# MARINTEC INNOVATION WEBINAR 11<sup>th</sup> June 2020

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<u>A</u> I4-Digital Ships Integrated functional systems

THE 4th INDUSTRIAL REVOLUTION AT SEA

<u>C</u> I4-Digital Cargo Integrated Logistic systems

### My Agenda Today

- 1. The Three Shipbuilding Scenarios 2020-2050
- 2. Economic goals of the I 4 revolution
- 3. How to Implement I4 revolution at Sea



# 1. Three Shipbuilding Scenarios 2020-2050

The economic scenarios within which the climate change and I4 revolutions must be implemented





# 2. Economicgoals of the I 4revolution

- Use I4 to develop a better way to manage ship functional systems
- Must be simple, reliable & adds economic and environmental value



TODAY'S SHIPS HAVE COMPLEX FUNCTIONAL SYSTEMS, WITH MANY CABLES, MANUAL CONTROLS, & LIMITED INTEROPERABILITY

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MAX LOADING RATE

3000 KL/H

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# The Potential of I4

The goal is to use digital information and automation to achieve better cost and revenue performance than is possible today:-

- 1. Currently many control systems are local and rely on wiring.
- 2. Replace cables with a central control area network (CAN) messaging system.
- 3. Integrate control systems using process control technology with sophisticated alarms
- 4. Automate parts of processes using algorithms, where safe and viable.
- 5. Automatic event logging; performance data; anomaly identification & diagnosis etc

#### Cost Goals: areas where I4 technology can reduce ship costs: -

Cost management & quality assurance with a **PRECISION** not possible with present INFORMATION



#### <u>Revenue goals</u>: areas where I4 can improve ship performance : -

Commercial management & QA with a **PRECISION** not possible with present INFORMATION



# 3. How to make I4 work at Sea

- A. Introduce process control to manage ship functional systems
- B. Link ships into company wide fleet management systems
- C. Adapt organization structures and personnel policies to fit



## The "Smart Shipping" Vision

- Smart Shipping: the vision is "superior ship and fleet performance in cost; fleet revenue; and environmental impact"
- <u>Strategy</u>: Combine digital technology with human expertise to produce superior performance in ship and fleet management.
- <u>Method</u>: Process Control is a proven technique which allows a few operators to manage complex processes with a reliability otherwise impossible.
- <u>Result</u>: quality assurance (QA) works better; people more productive; transport performance improves.
- Autonomous ship: "no crew" is a challenge, like putting a man on the moon, but not a commercial priority.



"Process control gets the best of people & I4 technology"

Autonomous ships – interesting challenge

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#### I4 on the ship: how to integrate ship functional systems

Ships are big and mobile and operate in a harsh environment, so implementing <u>process control</u> will be challenging. In this diagram messaging replaces wiring: functional systems (e.g. navigation, cargo handling etc) communicate by messages through a controller area network (CAN). This would work best with industry protocols.

- Each functional control system on the ship is linked to the ship's process control centre via its Electronic Control Unit (ECU)
- 2. Process control becomes a priority as I4 driven systems grow complex.
- 3. The CANbus backbone (e.g. from NMEA 2000) allows communication between the DPS and the ECUs. Ship design benefits include:-
  - Low cost digital interface replaces point to point wiring.
  - Centralised error diagnosis & configuration are made routine
  - Robust against electrical disturbances
  - Efficient message priority arbitration
  - Flexible easy to modify ECUs within the protocol



#### Using I4 at company level to run a fleet as a "transport factory"





