PORT & TERMINAL SECURITY IN THE DIGITAL AGE

RISKS, CHALLENGES, AND SOLUTIONS

Prof. Maria Burns, Director of the Logistics & Transportation Policy Program, University of Houston

What does digital transformation have to do with port and terminal security and operational efficiency? Everything, really. A port's decision for automation is the relentless drive for effective, efficient, fast, and continuously monitored supply chain processes. Full automation enables port and terminal managers to meet and exceed client requests and market demands, while allowing flexibility and dependability. This is achieved through the implementation of Artificial Intelligence (AI), big data, blockchain technologies, and the Internet of Things (IoT).

Automation has transformed the way cargoes move across global supply chains, but also the real time capabilities of monitoring and controlling these movements. Port and terminal management becomes more reliable and sustainable through automated berthing operations, automated scheduling of ships, services, and cargo handling, as well as the monitoring and controlling of fixed and mobile equipment.

WHAT ARE THE DRIVERS OF DIGITALIZATION?

Digitalization is driven by demand and competition but also compliance to industry standards. This is because ports, historically, serve as the convergent nodal points between cargo buyers and sellers, supply and demand, or production and consumption. As global supply chains become increasingly smarter and digitalized, seaports must also adopt in order to retain their market share. Seaports failing

to adopt in this fast-paced automation shift, will lose their influence over global supply chain networks, while competition will take over. The benefits of digital transformation include enhanced security, adaptability, as well as operational and cost efficiencies.

Information sharing may involve certain risks and challenges, but at the same time it provides tremendous opportunities related to real time data sharing and monitoring capabilities. These include the following risks, challenges and solutions:

THE DERIVED DEMAND FOR PORTS

Although ports and terminals are major nodal points in global trade and transport, there is a derived demand for their services. In economic terms, this means that the demand for the cargoes is primary, and this supply-demand equilibrium determines the demand for ports and terminals' services.

Digitalization provides instant response to supply-demand driven fluctuations. When ports operate efficiently and smoothly, nobody notices, as this is the expected norm. And yet, the smallest disruption gets instant attention, although many disruptions are caused by market supply-demand fluctuations.

IMPROVING TURNAROUND TIMES: RECTIFYING DOMINO EFFECTS OF GLOBAL SUPPLY CHAINS

Another paradox entails our persistency in measuring port efficiency all wrong, with little consideration of the domino effect of the previous ports of call delays upon the next port's scheduling mishaps. During the past decades, improving ships' turnaround times was a primary goal for port growth. However, an often-overlooked variable to determine turnaround times is the ship's punctuality, i.e. the ability to arrive at port when scheduled, according to the ship's estimated time of arrival (ETA). When ships arrive too early or too late, the essence of optimization is beyond the port's control. Admittedly there is a domino effect, port managers cannot control the vessels' ETA, neither can they control supply-demand fluctuations. This is why many ports invest in automation, as a mean of controlling the unforeseen. Investing in automation enables ports to boost performance and operational efficiency, while attaining sustainable port traffic, and manageable cargo handling operations, despite any supply chain disruptions or third-party delays. Most importantly, automation helps ports reap new opportunities in the realm of intermodal connectivity. This helps them increase market share and prevail over competition as vital nodal points within their supply chains.

A PORT-SPECIFIC, SUPPLY-CHAIN SPECIFIC STRATEGIC PLAN IS NEEDED

Going fully digital is not a one-size-fits-all choice. Full-automation requires port-specific, supply-chain specific design and implementation. This is an era where increasingly more ports and terminals make the strategic decision towards automation. However, while the decision for automation is pretty straightforward, the most impactful and risky parts of this decision include the stages of strategic investment, selection of technologies and automation platforms, as well as the implementation process across the entire supply chain.

