

Baltic and Black Sea Port & Shipping 2023

Efficient Ports: Forming New Logistics Chains In Improving Operations, Service Delivery And Economy

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moffatt & nichol



Moffatt & Nichol Today

Still A Family Run Company 77 Years Later

80%
REPEAT BUSINESS

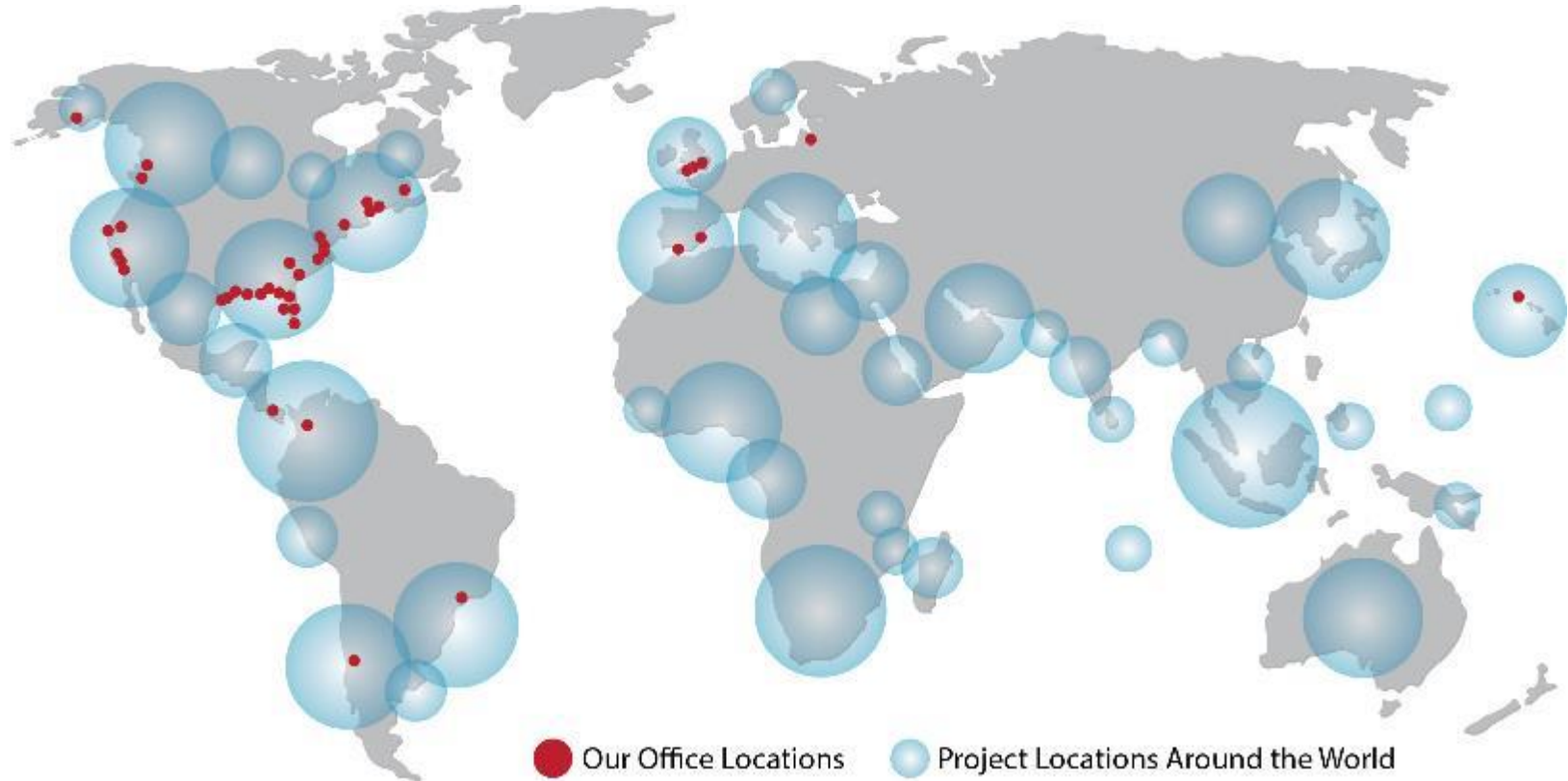
50 OFFICES
WORLDWIDE

OUR MOTTO:
"TO BE THE **BEST**
NO - F
BIGGEST!"

