Digitalization of the Maritime Industry

IACS

International Association
of Classification Societies

Our Position

IACS is committed to supporting the maritime industry's digital transformation, emphasizing the importance of a strategic, safety-oriented approach. The collaboration of expertise and industry engagement can create the foundation of a safer, environmentally conscious, and sustainable future through the development of industry recommendations and regulatory compliance.

BACKGROUND

Digitalization of the maritime industry is a topic currently being evaluated by various organizations. This terminology refers to the associated digital technologies that are integrated into maritime equipment and systems. The technologies currently being assessed include digital twin data analytics, blockchain, artificial intelligence, and the Internet of Things (IoT). The integration of these digital technologies into maritime operations will transform the industry to further enhance safety and efficiency.

Technological advancements, regulatory requirements, sustainability, environmental preservation, and economic pressures are various drivers that are influencing the maritime industry toward to a more digitalized approach. The key areas of focus include:

1. Physical and Digital Security (cybersecurity) - safety and security through threat detection, incident response, and surveillance

2. Autonomous Systems – safety and security of Maritime Autonomous Surface Ships (MASS)

3. Ship Operations through remote monitoring, automation, and optimization efforts

4. Ship design and building through optimized designs, 3D technology, and digital twins

5. Port and Terminal operations such as supply chain management and logistics

6. Environmental Compliance and Monitoring through emissions and fuel monitoring

These key focus areas showcase the benefits of increased efficiency, informed decision making, and environmental sustainability. The current foundation is built upon the principle that digitalization should:

1. Be human-centered. The prioritization of needs and skills of the workforce along with safety is key

2. Prioritize the integration of existing processes and systems into the digital landscape/environment, rather than decommissioning and replacing them

3. Balance technological advancements/innovations with risk management, cybersecurity, and cost benefit analysis

4. Be inclusive, with stakeholders' engagement to benefit from full adoption

The challenges and barriers that IACS must address with the introduction of the mentioned technological advancements include the vulnerabilities of the supply chain, cyber threats and data breaches, need for clear guidelines and standards, lack of standardization, lack of skills/training, data quality, quantity and integrity, and verification and validation of AI-related algorithms. These key focus areas highlight the complexities and challenges associated with digitalization in the maritime industry. Building the foundation for a successful transition to a digitalized maritime future requires strategic planning and a risk-based approach.

Summary of key issues

Despite the immense potential of digitalization, IACS recognizes significant challenges and considerations for its implementation across the maritime industry. Onboard concerns include ensuring reliable data collection and transmission from a vast array of sensors in often harsh maritime environments. Additionally, cybersecurity threats necessitate robust measures to safeguard sensitive shipboard data from unauthorized access or manipulation.

Integration of these innovative technologies with existing onboard systems requires careful planning and compatibility checks to avoid disruptions or malfunctions.

Shore-based operations also face challenges. Processing and analyzing the massive amounts of data generated by vessels requires robust data infrastructure and authorized personnel capable of interpreting these complex insights.

Furthermore, establishing clear data ownership and access protocols is crucial for collaboration within the maritime ecosystem. Standardization of digital technology protocols across the industry is essential to ensure smooth data exchange and avoid compatibility issues between different systems and classification societies. From an IACS standpoint, addressing these challenges will be paramount in ensuring a secure, efficient, and inclusive digital transformation for the maritime industry.

IACS is actively working toward addressing the following issues associated with the digitalization of the maritime industry:

1. Technical:

a) Establishing common data formats and standards for efficient data exchange
b) Protecting against cyber threats and ensuring the integrity of digital systems
c) Developing instruments for the safety and security of Autonomous Systems
d) Establishing recommendations for securing pathways between ship and remote operations centers and suppliers onshore
e) Ensuring seamless communication between different systems and users

2. Operational:

a) Human element considerations related to safety
b) Data analytics, utilization of data for insights and optimization
c) Process and systems change management
d) Supply chain integration of digitalized systems
e) Digital incident response procedures

To achieve effective digitalization in the maritime sector, IACS also recognizes the importance of key personnel across the supply chain. Effective data analysis capabilities, better understanding of the IT/OT systems integration, and the technological advancements will all be new challenges for the maritime industry.