Every port and terminal is unique, driven by the laws of supply and demand. The design of a digitalized, fully automated platform must take into consideration the particularities of the port: its location, the market segments and industries it serves, terminal design and capabilities, as well as the intermodal connectivity goals. Furthermore, stakeholders must decide on the best practices and the best automation investment, as to which technology, which security strategy, and which contingency plans must be developed for the specific port and terminal. In this respect, automation decisions should embrace the port or terminal particularity, in order to achieve optimum results.

INVESTMENT RISKS

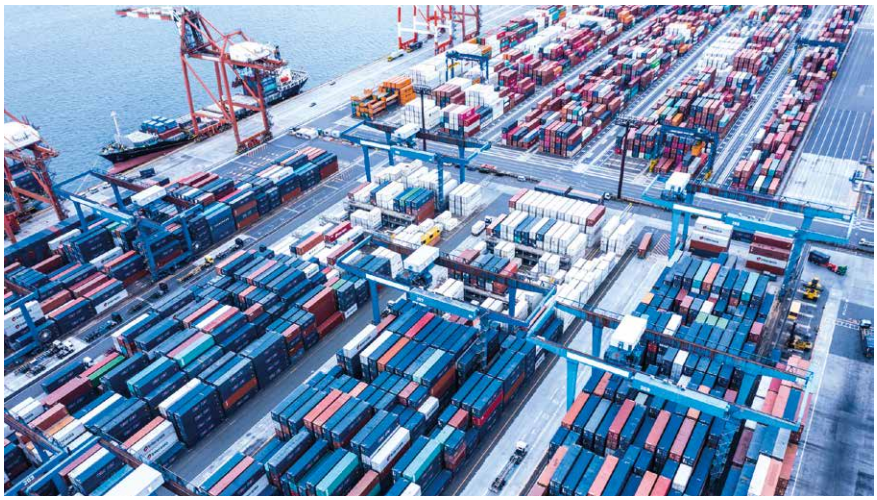
Traditionally, the risks of investment include overinvestment, underinvestment, and mis-investment. In short, investment decisions must be made at the right time, the right amount, and the right technology. Ineffective or vulnerable automation systems may in fact slow vessel turnaround time, cargo handling operations, or create scheduling complications for ships, cargoes, and multimodal connectivity. Since automation is used to enhance security, inappropriate investments in automation may increase risks in the areas of cargo theft, the smuggling of humans, narcotics, and weapons, ports and ships' security, and so on.

AUTOMATION AND THE MAGNIFYING GLASS PHENOMENON

A paradoxical area has to do with port security and the capabilities of automation: port management and the terminal processes must be well-structured before full automation is implemented. You see, automation accelerates and magnifies any process it touches. Port and terminal strengths and opportunities will certainly be magnified. At the same time, the very need of creating fast, integrated, and visible supply chains with real time data sharing and monitoring capabilities, may generate vulnerabilities. It is important for port managers to establish a sound and realistic understanding of their operational capabilities, the port's market positioning and overall strengths and weaknesses. Automation should be based on an already efficient working system. If the foundations of the system are not operating properly, if the performance is problematic, then digitalization will only magnify the problem, resulting in more errors, performance challenges, and supply chain vulnerabilities.

ENCOMPASSING A MULTI-STAKEHOLDER GOVERNANCE MODEL

The new port governance structures are becoming more complex in terms of the diversity and number of stakeholders. This multi-stakeholder model must be considered when designing a port-specific automation platform, we must examine its feasibility and long-term viability within a multi-stakeholder governance model. We must establish a digital culture which is accepted by the numerous global stakeholders, while taking into consideration their diversity in terms of



strategic goals, geographical activities, and diverse industries they represent.

The good news, is, that these advanced systems are ideal for the modern complex supply chains with multiple stakeholders representing different industries. In fact, automated platforms are often a result of a multi stakeholder partnership of a public private level. Complex networks are forming them of their supply chains, and it is exactly this complexity which raises the bar and necessitates collaboration among different industry segments. This integrated platform allows global networks to share and exchange information, while measuring and improving efficiency in a holistic way.