NO PROJECT
TOO SMALL

12,000+ PROJECTS
COMPLETED

1,000+ HIGHLY EXPERIENCED PORT
AND TRANSPORT PROFESSIONALS



Why Port Efficiency (Good Working Ports) is even increasingly important

› A real World Challenge

The **maritime port sector is of utmost importance** in our modern world. Seaports are crucial for the **economic development** of countries/regions.

Nowadays, they are a **focal point** for nearly **all larger supply chains** in **industrial production** and even for the **distribution of final goods to end-users/consumers**.

In economic terms, **maritime port capacity** has a **strategic-complementary (non-substitutional) character** in global goods production and distribution function.

Buzzword and so much more

Efficiency Is One Of The Most Essential Principles In Economic Theory And Is A Kind Of Buzzword That You Can Find In Nearly Every Presentation Of „Business Consultants/Economists “

Some Theory

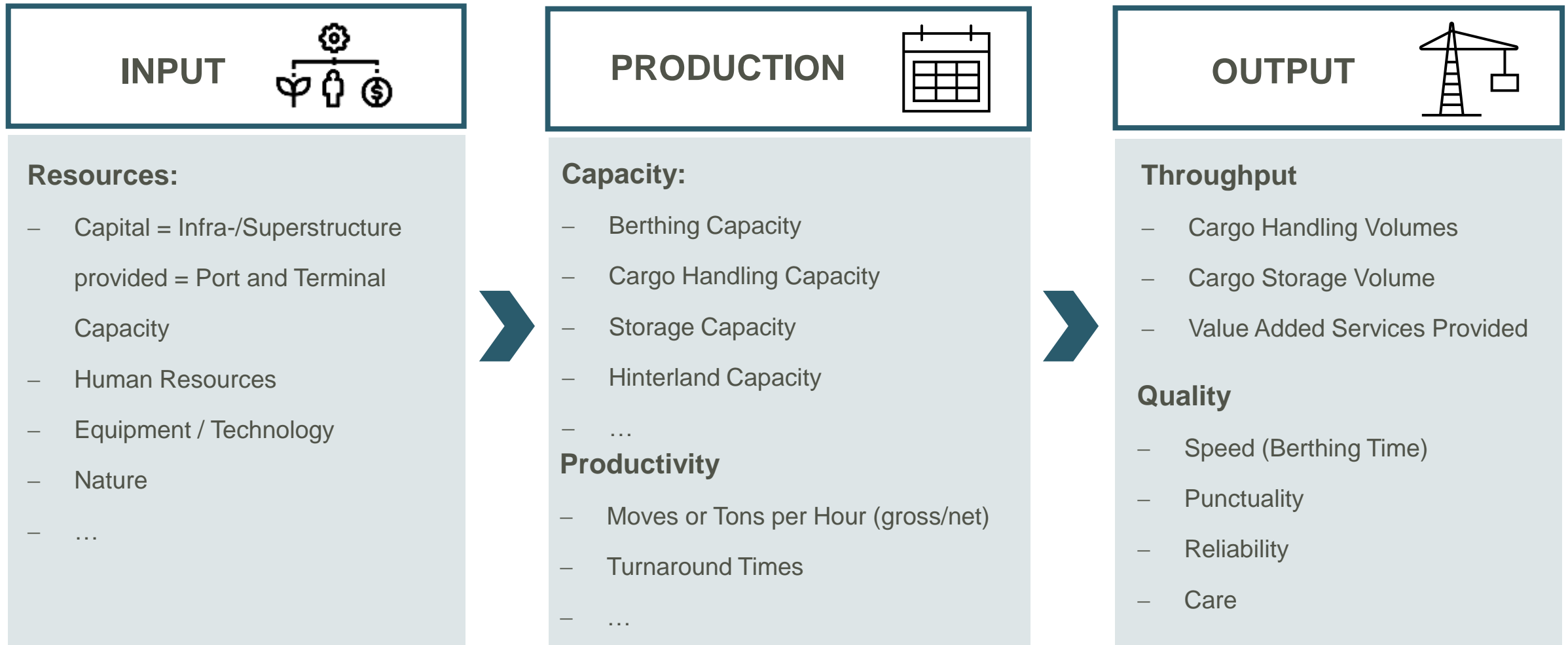
- › In social-since, there is the need to develop a normative criterion for evaluating subjective questions. In economics, as part of the social sense, one of the most essential normative criteria is efficiency. **Efficiency, economic efficiency, and Pareto efficiency are essentially synonymous:** “If we are in a position such that a person cannot be made better off without making someone else worse off, then this position is efficient.
- › In marked/price theory and so-called “industrial organization theory” (how economists see the port sector) **efficiency** is a measurable concept that **links the resource input** for the production of an **output**.

