Digital evolution

The forces that are driving the transformation of the shipping industry

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The marine industry is considered a latecomer to the digitalisation revolution. We still deal manually with large amounts of paperwork at all levels, and most ships don't have even basic sensors to obtain digitalised data. A passenger aircraft generates several terabytes of data every day, whereas a cargo ship takes 50 days to generate just one terabyte of data.

'Digital evolution' and 'digital transformation' have become buzzwords across the maritime industry. The concept and process of digital transformation initiatives are expected to drive the transition of an organisation from a traditional to a 'smart' company. But what do they actually mean?

Digital evolution and transformation is not about replacing paper with technology, or even assigning new digital responsibilities to traditional roles. It is about moving beyond the concept of connectivity and data-gathering towards a more integrated future where the entire industry operates as a single 'digital ecosystem'.

Digitalisation is expected to lead to four major trends that will reshape the industry, improve rates and reduce cost:

- Data analytics
- Data flow
- Smart vessels and automated smart ports
- Shared capacity.

As the world around us evolves, a company needs to adopt an agile digital business model if it is to begin digital evolution and transformation. Digitalisation is no longer the future; it is present.

Digital transformation and operational excellence

Digital transformation requires the adoption of digital technologies such as cloud-based solutions, blockchain and the Internet of Things (IoT) to transform the way assets are managed at sea. An important part of digital transformation is the drive towards autonomous systems, with automation being an enabling technology.

Going hand in hand with digital transformation is 'operational excellence'. The phrase means aligning people, process and technology capabilities to create a culture of continuous improvement. This bridges the gap between strategic objectives and operational architecture, improving operational performance.

The maritime industry has not yet fully taken advantage of digital technologies. The extent of digital transformation varies from one organisation to another, largely because of different digital footprint and maturity levels. A digital maturity assessment (DMA) will reveal the current level of process digitalisation compared with the availability of digital process support options.

Operational excellence should pave the way for digital transformation, and this in turn drives further operational excellence by enhancing information flow and service operations.

The maritime industry needs to recognise that digital technologies offer powerful means of connecting processes and people efficiently and of using information effectively without connectivity gaps.

Big data for asset management and optimisation

'Big data' refers to the large volume of data that companies handle every day, both structured and unstructured. This data come from a variety of sources such as business transactions, sensors and machine-to-machine interactions. Formats range from structured, numeric data in traditional databases to unstructured text documents, emails and remotely monitored software systems.

It is not the amount of data that is important; it is what an organisation does with it that matters. Big data can be analysed for insights that lead to better decisions and strategic business moves. Data analytics bring a host of benefits to the merchant marine fleet and help the company turn those indications into fruitful reality.

The maritime industry generates massive amounts of data from vessel operations and other sources, but much of it is not being used efficiently. Retrieval of data from equipment is not new; the game-changers are the analysis tools now available that can manage the data. These tools can make use of the data to provide accurate insights into whether equipment and business processes are operating at their optimum level.

For example, engine-makers offer vessel-specific monitoring and diagnostics systems that are capable of monitoring the vessel's main engines, generators, thrusters and other systems around the clock, feeding the data to the engine-maker's analyst. The analyst scrubs and cleans this data and produces advisory reports for management. These reports include maintenance recommendations for each item of equipment. The analyst can suggest ways of lowering costs and increasing operational efficiencies. For example, mandatory inspection or replacement of a pump after a fixed number of hours is no longer required because performance data from the equipment sensors indicate when action is required.

Digital big data asset management and optimisation will bring a cultural shift in maintenance from a visual, calendar-driven approach to an analytical, data-driven process.

Digital data, connectivity and records

Port and terminal authorities around the world are recognising the industry's migration towards digitalisation. Port authorities are relying on big data analytics (BDA), the Internet of Things and cutting-edge technologies like blockchain to replace traditional person-to-person communication.

BDA is the process of examining large and varied data sets – ie big data – to uncover hidden patterns, previously unknown correlations, market trends, customer preferences and other useful information that can help organisations make better informed business decisions.

The IoT essentially uses satellite constellations to link data from devices, appliances, equipment and machinery. These have

the intelligence to seamlessly connect, communicate and control or manage each other to perform a set of tasks with minimum intervention.

The rapid development of the IoT means that enormous quantities of data from different sources will have to be processed, analysed and visualised in a timely manner. This is where big data analysis fits in. Big data analysis and the Internet of Things complement each other and develop together as a 'double helix'.

Information-sharing

Blockchain is an important part of secure data management. It consists of a continuously growing list of records, called blocks, which are linked and secured using cryptography. Blockchain is a public electronic ledger that can be openly shared among disparate users and that creates an unchangeable record of their transactions, each one time-stamped and linked to the previous one. It can only be updated by consensus between participants in the system, and when new data is entered it can never be erased.

