Almost a decade has passed since the International Maritime Organization’s (IMO’s) Maritime Safety Committee (MSC) outlined its vision for taking electronic navigation forward from electronic chart display and information systems, or ECDIS. The concept centred on improving the flow of information between ship and shore to enhance safety but was also about bringing efficiency gains and, indirectly, helping the environment. It seems timely, therefore, to take stock of what has been achieved, particularly in light of the rate of technological change in the past decade.

For several years, the IMO’s vision for taking navigation beyond ECDIS seemed moribund, but a string of European R&D projects are now starting to bear fruit.

Kevin Tester, correspondent

As it stood, ships knew their own routes, but not those of the vessels around them. When vessels met, they could glean the name, position, speed, and final destination of their opposite number from AIS. But that information was correct only for that point in time. By adding route data to the mix, a captain would have a clearer picture of the others’ intentions.

By feeding this richer information into software anti-collision tools, it would be possible to automatically generate warnings if a nearby vessel strayed from its intended route, thereby helping officers detect potential incidents in good time and pre-emptively respond to prevent them escalating.

Magnus Sundström, the project manager of MonaLisa at the time, quipped that route exchange would be similar to smartphones, which by then were rapidly becoming a must-have accessory. “At first no one really knew why they would need one, but put it in their hands and before long they cannot live without it,” he said.

The route exchange standards pioneered on MonaLisa paved the way for a fuller implementation with real-world application: sea traffic management (STM). With standards set and a framework for practical application in place, the next step was to see whether the idea would fly - or rather, sail. This was the purpose of the STM Validation project, which commenced in 2015 and concludes later this year.

This massive undertaking entailed setting up two large-scale testbeds in the Nordic and Mediterranean seas by building a functioning infrastructure for information exchange, introducing machine-to-machine communication protocols, developing software services, and setting up procedures for richer ship port collaboration. More than 300 vessels, a dozen ports, five shore centres, and a number of technology suppliers came together to participate in the trials.

“The services and functionalities enabled by STM map pretty neatly with those envisaged under the IMO’s vision for e-navigation,” project spokesman Ulf Siwe told S&SA. “We’ve shown that this very conceptual idea can be implemented in the real world.”

Widening the scope

The IMO’s vision for e-navigation was shaped primarily from the perspective of vessels. Of course, vessels don’t operate in a vacuum. The MonaLisa and STM researchers quickly realised that involving ports was essential. Not only would ports themselves gain from various efficiencies, but it would raise the benefits for all stakeholders. It was a proverbial win-win.

As the STM Validation project reaches its scheduled
incidents. Nevertheless, often one vessel has to wait for another to pass, which has knock-on effects on fuel consumption, emissions, and schedules,” Siwe added.

Overall, the situation is sub-optimal for everyone involved. STM will allow routes to be exchanged between ferries, the pilots on other ships, and the vessel traffic service (VTS) centres, enabling better planning and helping traffic flow more smoothly through the narrow channels.

Siwe revealed that another implementation project was in the pipeline. Pending final approval, it will get under way in September. Its focus will be safer navigation of tanker traffic in the Baltic, where a major incident would be catastrophic for the marine environment. Systems on a number of tankers and at VTS centres in Estonia, Finland, Russia, and Sweden will be updated so that they can employ STM.

There are also follow-on initiatives in the Mediterranean. Cyprus has approved a project involving a major transhipment port that serves heavy traffic from Israel, Lebanon, Egypt, and other nearby countries. Because the steaming distances between these countries are so short, delays in loading at preceding ports can quickly accumulate. Route exchange would permit ports to adjust schedules on the fly and react more nimly to accommodate delays.

Another example is Pronto, a digital solution developed by Port of Rotterdam that went live in April. While strictly speaking, Pronto did not originate from the STM project, its underlying philosophy has much in common.

The initiative here is for ships – 30,000 of them call at the port annually – to share estimated arrival times and receive recommended speed adjustments to optimise their arrival at berth. According to the port, the application will reduce waiting times by 20% and boost the utilisation of capacity. The advice isn’t always to slow down, Siwe noted. This might seem counter-intuitive in terms of controlling emissions, but when duration at berth and impact on other vessels is taken into account, the net effect is a reduction. “Instead of slow-steaming, the aim should be ‘right-steaming.’” He added that the Pronto platform was compatible with ships using the STM route-exchange format.

Finding common ground
Port of Rotterdam is talking with its neighbours in Felixstowe and Hamburg about common digital initiatives. Such co-operation between rivals is, according to Siwe, unprecedented. “For best results, optimisation calls for cluster involvement. This realisation was so profound that it even outweighed longstanding rivalries,” he said.

Siwe believes that simply engaging in dialogue and co-operating can bring benefits even before the conversation turns to technological integration. Moreover, as more ports build STM into their operations and procedures, so the value for ships to employ the standard increases. Siwe hopes this organic growth will trigger a positive feedback loop for the standard’s wider adoption.

In fact, STM is no longer confined to European waters. Partnerships are being formed worldwide. One of the earliest international partners was the Smart Navigation initiative in South Korea. That programme, which started shortly after the sinking of passenger ferry Sewol in 2014, has focused on stemming incidents involving smaller non-SOLAS vessels such as fishing boats. STM complements and expands its scope by providing a platform for larger SOLAS tonnage operating alongside them.

China’s Maritime Safety Administration recently entered an agreement to set up an STM testbed. Similar to South Korea, China has been pouring resources into developing e-navigation solutions for smaller boats and its extensive network of rivers and inland waterways. However, the Chinese realise the importance of adopting global standards.

STM will be the data and communications standard used in the Sesame II project in Singapore, whose key objective is to reduce the numerous minor collisions that occur due to congestion. Next door, Malaysia has announced a major three-year STM project running through to 2020.

Discussions are also ongoing with the Australian Maritime Safety Authority and Transport Canada. “Australia is a great partner to have on board as its strong import/export ties help unify our partners across east Asia,” Siwe said. However, the United States is proving a harder nut to crack, owing to the way the US Coast Guard functions, he noted. “To move forward, broad support is needed at the state, federal, and national level.”

Key to the long-term future of STM and e-navigation more broadly is the development of global standards for data transfer. Regional solutions have little hope of succeeding when they must serve ships from all corners of the globe.

It does not necessarily follow that the applications and software platforms responsible for processing, presenting, and helping personnel, whether on ship or on shore, arriving at safer decisions must be identical. In fact, different regions may benefit from different implementations that better match local requirements. However, they must all talk the same language.

It’s conceivable that e-navigation slipped down the list of priorities at the IMO owing to the excitement surrounding remote control of autonomous ships. With an eye on the future, ASJ asked Siwe how these twin technological developments might mesh. “STM did not set out to build an infrastructure for self-navigating ships,” he explained, “however, I find it difficult to imagine such ships ever sailing without something like STM in place.”