As disruptive as the smart phone, the smart ship will revolutionise the landscape of ship design and operations, redefining the maritime industry and the roles of the players in it; with implications for shipping companies, shipbuilders and maritime systems providers, as well as technology companies from other sectors. Constant real-time remote monitoring of vessels worldwide will see ships become more reliable, more efficient and more closely integrated into global supply chains generating cost savings and improving revenue generation.

A NEW ERA OF OPPORTUNITY

The smart ship has the potential to create new shipping services, such as online cargo service marketplaces, more efficient pooling and leasing of assets, and of course, new alliances. Some of these services will support existing players in the market and others will be more disruptive. New players could enter the market and potentially capture a significant share of business in the same way that Uber, Spotify and Airbnb have done in other industries.

Growing worldwide interest in remote and autonomous shipping has been driven by the potential benefits. They are expected to be safer, more efficient and cheaper both to build and to run.

DEFENCE AGAINST ACCIDENTS

According to a report published by insurance company Allianz in 2012, between 75 and 96% of marine accidents are a result of ‘human error’. This is often as a result of fatigue. Remote controlled and autonomous ships will reduce the risk of injury and even death amongst ship crews, as well as the potential loss of, or damage to, valuable assets.

MORE CAPACITY

Remote controlled and autonomous ships will allow vessels to be designed with a larger cargo capacity, better hydrodynamics and less wind resistance. With no crew to accommodate certain features of today’s ships – for example, the deck house, the crew accommodation and elements of the ventilation heating and sewage systems – these can all be removed. This will make the ship lighter, cutting energy and fuel consumption, reducing operating and construction costs and facilitating designs with more and different space for cargo.

MARITIME SKILLS

Intelligent ships will also provide a response to a growing maritime skills shortage. Ships are becoming increasingly complex with more and more systems needing more and more skilled operatives. At the same time changes in lifestyle and expectations are reducing the attractiveness of seafaring as a career, with fewer people wanting to spend weeks at a time away from home and family. Remote and autonomous operations could see the transfer of seafaring jobs, requiring high levels of education and skills, from sea to remote operations centres on land and make them more attractive to young people entering the industry. Of course crew costs will be reduced.

The technologies needed to make remote and autonomous ships a reality exist – the sensor technology needed is sound and commercially available and the algorithms needed for robust decision support systems – the vessel’s ‘virtual captain’ – are not far away. The challenge is to find the optimum way to combine them cost effectively in a marine environment.
CONTEMPORARY TESTING
A series of tests of the sensor arrays in a range of operating and climatic conditions will be carried out in Finland in the coming months. Those tests will be on board Finferries’ 65 metre double ended ferry, the Stella, which operates between Korpo and Houtskär.

How to combine existing communication technologies in an optimum way for autonomous ship control is also being explored. As part of the Rolls-Royce led AAWA project, Rolls-Royce and Inmarsat have created a simulated autonomous ship control system which is connected to a satellite communications link, as well as land based systems, and allows the behaviour of the complete communication system to be explored.

The collection and analysis of significant quantities of operating data and the development of enhanced analytic capabilities is crucial to the development of remote and autonomous ships, providing a massive set of historical statistical data from which robust trends can be drawn and valid predictions of ship reliability made. Significantly more standardised and reliable ships are essential if they are to operate at sea for several weeks without on board engineers.

The intelligent ship of today is already making use of considerable quantities of data as part of its daily activities. Systems are monitoring vessel machinery - such as its engines and propulsors – ensuring they are performing as efficiently and effectively as possible. Big Data is already being used to design better ships. The latest addition to the Rolls-Royce designed fishing fleet is a 70-metre-long factory trawler the Holmøy. This ship incorporates some of the company’s most advanced technology and benefitted from thousands of hours of data logging aboard an earlier Rolls-Royce designed vessel.

SAFETY AND SECURITY
To secure regulatory approval, the support of ship owners, operators and seafarers, as well as wider public acceptance, the operation of remote and autonomous ships will obviously need to be at least as safe as existing vessels. The marine industry has some experience of systematic and comprehensive risk assessments. However, when new or emerging technology is involved a wider and deeper understanding of a new and changed risk portfolio – with a variety of known and unknown hazards – is needed. The AAWA project is identifying and exploring these hazards and developing approaches to tackle them.

Cybersecurity will also be critical to the safe and successful operation of remote and autonomous vessels. The project is identifying and adapting current best practice from a range of industries for application in the marine environment.

The results of such studies will be used to make recommendations to regulators and classification societies to support the development of standards for remote and unmanned vessel operation. Such rules are vital to the development of remote and autonomous ships. For remote and autonomous shipping to become a reality we need efforts at all regulatory levels. The legal challenges of constructing and operating a demonstration vessel at a national level need to be explored, while simultaneously considering appropriate rule changes at the IMO level. Legislation can be changed if there is the political will. Questions of liability for autonomous ships are subject to national variations, but generally it seems that there is a less urgent need for regulatory change in this field. What also needs to be explored is to what extent other liability rules, such as product liability, would affect traditional rules of maritime liability and insurance. These questions are being studied by researchers at the Faculty of Law at the University of Turku, Finland.

This is no academic exercise as commercial ship operators are actively involved in the AAWA project. Finferries is helping carry out a series of tests of sensor arrays in a range of operating and climatic conditions. ESL Shipping Ltd is helping explore the implications of remote and autonomous ships for the short sea cargo sector. This is happening. It’s not if, it’s when. We will see a remote controlled ship in commercial use by 2020.

ABOUT THE AUTHOR
Oskar Levander joined Rolls-Royce in 2012 as VP Innovation, Engineering & Technology and Marine. Before this, he worked for most of his career with Wärtsilä where he held various roles, such as Director, Concept Design, Marine Lifecycle Solutions. He graduated with honours from Helsinki University of Technology in 2000, with an MSc in Naval Architecture. Oskar has been working mostly with the development of new ship designs, machinery and propulsion concepts for various ship types and emerging marine technologies. He has been deeply involved in the development of more energy efficient ships and he has been an active force in promoting the marine use of LNG.

ABOUT THE ORGANISATION
Rolls-Royce’s vision is to be the market-leader in high performance power systems where our engineering expertise, global reach and deep industry knowledge deliver outstanding customer relationships and solutions. We operate across five businesses: Civil Aerospace, Defence Aerospace, Marine, Nuclear and Power Systems. Rolls-Royce has customers in more than 120 countries, comprising more than 400 airlines and leasing customers, 160 armed forces, 4,000 marine customers, including 70 navies, and more than 5,000 power and nuclear customers.

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