The International Maritime Organization (IMO) supports the implementation of automated electronic data exchange from ship to ship and ship to shore to increase efficiency, safety and security of maritime navigation and communications.

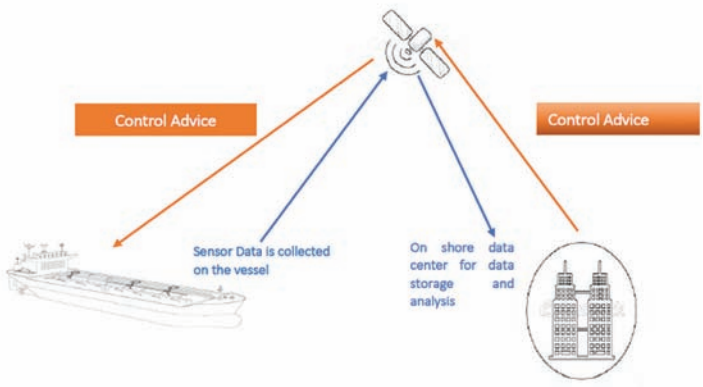
Shipping companies, charterers and equipment manufacturers are all striving to become the first to adopt digitalisation. This requires advanced IT and communications infrastructure and ship systems, updated software, ship-to-shore connectivity and, in many cases, cloud applications and new methods of online working.

GPS navigation, real-time weather data feeds and 'smart' containers are just some of the technologies redefining the movement of goods. In future, ships will inform ports about the goods in the containers on board long before docking, allowing better planning and faster unloading. Containers equipped with sensors and radio-frequency identification (RFID) transponders will be registered and tracked for optimised transport and distribution. Perishable goods, for example, will be monitored and delivered before spoilage can occur. Telematics systems and databases in freight trucks will help reduce waiting times and bottlenecks in ports, by keeping drivers informed of precisely when and where containers will be unloaded.

The oil and gas industry is beginning a transformation of its own, increasingly looking towards data-driven solutions to boost performance, enhance efficiency and, ultimately, to reduce costs.

Digitalisation and classification services

Classification societies are exploring the opportunities offered by digital technologies for operational optimisation, design optimisation and other applications. Digital applications rely on a vessel's operational data, incorporating vessels into the IoT. While this can include logistics data, administrative data, noon reports and other voyage-related data, classification societies tend to focus on the data that are received from the sensors on board the vessels.



Digital sensor data is collected on board from many different sources, such as navigation, machinery operations and safety systems. Once the sensor data is transferred ashore, it can be combined with other data and models to produce new knowledge and enables new applications.

Although shipping companies are increasingly willing to share information in order to reap the benefits of big data analysis, the approach to data capture remains very fragmented. Similar data are routinely sent to several vendors and analysis is still carried out almost entirely on a ship-by-ship basis, which is both time-consuming and inefficient.

By contrast, classification societies have established their own data centres, consisting of a secured shipping operations database serving as an independent information hub. Here data are collected from multiple vessels, regardless of class or company, but are accessible only by agreed permissions. Companies are free to choose what they want to share and to specify whether they want it shared with engine-makers, equipment manufacturers, shipyards or other stakeholders who might benefit.

In recent years, classification societies have developed their own software and services to advance specific digitisation-based systems:

- Hull maintenance information service to provide owners and managers with hull maintenance information for individual ships
- Condition-based maintenance, which requires analysis of ship data from onboard sensors using algorithms to monitor ship machinery conditions
- Onshore Digital Archive Centre complying with IMO Goal-Based Standards (GBS) and industry standards
- Online emission reports as required by EU Monitoring, Reporting, Verification (MRV) regulations
- Electronic certificates with secured electronic files
- Voyage optimisation with planning, monitoring and follow-up of ship operations and performance analysis.

Overcoming the challenges

The stream of data available to maritime operators is growing continuously. Worldwide, 2.5 quintillion bytes of data are being generated every day.

To gain valuable insights from all this data requires vast amounts of computation resource for storage, harmonisation and analysis. This in turn requires immense investment, software expertise and knowledge of the sector.

One crucial challenge that the industry must address before data analysis can reach its full potential is the segregation of data in silos. Currently, vessel operators and system developers all possess their own data. Reluctance to share data and ambiguity about who owns it have laid roadblocks on the digital journey. Initiatives such as the classification societies' data centres will go some way towards breaking down these silos, but these are only the beginning.

The benefits of consolidating data can be huge. Through data consolidation and assessment of all the different elements of vessel, voyage and company performance on one platform, vessel operators can gain the insight needed to inform all aspects of vessel management, from design and operational efficiency through to component or system stress and repair.

The maritime industry is only at the start of its digital journey, but the future is promising. Riding a wave of transformative innovation and change, digitalisation will help improve safety, reduce costs and streamline vessel and fleet performance, through data.