

Marine Board/MARAD METRI Summit Dr. Thomas Wakeman III, 9 Nov. 2020

MTS Components of Global Supply Chain

- Ocean & Harbor Access (Waterways & berths)
- Port/Terminal Gateways (Cranes, yard, & gates)*
- Landside Connections

 (Intermodal highway, railway & barge mobility)
- Distribution Centers
- Road and Rail Assets



* Note: Blue highlights key points

Presentation's Key Points

- Uncertainty challenges traditional planning practices.
- Population increases, technology advances, and climate changes are driving new challenges now and in future decades.
- Port infrastructure is challenged by increasing scales, aging and deteriorating assets, and competition among supply chains.
- Maritime businesses are increasingly challenged by environmental, social, and governmental (ESG) factors (regulations, policies, etc.)
- MTS planning demands critical thinking and problem solving.
- Planning practices must use risk analysis, resilience, sustainability and collaborative methods to meet industry challenges.

Historic Planning Tool – Linear Regression Modeling

• In a stable global environment, it was acceptable to:

• Plot, • Predict, and • Provide **Projections** for planning activities



Today's and Tomorrow's Disruptive Context



Three Key Drivers of Non-linear Change

- Population growth is creating new pressures on the built and natural environments, voiding old tools and static methods for their applicability to finding solutions to today's challenges.
- Technological advances are rapidly creating new opportunities for innovative solutions to economic, operational, and social-behavioral challenges (e.g., 2007 smart phone introduced).
- Climate extremes are causing unstable environmental conditions that necessitate dynamic approaches to stop or minimize impacts.



Principal Locations of Population Growth from 2010 to 2050



people over 40 years in area south of Tropic of Cancer (TC).

New Tech: iPhone Introduced in 2007



Autonomous & Connected Vehicles and Ships



Yara Birkeland Autonomous Ship Project



Automation of Container Terminals

- ~Forty semi or fully automated terminals are operating around the world today.
- An estimated \$10 billion have been invested in these box terminals.



Earth is heating up!



So are the oceans!

Extreme Weather Disruptions Are Increasing

- Climate changes mean greater frequency and intensity of storms with increasing impacts on existing waterways, coastal infrastructure, and ports/terminal facilities and equipment.
- This is not a concern for the future 2020 had 27 named tropical storms in the Atlantic by October 30th.
- Sea level rise and associated impacts (flooding) will jeopardize existing and future infrastructure serviceability
- Increasing heatwaves, climbing temperatures, droughts, and firestorms in California, Australia, and heat stroke cases around the world are threatening people and businesses.

Industry Challenges in Maritime/Port Sector

- 1. Increasing vessel and infrastructure scales
- 2. Infrastructure deterioration with limited new funds
- 3. Organizing around "supply chains", not facilities



Challenge 1: Increasing/Changing Scales



Containerships Keep Getting Larger



Source: Deutsche Bank and sector data

Bigger Ships Mean Bigger Infrastructure Panama Canal Expansion - 2016



Numerous Multi-modal Connections for Moving Freight



• Driver/operator shortages

STACI

 Yards, rail, and roads lack necessary capacity to fully meet future daily demand

Result: Infrastructure Misalignment

- Growing mega-ships are too big for last century's infrastructure (e.g., channels, turning basins, & bridges).
 Hence:
- Dredging projects were/are needed to deepen channels.
- Bridges with height limitations had to be raised to provide adequate air draft for the new vessels.
- Landside multi-modal moves require connectors and logistic systems to handled the added cargo with reliability... including additional port connector roads and railroad assets.

Challenge 2: Deteriorating Infrastructure





2017 USA Infrastructure Report Card GPA = D+

- Aviation D
- Bridges C+
- Dams D
- Drinking Water D
- Energy D+
- Hazardous Waste D+
- Inland Waterways D
- Levees D
- Ports C+
- Rail B
- Roads D

Bold indicates improvements since 2013

Estimated \$2.0 trillion 10-year investment needed

Challenge 3: Competing Supply Chains (SC)

- A supply chain is a system of organizations, infrastructure, business activities, data, information, and resources involved in moving a product or service from a supplier to a customer.
- Because of multiple logistic options available to shippers, supply chains must compete for cargo.



SC shifted from **"Point-to-Point"** moves to a **"Just-in-Time"** pipelines and recently shifted again to **"Just-in-Case"** systems because of disruptions.

SC are Vulnerable to System Disruptions

- During the early 2000s there were several disruptions of SC causing cascading interruptions in global supply chains.
- Shippers are concerned by unscheduled stoppages because of SC interdependences, e.g., the impact of the Japan's earthquake and tsunami, 2008 financial meltdown, 2017 & 2020 hurricanes, COVID-19 pandemic/blank sailings, and Port of Beirut explosion on goods movement into Lebanon.
- Shippers are moving from lean (i.e., JIT) to resilient (i.e., JIC) supply chains to enhance delivery reliability.

Planning for MTS Sector Disruptors

- Population, technology, and climate changes, as mentioned.
- In 2020, COVID-19 pandemic, hurricanes, wildfires, social upheaval, geopolitical and financial crises, swarming locusts, an exploding port in Beirut... 2020 has been a difficult year but more surprises to come.
- Environmental, Social, and Governance (ESG) mandates are new disruptors that destabilize the status quo and demand actions.
- COVID-19 has increased Port State and local regulatory requirements.
- Financial disruptions are gathering around future maritime and new build activities because of new IMO initiatives to mitigate climate change (e.g., IMO set new target for Green House Gases reductions at 50% by 2050 -- IMO 2050).

