2016 Korean–Hellenic Maritime Cooperation Forum
Smart Ship and connectivity

8 June 2016
I. Market Trend

II. Industry Changes

III. IoT Technologies

IV. New Perspectives

V. Connected Smart Ship
Three key trends around the maritime industry call for profound innovations:

- **Industry Changes**
  - “Strive for Turnaround”

- **Diverse Stakeholder Voices**
  - “Value-Added Services”

- **IoT Technologies**
  - “Vessel of Future”
Industry Changes

Ocean transportation players strive for high performance in high complexity

- **Mega Vessels**
  - >10,000 TEU Ships +127% Growth (2013~2016)
  - Additional 18.8% on order book – 3.4 Mn TEU, 60%> 10,000 TEU

- **Modernized Infrastructure**
  - World port TEU throughput >1 Bn by 2020 (623 Mn today)
  - Investment for larger terminal expansion
    - Longer berth lengths
    - Deeper draft
    - Larger quay cranes
  - Larger hinterland

- **Complex Cargo**
  - Global transshipment volume >320 Mn TEU by 2020 (175 Mn today)
  - Sophisticated cargo handling requirements
  - Higher crane density
  - Higher crane and berth productivity

- **Extended Network**
  - Multi-modal network connectivity – global & hinterland
  - Global port connectivity

Diverse Stakeholder Voices

New innovations are required to meet diverse stakeholder expectations

- **Cargo Owner**
  - Door-to-door cargo visibility

- **Regulator**
  - “Green”
  - Measured compliance

- **Suppliers**
  - Market extension
  - Innovative customer interaction

- **Ship Owner**
  - One-stop life-time maintenance services

- **Shipbuilder**
  - Product differentiation
  - Data-driven new services

- **Shipping Liner**
  - OPEX reduction
  - New revenue generation

- **Port Operator**
  - Terminal productivity
  - Minimized congestion

- **Class Society**
  - Digitized ship database
  - Remote audit & inspection

Source: Accenture Maritime Industry Analysis, HHI Marine Service VOC, DNV-GL Research
IoT Technologies

Technology is already available for ‘vessels of the future’

**IoT Technology Trend**

- **Connected Ship**
  - Fleet of vessels monitoring and optimization of maintenance and utilization

- **Connected Ind. Equip.**
  - Operations continuity, fuel efficiency and routes optimization of Industrial equipment

- **Connected Vehicle**
  - Created an innovative Connected Vehicle service. Expected to manage 5 million vehicles by 2018

- **Connected Home**
  - Create a Connected home service for consumers users from energy to security

- **Connected Worker**
  - New technologies for field workers to optimize maintenance on industrial equipment’s

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Source: HHI R&D Center Report, 2013

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# of Vessel I/O Points

<table>
<thead>
<tr>
<th>Year</th>
<th># of Points</th>
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<tbody>
<tr>
<td>'93</td>
<td>2,000</td>
</tr>
<tr>
<td>'99</td>
<td>4,000</td>
</tr>
<tr>
<td>'03</td>
<td>10,000</td>
</tr>
<tr>
<td>'12</td>
<td>20,000</td>
</tr>
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Including Communication Tag

**Communication Tags**

- Hardwired Signal Connection
- RS 485 Serial Comm.
- Serial CAN Comm.
- Ethernet TCP/IP Comm.
New Perspectives – “Vessel Lifecycle”

We are taking a ‘lifecycle’ perspective of our vessels focusing on the total value of vessels to our customers

1~2 years

1. Marketing / Sales
2. Manufacturing
3. Delivery
4. Warranty
5. Operation and Maintenance
6. Scrapping

25+ years

Traditional Shipbuilding

Lifecycle After Market Services

“With their focusing only on manufacturing, shipbuilders have ignored the potential values of ship operations and maintenance. Although vessel lifetime is more than 25 years, most shipbuilders have failed to expand into the aftermarket.

