

Driving Digital Transformation: A Perspective from Erwin Rademaker, Program Manager, Port of Rotterdam Authority

By Michael J. Keegan



The Port of Rotterdam is the largest port in Europe. From all indications, the port is preparing for the future today, focusing on safety, efficiency, and sustainability. To do this successfully, the port is developing its digital twin, providing real-time situational awareness of all things static, moving, human-driven, or auto-

nous, pulling together all the geographic, sensor, and real-time information to provide port personnel a complete and current view of port activities.

Erwin Rademaker, program manager with the Port of Rotterdam Authority, joined me and my co-host, Sreeram Visvanathan, IBM global managing director for Government, Healthcare, and Life Sciences on *The Business of Government Hour*, to discuss the Port of Rotterdam’s digital transformation strategy, how it is creating its “digital twin,” and other ways the port is changing the way it does business. We conducted this interview at this year’s SPADE conference hosted in Soesterberg, the Netherlands. It brought together defense, intelligence, and security leaders from Europe and around the world in dialogue with experts from IBM and industry. This year’s theme was designing for the future of defense and security. The following is an edited excerpt of our discussion, complemented with updated and additional research.

History and Mission of the Port of Rotterdam

The Port of Rotterdam is one of the oldest and largest seaports in Europe. The port became a major seaport in 1360 after the construction of a canal to the Schie. This development allowed the port to gain access to larger cities in the north, and to facilitate the transport of goods between England and Germany. The Port of Rotterdam became the country’s second most important port after its expansion along the Meuse.

Today, the port is a strategically important distribution point in Europe. From 1962 until 2004, it was the world’s busiest port. Today, the port stretches 26 miles, docks more than 140,000 vessels annually, and handles about 460 million tons of cargo annually.

The port is operated by the Port of Rotterdam Authority, originally a municipal body of the municipality of Rotterdam, but since January 2004, a government corporation jointly owned by the municipality of Rotterdam and the Dutch State. The mission of the Port of Rotterdam Authority is to create economic and social value by working with clients and stakeholders in the realization of sustainable growth in Rotterdam’s world-class port. The objective is to enhance the port’s competitive position as a logistics hub and world-class industrial complex—not only in terms of size, but also with regard to quality. The Authority is leading the transition to sustainable energy and it is committed to digitalization in order to make the port and the supply chain more efficient. The core tasks of the Authority are to develop, manage, and exploit the port in a sustainable way and to deliver speedy, safe services for shipping.

Competitive Advantage for the Port of Rotterdam

From a historical point, our competitive advantage is location. We are a river port. The river Meuse and the Rhine, two of the biggest rivers on the European continent, are on the western side and flow into the sea at Rotterdam. Our great connection to the hinterland, rivers, and sea is a strategic advantage—so that’s one thing. At the other end, we have very deep waters. The port can accommodate ships that require deep water to offload and onload. While location and water depth are reflective of traditional competitive advantages, we also need to think about what our competitive advantages need to look like in the future. Today, we are the most connected port, both physically and now digitally, as we undergo a total digital transformation.

As a program manager, I work directly for the Port Authority, focusing on building that competitive advantage and leading our transformation effort across the port. Whether we're pursuing sustainable energy or digital transformation, we can't do it alone. We need to create a coalition of partners and stakeholders to make these big changes happen. My role is to create these partnerships and share a vision of where we are heading within the strategic mission of the port, and then execute on that.

Facing Challenges and Making Connections

We face many challenges. My most significant is finding and working with partners who share our vision of taking a long-term approach, rather than pursue the short-term of a one-year cycle of profit and loss. Engaging partners who share the port's long-term vision is challenging but necessary. This is why we look for partners who are world market leaders and invest significantly in research and development.

The other challenge is internal. On a strategic level, we make sure we connect with those responsible for port operations. They manage vessel traffic and make sure every ship is safe, into and out of the port. Port operations control all aspects of this process. When we introduce an innovative change—such as energy transition, digital transformation, or the coming of autonomous ships—these efforts can lead to major

disruptions in the current port operations. As port operators, we must understand how these changes and innovations impact the operations of our stakeholders.

Digital Transformation Strategy

In planning for the future, we had to go back to basics and ask ourselves how we should operate as a modern port. We recognized the need to improve and optimize how we do things. The Port of Rotterdam Authority aims to be the smartest port leveraging the Internet of Things (IoT)—which includes sensors and finding the easy ways to connect things using mobile devices and mobile network platforms. Generally, our initiatives either focus on better control and management of the port and port infrastructure (our core tasks) or they revolve around improved insight into, or efficiency of, logistics processes.