The maximum principle refers to an **efficiency idea** to produce with a given amount **of resource input** (labour, capital, human capital, bounded technology but also natural “external” resources) a **maximum output** amount (as a quantity).

The minimum principle refers to **an efficiency idea** to produce a **certain predefined output** with **a minimum of resources input** (minimum means in terms of production costs; in economics the minimum concept is prevailing because it includes the aspects of finding a cost-optimal factor input combination)

Efficient Ports

Measuring Efficiency (Port Performance + Resource Input)



Efficient Ports

A Dynamic Problem

- › Port Efficiency is a dynamic problem and always has to be addressed in the **prevailing technological** and **commercial framework**.
- › Port Efficiency is a problem related to the **marginal principle** so along the evolution line of ports there is a growing optimization complexity between increasing (marginal) **output** and related (marginal) **implementation costs**.
- › The evolution of the port sector toward the so-called **5th-Generation ports** also reflects the requirements of introducing **new logistic chains/supply chains**, especially in highly industrialized countries.

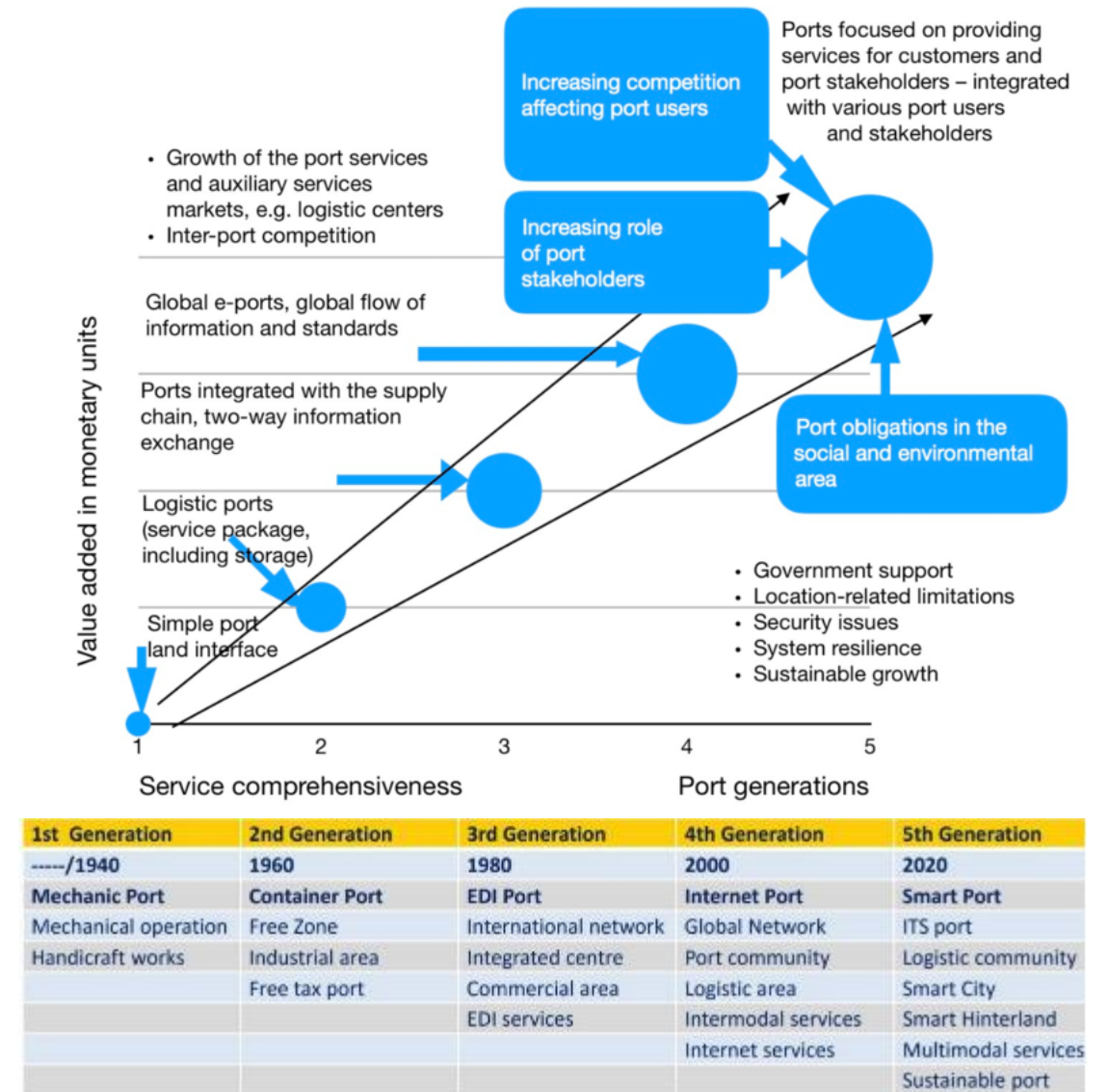


Figure 1 – uploaded by Adam Kaliszewski

Efficient Ports

The Main Challenges (Currently)

- › Maritime ports are still one of the **most heterogeneous sectors** with patterns that create some romantic feelings about the good old days in ports and in contrast to these high-tech patterns with fully automated / high-performance cargo handling operations driven by AI applications. The problem is that these heterogeneous notes are part of the same network. According to this, the better integration of