DATA-DRIVEN SECURITY

A port and terminal's security strategy incorporates the use of various legal and regulatory standards, best practices, risk management tools, and automation technologies. Digitalization enables a data-driven level of efficiency, and visibility which helps ports significantly improve their security strategy, by mitigating risks and security threats. And while many risks are not completely eradicated, they can be investigated or traced better in an automated environment.

DOING MORE WITH LESS: DIGITALIZATION AS AN EFFICIENCY BOOSTER AND COST-CUTTER

Digitalization helps port authorities cope with increasing trade volume and specialized cargo handling requirements. Modern port and terminal operations are becoming more complex, due to the high volume of cargoes, increased speed, and increased volume of information. This rapid growth brings many opportunities but also many challenges. Over the past few years' ports and terminals of different geographical locations, sizes and types, invest in innovative digitalized solutions. This enables them to "do more with less", that is, boost efficiency and productivity, and securely handle higher cargo volumes in less time.

MEASURING PERFORMANCE

Digitalization capabilities allow decision makers to better measure, compare and contrast performance, operational solutions, and business options. Successful automation decisions can be evaluated through return on investment, but also through performance measurement. The process of gathering, evaluating, and acting upon real time Big Data compiled from various sources enables maritime leaders to optimize capabilities, explore various options and solve problems in an efficient and effective manner. Automation enables the diligent recording of every single process. In the case of a performance claim, or an incident investigation and root cause analysis (IIRCA), the claimants or the authorities respectively, can identify the circumstances leading to the incident.

OPTIMIZING REGULATORY COMPLIANCE

By acting upon reliable, timely, and multileveled data, there are tremendous advantages in operational efficiency, risk management, and regulatory compliance. Ports can undertake a more proactive stance in the areas of safety, security, environment, social responsibilities, and quality management.

CHANGE MANAGEMENT AND THE HUMAN FACTOR: MAKING A SMOOTH TRANSITION TOWARDS AUTOMATION

Technological innovations have enabled modern ports to be transformed into the "smart ports and terminals" of the future. Innovative technologies and digital systems enable the transition process to be fast and smooth.

But how about the human factor? Admittedly, human nature is notorious for resisting change. This is where a change management mechanism should come to place, in order to coach, train, support and help organize the new "business as usual".

The only way of making a smooth transition towards automation, is to consider the human factor, and the need of keeping our people well-informed and mentally ready to face their new career chapter. Failure to address the human factor means compromising the terminals' short-term goals of operational efficiency, and regulatory compliance. Port managers must develop a knowledge based platform, and a change management mechanism, where time and resources are invested in training and preparing employees.

CONCLUSION

Full automation enables port and terminal managers to meet and exceed client requests and market demands, while allowing flexibility and dependability. The sky is the limit, with the newly acquired capabilities including real time digitalization technology, intelligent container piling and stacking at the terminal, intelligent warehouse management, multistage operational optimization, remote control monitoring. In short, digitalization and automation not only optimize terminal operations and warehousing capabilities, but also unfolds new opportunities in terms of intermodal transportation and hinterland connectivity.

ABOUT THE AUTHOR

Prof. Maria Burns is a National Academies scholar, and the Director of the Logistics & Transportation Policy Program, University of Houston since 2014. She was conferred the prestigious Honorary Membership of the US Coast Guard Auxiliary. A most productive security researcher and data scientist, she has developed numerous research and training manuals for the Government and the energy & maritime industries. Since 2014 she serves as a lead researcher (Principal Investigator) in Department of Homeland Security Research and Training Grants. She has authored the books "Port Management & Operations" (2014); "Logistics & Transportation Security" (2015) and "Managing Energy Security" (2019). She has obtained several prestigious awards including the "Excellence in Emergency Management Award", and Membership in the Private Sector Advisory Council (PSAC). She is a Certified Maritime Auditor for Security (ISPS), Safety (ISM), Quality (ISO9001) and the Environment (ISO14001).