‘Big Data’ from all the processes of design, manufacturing, and operations & maintenance will enhance quality, safety, and efficiencies of vessels”

Former CEO of Lloyd Register

Source: Interview with JoongAng Ilbo, March 2015
New Perspectives – “Value Chain”

The vessels are connected with various partners throughout the value chain, which has vast optimization opportunities

**Key Challenges**

- Ship Management
  - Maintenance cost
  - Ship availability
  - Second-hand value

- Navigation Management
  - Fuel cost reduction
  - Schedule management
  - Emission control
  - Accident prevention

- Port Operations
  - Port time reduction
  - Berth plan optimization
  - Seamless trans-shipment

- Inland & Customers
  - Cargo visibility
  - Container repositioning
  - Hinterland operations
“Connected Smart Ship” is a joint initiative of HHI and Accenture to:

- Create business value for ship owners based on data analytics
- Transform the maritime industry by creating connected ecosystem

* VDR: Voyage Data Recorder, **AMS: Alarm Monitoring System
# Value Propositions

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Value Propositions</th>
<th>Benefits</th>
</tr>
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</table>
| Ship Owners & Liners          | - Voyage optimization  
  - Track & monitor voyage  
  - Safe, environment-friendly, and economic voyage  
  - Vessel efficiency  
  - Vessel and equipment monitoring  
  - Diagnosis & assessment  
  - Predictive Maintenance | Reduced operations cost  
  through optimized navigation & shipping operations in overall value chain, and through proactive predictive maintenance with real-time diagnostic analytics |
| Port Terminal                 | - Visibility & efficiency  
  - Schedule management  
  - Stowage plan & monitoring  
  - Port operations support | Increased revenue  
  by higher vessel utilization, value-added services to shippers, and new business models based on vessel data                          |
| Others (Logistics, Ship Class, Insurance, etc.) | - Door-to-door cargo tracking  
  - Data-driven value added services | Increased efficiency  
  by real time monitoring during sailing and providing end-to-end data integration                                                     |
Value Propositions – Ocean Carriers Case

Ship Operations & Logistics

Fuel & Energy Cost
- Trim Optimization
- Optimal Economic Voyage (slow steaming, weather routing)
- Bunker Monitoring

Time & Efficiency
- Economic Port Sync Voyage (Virtual Arrival)
- In-Port Operation & Time Optimization

Vessel Maintenance

Maintenance Cost
- Remote Equipment Monitoring and Predictive Diagnosis

Time & Efficiency
- Remote Equipment Monitoring and Predictive Diagnosis

- 2 ~ 5% Propulsion Energy Saving
- 5 ~ 6% Fuel Saving
- 1 ~ 5% Fuel Loss Prevention
- 6% Fuel Saving
- 10 ~ 25% Port Time Reduction
- 10 ~ 20% Maintenance Cost Saving
- 60 ~ 90% Unplanned Downtime Reduction
- ~ 20% Increased Availability

Source: Accenture Maritime Industry Analysis, 2014
Ocean Link™ is a bundled offering of platform and services that HHI and Accenture co-develop to implement the CSS business.
Key Differentiators

**We** understand your industry
- Laser-focus on your business values
- Combination of HHI’s shipbuilding leadership and Accenture’s global industry expertise

**We** lead shipbuilding & digital
- Integrated shipbuilding capability
- Ship-shore integration based on HHI-proprietary vessel data model
- Proven IoT and digital platform capability

**We** are open
- Flexible delivery and commercial model
- Continuous development of new advanced solutions
- Compatible with major device / solution providers
- Open to joint business model with you
Integrated ship-to-shore platform to aggregate complete vessel data to enable continuous innovative services for ship owners.

**As-Is**
- Siloed by providers
- Secure partial ship data
- Long time to develop new shore services

**To-Be**
- Integrated & Standardization
- Secure whole ship data
- Speedy & Flexible service Dev. based on full connection with shore