ports in so-called “transport corridors” is seen now also from a port-to-port-perspective. The famous Chinese “one belt one road” imitative, strongly focusses on this aspect understanding the importance of efficient ports in both sides of maritime transport or ongoing efforts of DP World related to the World Logistic Passport and in parallel increasing their port operations in China and especially Africa.
- › Maritime ports facing **the challenge of being confronted with still large economies of scale on the shipping side** (asymmetric distribution of these economies of scale between shipping and port) and related to this ongoing technological challenges with constantly increasing parcel sizes (higher peak factors) as well as also a commercial challenge with a constant concentration on the shipping side leading to asymmetric bargaining power.
- › The **real issue about efficiency is now about the balanced risk/profit allocation between the different parties** involved in providing resources (and getting rewards/profits) to this, namely the shipping lines, the port operators (partly also the hinterland transport providers) and the port administrations (the public sector). Most of the current efficiency problems in the maritime transport (port) sector can be traced back to non-risk balanced commercial relations between these parties. The parties are responding to this with a higher integration of the maritime supply chains under one corporate umbrella, especially port terminal and shipping lines but also hinterland transport companies and value-added service providers (the latest developments are the integration of logistic companies by M&A).

Evidence For Port Efficiency

The Real World taste



Up to **100** vessel queuing in peek had a nominal capacity of about **500,000** TEU.

