Open source advocate Krystyna Wojnarowicz has spent decades helping industries transition towards digitalization and is now committed to bringing the maritime world up to speed. She is co-founder of Silicon Valley based Marsec, Inc., a software engineering center of excellence specializing in sea traffic management solutions.

What lessons does Silicon Valley have for the maritime industry?

Silicon Valley software companies focus strongly on the customer. We are very good at developing new technologies and solutions that address customers’ pain points thus providing real value. Another key element of our success is the widespread use of open source software as a component in our solutions. This enables us to shorten development time and radically lower the cost to the customer without compromising on system quality.

All Marsec’s e-Navigation and sea traffic management solutions are based on open source. However, not everything has to be or should be open and free - it has to make business sense for all. Nevertheless, I do believe that encompassing open source components in products and services is a must and the way forward in maritime. It is one of the key enablers for the Internet itself and therefore for both the industrial Internet of Things and cloud computing.

I believe you are also a proponent of open innovation and new forms of collaboration. The open source movement is all about collaboration and I think maritime can learn a lot from the open source movement about collaborative business models. In Silicon Valley, we collaborate with our competitors to create platforms upon which we then build innovative value-added services. Collaborative business models have to grow as an industry is transformed through the technology that is emerging. Large software players have figured that they often use up to 80 percent of their time developing similar platforms. However, most of their income comes from the 20 percent of real innovative services run on the platforms. This is their competitive edge. So, instead of all wasting money maintaining individual platforms, they agree on the smallest common denominator and collaborate to distribute the maintenance costs.
This is how open source works. For instance, why do all these huge companies work “for free” to develop Linux? Because it’s just the platform upon which real innovation occurs. The Valley has understood this, but Europe is still lagging behind. The maritime industry, especially marine electronics players, should grab this opportunity to make things cheaper, faster and better for everyone. Open source will reduce development costs for software companies and allow them to focus on the real differentiating value, while lowering prices for the customer. So, it’s a win-win situation.

Some maritime players are concerned about data security and ownership. Indeed, with Big Data being produced and collected from shipboard sensors, the question is, “who owns what?” Data is a competitive asset and has to be managed as such at the enterprise level. For it to drive strategic insights that lead to competitive advantage like improved performance, predictability, and profitability, data must be analyzed and presented as useful information for end users and decision makers.

Aggregating and analyzing Big Data in-house may be challenging, so I see the emergence of “data brokers”, companies specializing in turning data into useful information to support informed decisions. Beyond this, shipowners could consider releasing the commercial potential of their data by selling it whenever it makes business sense. There are some relevant and well-proven data management models for this in the financial services sector.

Data and system security is of paramount importance. Security should be incorporated from the early design stages of a robust system architecture, and the highest security mechanisms should guard the data itself. Here the maritime industry can learn a lot from such industries as financial or medical services or the defense sector.

At industry level, the latest digital developments suggest some profound changes. The maritime sector, as part of intermodal transportation networks, will become one of the new hybrid industries, driven by the advent of the industrial Internet of Things which will blur boundaries between traditional industries.

An “Internet of Things at Sea” would involve interconnecting ships and shore in real time. With deep sea connectivity still expensive, isn’t this science fiction? Not at all: the industrial Internet of Things revolution could see the transport industry being one of the early adopters. We’re very close to being able to build an Internet of Things at Sea that allows us to connect and exchange data all the time and anywhere via Internet enabled technologies. For once, maritime seems well positioned to have a head start, as we already have sensors producing all kinds of data onboard ships. However, as yet it isn’t really being collected and analyzed properly in real time.

Ashore, the Internet of Things can enable this by pushing data continuously to and from the cloud. At sea however, continuously pushing data from ships into the cloud and to shore is difficult and expensive and even undesirable due to
security concerns with the current marine communications solutions. However, two new developments promise to change this.

Deep-sea connectivity via high throughput satellite networks could massively increase data capacity and help unlock the potential for ship-wide data gathering. However, nano-satellites will likely be the real enabling technology, providing cheap, global connectivity for the entire maritime industry. As small as a shoebox, cheap to build (from off the shelf components) and launch, they can fill in the present coverage black spots. More importantly though, unlike traditional satellites with 10-15 year lifetimes, nano-satellites can be replaced with software- and hardware-updated versions every two years. This will provide the almost continuous technology refresh rate required for the success of the industrial Internet of Things at Sea.

“Edge or fog computing” is the other enabling technology. It brings processing power closer to the sensors aboard ships. The collected data is analyzed in real time onboard, then some is used directly to support crew decisions and only what is needed ashore is batched up and shot into the cloud.

This also means much less satellite bandwidth and associated costs, but also requires some extra computing capacity on board. Luckily, sensors and processing are very cheap. You can use small, powerful and inexpensive Linux computers, which need little power and space. Locating them onboard will also help to solve data security and ownership issues for ship owners. Edge computing using open architecture delivers seamless interoperability at low cost.

The Danish Maritime Authority has been exploring the Maritime Cloud idea, and I believe you recently collaborated with them on an e-Navigation test bed. Yes, we are actively involved in developing and supporting the Maritime Cloud, an open source framework for maritime communication. We utilized an edge computing approach in this test bed, which uses an iPad app connected to a Linux server located onboard vessels to demonstrate automated Sea Traffic Management.

We deployed the test bed onboard five vessels owned by Bastø Fosen ferry company in the Horten-Moss Strait, the most heavily trafficked seaway in Norway. To test the app, we also created land-based installations at Bastø Fosen’s traffic center and at the Norwegian Coastal Administration where they also oversee traffic.

The app, called REX, short for Route EXchange, allows captains to share routes in real time to optimize navigation. It connects bridge crew to a system that takes into account each ship’s characteristics, including how long it takes to accelerate and decelerate. Besides aiding quick decision-making, the app can also be used as a planning station to plan routes and adjust them well ahead of departure.

The test bed indicated fuel savings of up to 15% per annum. Based on this, I believe that industrial Internet-of-Things-enabled solutions such as REX can lead to the building of a global system of sea traffic management and a smart intermodal transport system.