IACS Position

IACS has a supportive and proactive approach toward recognizing the potential of digitalization of the maritime industry. The safety driven focus uses risk-based approaches to advocate the implementation of new

technologies and processes to facilitate interoperability and efficiency. To support this, IACS focuses on:

1) **Safety First:** Developing clear guidelines for the safe implementation of new technologies such as supporting autonomous vessels and remotely controlled navigation systems, for improving operational safety in a digital age.
2) **Technology Vetting, (evaluation and approval):** A robust evaluation framework which assesses the safety, security, reliability, and environmental impact of new technologies, providing confidence to ship owners and operators before adoption.
3) **Knowledge Sharing and Collaboration:** Knowledge sharing among classification societies, industry stakeholders, and institutions through workshops, conferences, and participation in Joint Industry meetings and working groups. Lessons learned from these collaborative efforts can further assist with rule development and provision of implementable guidance to the industry.
4) **Future-Proofing Regulations:** IACS stays abreast of technological advancements, ensuring regulations remain adaptable to accommodate innovation.
5) **Supporting Data-driven Regulation and Compliance:** Develop data-based inspection and review processes utilizing sensors and remote monitoring technologies for real-time assessments, reducing the frequency and cost of manual inspections. Promote the application of big data analytics to improve vessel performance and safety assessments.

IACS is embracing this opportunity by incorporating digitalization across its working groups. Recognizing that the context of digitalization may vary, there is a potential for digital aspects in all areas of IACS's work, including inputs, outputs, and internal processes. At the same time, managing the added complexity, addressing human-system interface issues, ensuring proper data management, and engineering safe and dependable digital solutions all require careful consideration. The safe integration of artificial intelligence could also become part of the challenge.

IACS's perspective on the application of technology emphasizes on the following:

- Requirements for assessing the technology applicability and risks.
- Instruments for data and information exchange for technologies to work, as well as for the use of data by the entire supply chain.
- Additional focus on the human element (training, awareness, engagement, safety).
- Promotion of awareness in the industry that will assist in addressing relevant challenges.

There is a need for a coordinated effort paired with leadership to address the challenges and opportunities presented by digitalization and to ensure a safe, efficient, and sustainable maritime industry. Fostering collaboration and knowledge sharing between IACS, regulatory entities, and stakeholders is the path forward to success.

Summary of Work already carried out by IACS on this Issue to Date

IACS has been actively engaged and contributed to various industry initiatives related to maritime digitalization such as the International Maritime Organization (IMO), European Maritime Safety Agency (EMSA), and Baltic and International Maritime Council (BIMCO). A list of notable IACS work, IACS publications and ongoing projects include:

1) IACS Publications and Guidance: IACS is working on various guidance documents and papers on digitalization-related topics, including data sharing, and digital twins.

2) IACS Recommendation No. 166 on Cyber Resilience - provides technical information to the stakeholders which will lead to delivery of cyber resilient ships by mitigating the risk related to events affecting onboard computer-based systems.

3) IACS Recommendation No. 171 on Incorporating cyber risk management into Safety Management Systems – provides high-level recommendations for maritime cyber risk management that can be incorporated into existing risk management processes and are complementary to the safety and security management practices established by this International Maritime Organization.

4) IACS Recommendation on Ship Data Quality (ongoing) - discusses the principles of data quality management, describes a method as an example to determine the quality of data generated onboard vessels, or received from other sources, and used for functions such as performance optimization, condition-based maintenance, system diagnostics, fault prediction, telemetry, remote monitoring, and others.

5) IACS Recommendation on Cybersecurity Controls for Ships in Service (ongoing) - focuses on ships in service and describes a minimum set of realistic Cyber Resiliency Controls, to mitigate cyber risks, irrespective of ship's construction year. It provides a basis for existing ships without replacing any of the IACS published Requirements and Recommendations on Cyber Resilience applicable to new construction ships.

6) IACS Unified Requirements (UR) E26 and E27 on Cyber Resilience of Ships and On-Board Systems and Equipment respectively.

7) IACS Recommendation on the protocol of format definition and exchange of 3D model among stakeholders to facilitate 3D classification (ongoing) – Recommendation to develop a protocol for design review to facilitate the exchange of 3D models among stakeholders in the scope of digital classification and class transfers handled by classification societies.

8) IACS Recommendation (ongoing) on "complex systems" with a focus to categorize complex systems that require additional assurance actions beyond conventional classification / risk approaches and those that do not, recommending additional assurance actions necessary to deal with the identified complexity.

9) IACS Recommendation (ongoing) on the development of a Software and Hardware inventory template for computer-based systems onboard that would assist with asset management and could be used by all stakeholders (suppliers, integrators, owners).

10) Collaboration with BIMCO on environmental data set for the IMO compendium – The project team develops a document (EGDH 11/2) to provide a data set for "ship fuel consumption reporting verification" and propose to further amend the IMO Compendium with information related to IMO environmental reporting.

11) EMSA Workgroup on E-Certificates – Workgroup will address how to further promote the use of electronic certificates and have all underlying survey data shared electronically.

Additionally, IACS actively participates and supports the IMO efforts in areas related to Digitalization, Cybersecurity, and MASS.