Evidence For Port Efficiency

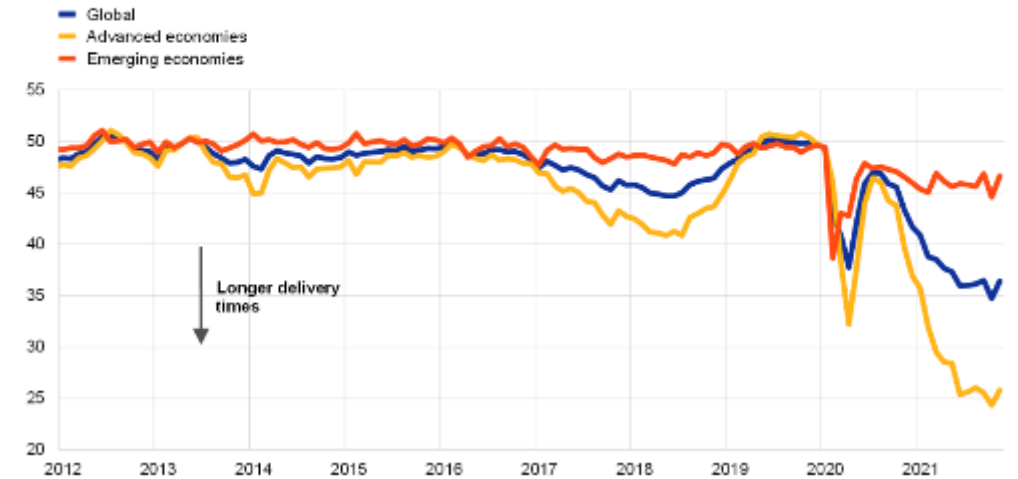
The Magnitude Of Port Efficiency Becomes Evident At Most In Its Absence

- › The **Supply Chain Disruptions** to shortages of key goods, price inflation, factory closures, unloaded shipping containers and negative effects on a nation's economic wellbeing. Supply chain shock as induced a loss of global trade volume of about **2.7%** (value of about 870 bill USD) and global production of **1.4%** (EZB estimate)
- › A large part of the story in 2021/22 about the global supply chain disturbance e.g., with problems in the manufacturing of high-value industrial products as well as the provision of consumers with final goods was related to operational problems (inefficiencies) in ports and ports integration in hinterland transport. This can be traced back to one key factor: under-investments **under-investment** in the port/Intersection capacity and productivity.
- › One main takeaway from the supply chain disturbance for the port operations company (especially the independent ones) is, that they could only **generate moderate (windfall)profits** out of it (mostly increasing storage revenues = profits from inefficiency) that was marginal compared to the shipping line bonanza.

Suppliers' delivery times

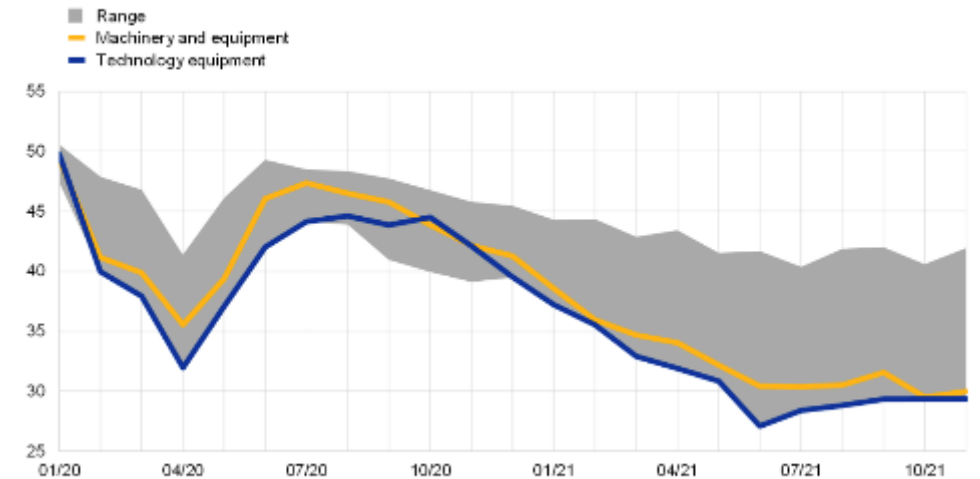
a) PMI SDT across regions

(diffusion indices)



b) Global PMI SDT across sectors

(diffusion indices)