Our long-term strategy focuses on optimizing and coordinating the handling of ships through transparent information sharing. For instance, we're enabling clients and tenants to engage in smart planning so they can select the most efficient routes themselves. Also, we're enabling berths and dolphins to automatically indicate when they become available. We are constantly looking at new technologies to apply, even for mission critical systems like the hydro-meteo system, which we replaced with the Watson IoT platform.



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Another trigger framing our digital transformation efforts—more automation for our port tenants. The most automated terminal in the world is the Rotterdam World Gateway terminal on the far end of the Maasvlakte 2. You don't see anyone in the terminal anymore. It's fully automated. Loading and unloading containers on vessels are completely automated. The only manual or human interference is a crane operator remotely controlling multiple cranes at the same time. With the tenants getting more and more automated and digitized, the port has to provide more and more information. This is all technology and market demand driven. As our tenants change the way they do business, we're working to accommodate those changes. We realize the demand for more integrated, real-time, and seamless information will only increase. Therefore, we developed this vision of the digital twin, which is a digital representation of our physical port.

Developing a Digital Twin

The port of Rotterdam is committed to becoming the world's smartest port and the development of the digital twin is key. It is a virtual representation of a physical object and system—across its entire lifecycle. It uses digital tools and real-time data to virtually create, test, build, and monitor the goings on at the port. The digital twin will be an exact digital replica of our operations, mirroring all of our resources and tracking ship movements, infrastructure, weather, geographical information, and water depth data—with 100 percent accuracy.

Developing the digital twin is a way to anticipate the significant transformation to the near future—the company of the digital, fully autonomous ship. We're taking a digital ecosystem approach. Our geographic information system (GIS)-powered digital twin would allow port managers to view the operations of all the primary players. It would provide an accurate, current picture of what is going on in the port—everything from the weather to how many ships are sailing about, their speed, and where they are headed. Simulations would be run digitally to improve efficiency and save money in the real port. We anticipate being able to pinpoint the best times for ships to berth and offload or take on cargo, because the digital twin simulations will give them the optimal water depths and berth vacancies, among other variables.

In the digital twin, we can predict with more precision the future water depth. Water depth in the ports consists of the water bottom, the dredging area, the dredging depth, and the water height. In Rotterdam, at the seaside, we have a tide of one to two meters. If we can predict 72 hours ahead

of a ship's arrival the exact water depth in any place in the port, container vessel owners heading to the port may better determine its safety margin and keel clearance. With precise, predictive information, the vessel may decrease that safety margin and the keel clearance 30 centimeters. This means the vessel could add 20 more cargo units on board. In having this information, we are contributing to a more sustainable world, as well as more efficient cargo transportation and less pollution.

Autonomous Ships of the Future

Autonomous ships and unmanned ships are not the same. According to international law today, vessels traveling international waters must have a captain on board. I understand that the International Maritime Organization, as part of its roadmap to autonomous shipping, may be changing this rule shortly. From that point, it will be possible to have a captain on shore remotely controlling a boat, providing he has full access to all the necessary systems. That will be the first step for autonomous shipping. The first autonomous vessel already is in production. It's a ferry called Falco in Finland. Many people might not be aware of it, but we are living in an autonomous vessel era right now. The first one is already in production. But it still has a captain on board, because regulation requires it. The essential elements of autonomous shipping include a vessel with Global Positioning System (GPS)-location technology, a smart ship equipped with active/moving sensors, a smart infrastructure equipped with passive/fixed sensors, and integrated, real-time information.



Perspective: Digital Transformation

The smart Container 42 symbolizes (semi) autonomous ships that in the near future need all kinds of new, hyper-secure and accurate information in order to perform their (semi) autonomous tasks in a safe, reliable manner. It is the smartest container this planet has ever seen equipped with sensors and communication technology, and it will travel around the world for two years to collect data that, until now, had been invisible. Vibrations, pitch, position, noise, air pollution, humidity, and temperature are among the things that will be recorded. The name was inspired by Douglas Adams, *The Hitchhikers Guide to the Galaxy*. It's a metaphor for the smart port of the future. The Container 42 platform will explore that unknown territory. The collected information will offer all parties in the supply chain more insight and the capability for further optimizing their processes.



Being True to Yourself and Your Vision

During an age of transformation, like today, the first quality a leader needs is to start with a comprehensive vision and mission. Of course, many things are unknown, so you have to embrace the unknown—it takes courage. Nor can you do it alone. You need to engage partners who share your vision and mission and align with your end goal to create a new and better future. I don't consider myself a leader. I'm just a regular guy who loves his job, but it's not everything to me. Leaders must be true to themselves. That's the lesson I teach to my children: be yourself.

You can listen to the complete version of my interview with Erwin Rademaker, Program Manager, Port of Rotterdam Authority at businessofgovernment.org/interviews. To learn more about the transformation to smartest port, go to portofrotterdam.com/en/port-forward/knowledge.

