Strong network anchors

by Sarah Banks, *Head of Transport & Logistics*, Prasanna Ellanti, *Head of Border Services*, and Johnny Anderson, *Supply Chain and Operations Strategist, Accenture*

With the global economy continuing to grow in both size and complexity and the geopolitical environment shifting at an unprecedented pace, the entire port ecosystem – terminal operators, seaport authorities, shipping lines, customs agencies, and logistic providers – faces mounting pressure to modernize. Mega-container ships, evolving customs regulations, and the demand for transparent, real-time shipment tracking are driving a shift to smarter and more agile infrastructure. These factors require moving away from pen & paper or outdated IT systems while securing investment funds, maintaining daily operations, and remaining competitive.

We believe that modernization for ports will come through digital transformation. Aided by advanced technologies, it can reshape them to become smart, interconnected ecosystems that will orchestrate global trade in a live-and-direct manner. Our conversations with clients, industry leaders, and public sector agencies uncovered three strategies that are helping forward-thinking ports overcome barriers to reinvention, thus reinforcing their position as anchors of strong trade networks. When implemented effectively, they can result in more efficient and sustainable operations, increased resilience, and safer environments for workers.

Accelerating digitalization through trust...

The Maritime & Port Authority of Singapore's (MPA) Just-in-Time platform allows multiple stakeholders to exchange and access real-time data on services required when ships arrive. This helps them coordinate pilotage, towage, bunker services, and supplies more efficiently, reducing time spent at anchorages.

Similarly, the Port of Rotterdam has implemented an artificial intelligence (AI)-driven platform called PortXchange, which integrates data from shipping lines, terminal operators, and customs agencies to provide on-the-go port call coordination. For Maersk, collaborating through PortXchange to share data about its vessel movements has generated a 20% reduction in wait time, resulting in faster turnaround, fewer delays, and significant cost savings.

One of the primary approaches to modernizing maritime ports is fostering ecosystem collaboration. Ports are complex systems involving multiple stakeholders, and effective co-op is essential for reducing bottlenecks. Given their central role in coordinating operations, seaport authorities are uniquely positioned to drive these initiatives. Beyond increasing operational efficiency and resilience, ecosystem collaboration can also help tackle the common challenges to modernization: high costs, operational disruption, siloed legacy systems, and data-sharing concerns.

To overcome the significant costs of digitization and potential resistance to change among stakeholders, ports must develop compelling business cases that align with each party's specific goals, such as improving efficiency, safety, or sustainability. By working together, stakeholders can unify around common objectives and build trust. That trust will be crucial during the next stage: establishing seamless data sharing and implementing multi-stakeholder platforms. As direct competitors, shipping lines are often hesitant to share data, fearing it could compromise their market advantage. Building the trust needed for effective data-sharing begins with clear goals and transparent data governance policies that define access, usage, and security measures. Technologies such as decentralized blockchain can enhance transparency and traceability. Somewhat counterintuitively, data-sharing can improve cyber security by helping spot patterns and identifying risks through shared intelligence. Finally, cultural openness is key – regular workshops, cross-stakeholder forums, and leadership buy-in encourage greater transparency.

In order to bring all interoperable systems together, we recommend organizations focus on building a strong 'digital core,' which we define as a technological capability that brings together key components of cloud, data, AI, and security to drive reinvention and which enables adaptability to change.

...people...

Leading ports implement comprehensive training programs to upskill their workforce. Among others, MPA and the Singapore Maritime Foundation have formed the Tripartite Advisory Panel to unite industry partners, unions, and academia. Together, they attract young talent, level up the current workforce's expertise, and redesign job roles. Their Workforce Singapore's Career Conversion Programme (CCP) supports mid-career professionals in skills conversion and new roles in port operations and maritime services. Since 2019, the CCP has talent-tuned over 340 individuals, focusing on digitization, decarbonization, and cyber security.

Across all industries, the proliferation of AI is changing skill requirements for many jobs. Engaging the workforce is crucial for the successful implementation of digital transformation in ports. Resistance to change from employees concerned about work loss can hinder the adoption of new technologies and processes. Therefore, it is essential to involve the workforce in the modernization journey and provide them with future-fit training and support. As the maritime ecosystem transforms, new jobs are being created in areas such as data

Photo: Accenture

analytics, automation, and sustainability. Initiatives like retraining longshore personnel as computer tech operators can improve job quality, safety, and operational efficiency – while also ensuring that ports remain competitive in an increasingly digital world.

Fostering a culture of innovation and continuous improvement will not only secure stakeholder engagement but, in the long term, create a feedback loop where employees train and improve the systems to fit what is needed. Ports cannot simply impose new technologies on workforces to modernize operations – they must ensure workers feel they own the technology and see its benefits in their day-to-day tasks.

...and a scalable strategy

The Port of Rotterdam has installed sensors, known as 'smart bollards,' along its quay walls to gather crucial structural data. By integrating this digital technology into the existing infrastructure, the Dutch seaport has enhanced its return on capital investments: the data collected has revealed that the quay walls have a longer lifespan than initially anticipated.

In another example, the Port Innovation, Engagement and Research center at the Port of Halifax fosters research and innovation from various stakeholders in the maritime industry. Its most successful projects include real-time emissions monitoring with the help of AI or deploying autonomous surface vessels to remove floating pollution from waterways.

Building a long-term, scalable vision is essential for sustainable port modernization. This involves developing a strategic plan that aligns with the seaport's long-term goals and is flexible enough to adapt to future changes. Leading ports adopt a phased approach to digital transformation, starting with pilot 'quick win' projects and gradually scaling up successful initiatives. This helps them showcase the value to stakeholders to maintain their support and break through the barrier of high financial investments and operational disruptions, which can be particularly daunting in such a high-volume industry.

Projects managed within innovation hubs allow for continuous exploration of new technologies while minimizing risks. These small-scale initiatives allow ports to refine solutions in a controlled environment, ensuring that technologies are both effective and scalable before larger roll-outs. They can also help test the benchmarks and metrics before rolling out full-scale plans.

Driving sustainable growth & competitiveness

The modernization of maritime ports through digital transformation is not just a tech upgrade but a strategic imperative. By enhancing ecosystem collaboration, engaging the workforce, and building a long-term, scalable vision, ports can overcome the challenges of outdated infrastructure, high costs, and operational disruption. Better coordination between seaports, ocean carriers and terminals can enhance the resilience of the entire global trade system and more quickly restore supply chain normalcy in case of crisis. The success stories of leading ports like Rotterdam, Singapore, and Halifax (and many others, big & small) demonstrate the potential of digital transformation to enhance efficiency, reduce bottlenecks, and achieve significant cost savings.

As the global economy continues to evolve, the smart ports of tomorrow will be those that embrace digital technologies and leverage them to create resilient, interconnected ecosystems that drive sustainable growth and competitiveness. ■

Sarah Banks leads Accenture's global Transport & Logistics practice, bringing over 25 years of experience driving digital transformations that help clients adapt to industry's evolving demands.

Prasanna Ellanti leads Accenture's global Border Services industry, bringing nearly two decades of deep experience in customs, immigration, border and identity management, and ports transformation.

Johnny Anderson is a strategist with the Supply Chain and Operations practice at Accenture, where we help our clients shape tomorrow's value chains to positively impact business, society, and the planet.