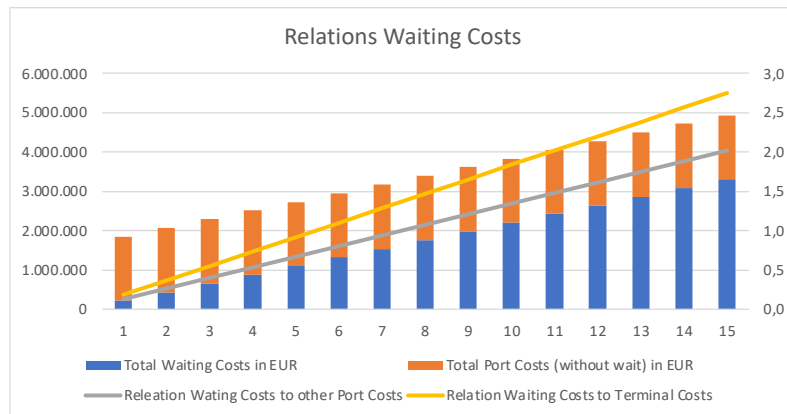
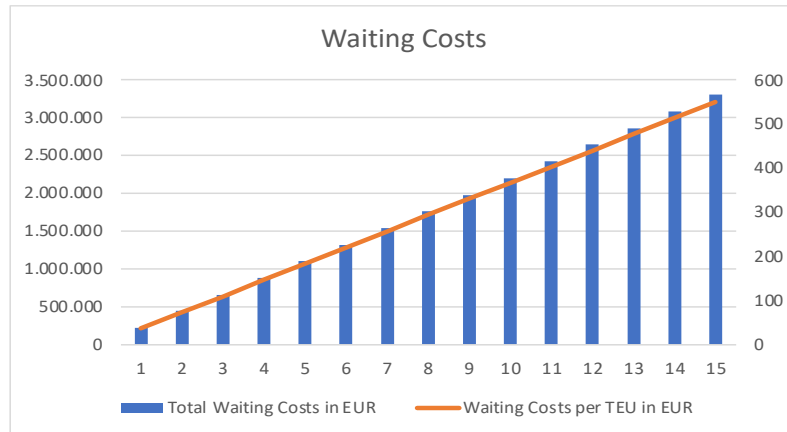
Sources: Markit and ECB calculations.