Global Port Planning Objectives

- Develop their toolbox for MTS planning, engineering, and business operations.
- Use scenario-based planning practices for risk analysis, developing project sustainability, and creating resilience enhancements.
- Build business teams with partnerships and SC collaboration.



International Maritime Trade, 2000–2019 (UNCTD, 2020, Figure 1.2)



Source: https://unctad.or g/system/files/of ficialdocument/rmt20 19ch1_en.pdf

Global Containerized Trade, 1996–2018 (UNCTD Figure 1.5, 2020)

Million 20-foot equivalent units (TEUs) and annual percentage change (rt. axis)



Future Trade Increases and Sea Level Rise Will Drive Additional Port Area Requirements

Ports Must Grow 83 to 270% in Terminal Yard Size by 2050



Source: Hanson and Nicholls, 2020, Earth's Future

ESG and Future Financial Challenges

ESG factors hold major implications for the future equity-capital requirements of shipping companies - consider:

- In 2019 banks announced the Poseidon Principles to provide a framework agreement aimed at aligning shipping investors with the IMO 2050 requirement for carbon-reduction.
- In 2020 a number of major ship charterers launched a carbonreduction platform called the Sea Cargo Charter, mirroring what shipping banks are doing with the Poseidon Principles.
- Other investors are developing their own proprietary models and they're scoring companies on their ESG footprint, i.e., 1 through 5, with only investments in companies that score 3 through 5.

MTS Digitalization Efforts Are Emerging

- Digital Container Shipping Association (DCSA) was founded in April 2019 by several carriers to drive standardization, digitization, and interoperability to reduce waiting time at ports for container ship berthing slots.
- In May 2020, DCSA announced a collaborative effort to push for industry adoption of electronic bills of lading.
- In October 2020, DCSA published its standards for its "justin-time (JIT) port call program", which will optimize ship steaming speeds, lower fuel consumption, and reduce CO2 emissions.

Port Bribery and Corruption Activities

- The United Nations estimates that corruption can add 10% or more to the cost of doing business internationally.
- B/C activities cause seafarers fear, stress and feelings of subjugation.
- Port problems may include (Cardiff University, Feb 2020):
 - Thief of Provisions (ship stores, refrigerated goods, can goods)
 - Thief of Equipment (brass fittings, hand-held machine tools, electronics)
 - Facilitation Gift Demands (cigarettes, alcohol, soft drinks)
 - Financial Extortion (cash)
 - Bunker Supply Fraud (short filling, poor quality)

Cybercrime

Recently the four largest container carriers were attacked:

- June 2017, A.P. Møller–Maersk, No. 1, was debilitated by a cyberattack that impacted its bottom line by approximately \$300 million.
- No. 3 COSCO was hit in July 2018 in a cyberattack that resulted in network failures in the United States, Canada, Panama, Argentina, Brazil, Peru, Chile and Uruguay.
- No. 2 Mediterranean Shipping Co. (MSC) was knocked offline for fivedays in April 2020. The network outage was a malware attack that affected digital tools, including msc.com and <u>myMSC</u>.
- No. 4 CMA CGM is the latest container shipping line to be hit with a ransomware cyberattack in **September 2020**.

Steps to Meet MTS/Port Planning Challenges

- Recognize that there are increasing infrastructure capacity requirements for waterways and ports.
- Inventory aging and deteriorating infrastructure to estimate needed capacity enhancements and financial requirements.
- Focus on risk analysis, resilience and sustainability to address potential impacts of disruptions including:
 - Scale shifts and infrastructure deterioration,
 - Climate change,
 - ESG, corruption and cybersecurity, and
 - Funding shortfalls, affordability and financing partnerships.
- Analyze chronic and acute hazards and create communications plans with other port/terminal stakeholders.

Build Integrity & Regulatory Familiarity

- **Develop workforce integrity** with clear ethical and moral principles to avoid corruption complexities.
- Know the laws and regulations that govern ports of call as well as develop an awareness of local practices of ports and terminals.
- Work with governments, industry networks, and shipping companies to create tools and define collective actions approaches to meet corruption head-on.

Conclusion: Must Meet Challenges

- Increasing waterborne cargo volumes
- Sea Level Rise/climate change
- Autonomous ships and automation
- Supply chain disruptions
- Bribery and corruption
- Digitalization and cybersecurity
- Labor (seafarers and longshoremen) considerations and concerns





Student Questions?

• What will the future hold for me?

 How do I determine which subjects and skills I need to study and practice to get a job?

• What should I know to succeed in my maritime career over the next decade and beyond?

Key Takeaways for Student Curriculum

- Build understanding and appreciation of maritime industry's global economic contributions and geopolitical influences (e.g., trade).
- Enhance knowledge of business systems, digital transformations, and emerging technological practices (automation, AI, machine learning)
- Anticipate disruptions and develop problem solving and critical thinking capabilities and develop resilience/sustainability concepts.
- Promote skills development for written and verbal communications, collaboration and cooperation processes, and team building.
- Build a robust ethical/moral foundation that is also malleable and aware of cultural differences.