

The MBED (Maturity Based Evidence Dependent) Regulatory Framework for Highly Autonomous Systems



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Joseph is a Technology Market Manager with Lloyd’s Register Marine and Offshore Innovation team. A mechanical engineering graduate from the University of the Philippines, he is a keen member of the Prognostic and Health Management (PHM) society. Joseph has over 16 years of design and regulatory experience across the marine industry involving development, testing and review of engineering systems of diverse marine assets such as drill ships, LNG carriers, oil tankers, passenger ships and naval vessels.

Prior to joining the innovation team, he was lead engineer for LNG fuelled applications including alternative fuel technologies. In the last two years he has focused and helped shape the development of digital compliance, LR’s regulatory framework for digital health management (DHM) systems and digital twin technology. DHM is a fundamental enabler of autonomy, providing the capability to monitor the health of electrical, mechanical equipment and structural components of the ship. His exposure to different DHM architectures employing physics based and data driven techniques imparted the value of “adaptive capability” – a distinguishing characteristic of autonomy.

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Abstract:

This paper articulates the opportunities but also unique challenges that autonomous systems present the marine industry. It describes and explores the experience of aerospace and automotive industries in developing increasingly autonomous assets. Resulting from the unique characteristics of systems that learn and adapt, it elaborates the different certification and regulatory challenges. In response it proposes a unique regulatory framework for autonomy based on the maturation of capabilities – a licencing approach similar to how aspiring captains, airline pilots, doctors and similar professions are evaluated and monitored.