** Orange finds that customers appreciate being able to try out solutions in a protected sandbox before investing. Cloud-based platforms can let shipping companies experience the benefits of IoT solutions and other digital transformation initiatives before signing up and deploying them on board.

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