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Op-Ed: Technology alone will not secure shipping's Future

Written by Arun Sharma

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Ships don't decarbonize themselves. Algorithms don't assume accountability. Yet as shipping accelerates into alternative fuels, deeper digitalization and a more complicated security environment, the industry still tends to describe the challenge primarily in terms of technology and regulation. That framing is incomplete.

The hard truth is that the success or failure of this transition will be determined less by the sophistication of new systems than by the competence, judgement and integrity of the people expected to operate them, both at sea and ashore. If we modernize the ship faster than we modernize human readiness, we create a gap where risk accumulates quietly, until it becomes visible through incidents, near misses, fatigue, or loss of trust.

Shipping has always depended on professional judgement in conditions that change quickly and leave little margin for error. Digital tools have not removed that reality. They have changed the context in which judgement is applied.

Modern vessels generate vast volumes of data, alerts and automated recommendations. The challenge is no longer access to information, but the ability to interpret it correctly while maintaining situational awareness. That is a human skill. When systems are well designed, they can strengthen decision-making. When they are poorly integrated, they can create new failure modes: fragmented attention, over reliance, and gradual deskilling.

Seafarers today are expected to manage navigation, machinery and safety responsibilities while also engaging with expanding reporting demands, compliance checks and digital interfaces. The intention is often positive: transparency, traceability, accountability. But when digital requirements accumulate without careful integration, they can compete directly with operational priorities. In high workload environments, even small distractions matter. A safety culture cannot be built on the assumption that crews have infinite cognitive capacity.

This is not an argument against digitalization. It is an argument for design discipline: technology should simplify and clarify, not complicate and distract. If the bridge team or engine room is spending disproportionate time serving systems rather than being supported by them, we have introduced risk in the name of control.

The energy transition sharpens this challenge further. Shipping is exploring LNG, methanol, ammonia and hydrogen, each bringing distinct handling procedures, safety considerations and operational risks. Engineering innovation and regulatory frameworks will be essential, but technical readiness alone will not guarantee safe adoption.

What ultimately determines safe operations is whether the people managing these systems have the training, confidence and practical experience to respond effectively when conditions change. Some fuels introduce hazards unfamiliar to many seafarers. Managing those hazards requires more than procedural guidance. It requires scenario-based training that prepares people for real decisions under stress, including the confidence to act quickly when something is abnormal.

Among the future fuels, ammonia illustrates the human factor challenge particularly clearly. Its toxicity changes the nature of emergency response, detection requirements and the consequences of error. Introducing such fuels safely demands deep investment in drills, competence frameworks and safety culture, not only new equipment and compliance documentation. If we move faster on infrastructure than on human readiness, we may meet a regulatory milestone while remaining operationally exposed.

At the same time, artificial intelligence and predictive analytics are becoming more common in operational support, from maintenance forecasting to routing and risk awareness. Used well, these tools can improve efficiency and reduce risk. Used poorly, they can create a subtle accountability problem: decision-making is influenced by systems that operators do not fully understand, and responsibility becomes blurred when outcomes are questioned.

The line must be clear. AI can inform, but accountability must remain human. Command responsibility at sea cannot be outsourced to an algorithm. Governance frameworks should ensure transparency of the system’s limitations, clarity of override authority, and traceability of decisions. The industry should be wary of a future where an automated recommendation becomes a default instruction simply because it is presented with confidence.

Maritime security has also expanded beyond what many organizations are culturally prepared for. Cyber risk, sanctions compliance, supply chain integrity and hybrid threats now sit alongside traditional concerns about physical security. These challenges cannot be solved solely through technical controls, because many vulnerabilities arise from human behaviour, weak processes or ethical blind spots rather than equipment failure.

That means security must be treated as a culture, not a checklist. Awareness and responsibility need to be embedded across organizations, not confined to a specialist function. In a world of evolving geopolitical tension and complex compliance expectations, the industry’s credibility depends as much on conduct and governance as it does on technical capability.

In this environment, leadership is decisive. Shipping has long operated within robust regulatory frameworks, but compliance alone cannot address today's complexity. Leaders must guide organizations through uncertainty, balancing commercial realities with non-negotiable priorities of safety, sustainability and integrity. Cost pressures are real, but compromising on training, maintenance or safety culture is a false economy. True competitiveness in the coming decade will be defined by trust, trust in systems, in governance and in people.

This is where institutions such as classification societies have a vital role. The industry needs more than technical verification. It needs frameworks that embed human factors into risk assessment, cyber resilience, alternative fuel guidance and operational assurance. We must help translate complex transitions into safe and practical implementation strengthening not only the ship, but the ecosystem of competence and accountability around it.

If the industry fails to re-center the human element, the consequences may be subtle at first but severe over time: erosion of skills, increased systemic risk, diminished trust, and incidents triggered not by lack of technology but by lack of judgement. Shipping has always been powered by people. As we embrace decarbonization, digitalization and evolving security paradigms, we must ensure the human element remains not peripheral, but foundational.

Because maritime transformation is not ultimately a technical test. It is a readiness test.

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