Evidence For Port Efficiency: Sample Calculation Hamburg

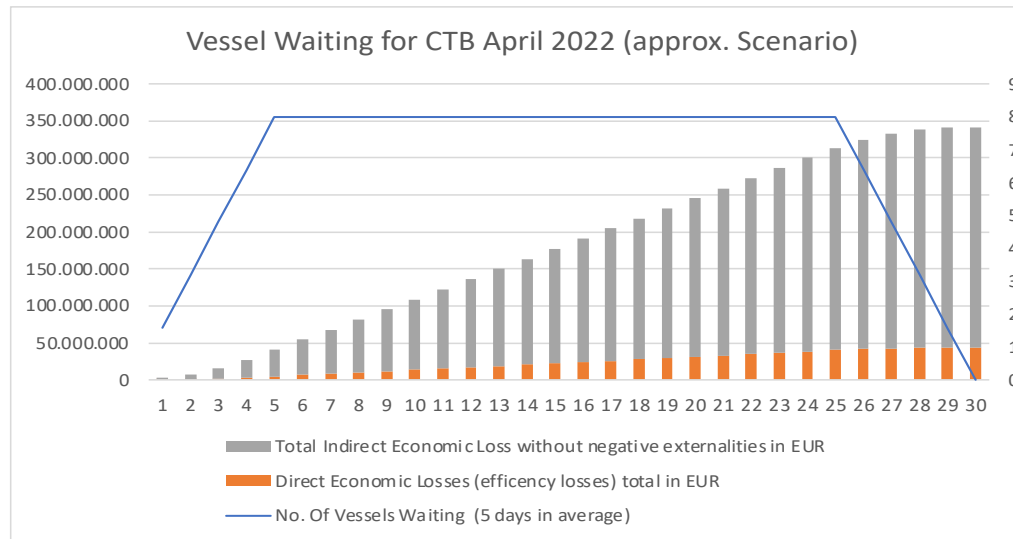
Important for
Baltic/Polish
Ports

Hamburg Container Terminal Burchardkai (CTB) April 2022

Per Vessel arrival in HH (+12,000 TEU vessel)



The Scenario



240.000	TEU affected
341.000.000	EUR total economic loss (without externalities)
1.421	EUR/TEU involved as total economic loss (without externalities)
44.000.000	EUR Maximum direct readiness to pay of shipping lines to avoid the delay
297.000.000	EUR Maximum in-direct readiness to pay of cargo owner to avoid the delay
183	Maximum EUR/TEU direct readiness to pay of shipping lines to avoid the delay
1.238	Maximum EUR/TEU in-direct readiness to pay cargo owners to SL to avoid delay

How To Generate And/Or Improve Port Efficiency

- › At All Stages Of A Port Development Project Cycle There Is Room For Creating / Gaining A Higher Efficiency



Current Main Drivers For Port Efficiency Improvements

What Makes A 5th Generation Port Efficient

- › **Digitalization** (digitalization, digitalization...) it is important and relevant to all stages of a port development project: Decision-making is mainly related to commercial intelligence that strongly uses big data mining methods and related digital tools.
- › **Terminal Automation**, especially in container operation (second wave of automation) as a sub-section of digitalisation is one of the main sources of increasing efficiency mostly related to costs (in some Western European countries, labour costs account for 60% of OPEX, so nearly all effort with related high CAPEX to increase automation and reduce labour financially payoff) but also in terms of business reliability/flexibility.
- › **Data/information integration** is also a subsection of digitalisation. We are talking about joint (digital) platforms / PCS, electronic BLs or fully integrated (e.g., with banking) blockchain solutions (e.g., GSBN).
- › **Internalisation of the external costs of port operations (port greening)**, e.g., measuring a project's carbon footprint or creating a technical and commercial framework for a CO2-neutral port terminal operation (internal technical measures and investments in new machinery, financing of compensation projects, specific tariff schemas).
- › **Appropriated (risk-balanced) port management schemas/ role models/contracts** between the public and the private sectors (PPP). This is also related to an inflow of financing sources for port projects and innovations.

Where Port Efficiency Is Currently Needed Most

New Logistic Chains for Driving Economic Development

- › International **multi-sourcing** and **just-in-time-sourcing** for industrial production: mainly related to complex container transport chains. After 2010 this became standard for nearly all industrial production. The supply-chain disruptions that are discussed widely primarily refer to it.
- › **B2C distribution** from large, highly integrated digital platforms also involves more and more seaborne transport by involving own shipping containers and even own chartered vessels (e.g. since 2018 Amazon) using ports as logistic centres.
- › Ports are **a logistic centre for state-of-the-art** RoRo-vehicle transport (including a wide range of value-added services) with various production locations worldwide, the trend to smaller model series, and the increasing need for customisation. E-mobility is even fostering this trend. (new value-added services and even some parts of the vehicle assembling can be handed over to the port logistics provider).
- › Off-shore supply for large wind farms requires **new kinds of service ports and so-called fit-out ports** that provide specific installations and capacities (port terminals becoming an assembling facilities).
- › Ports are the **import gate for new forms of energy carriers** (mostly related to H₂) and even the location of energy carrier conversion (cracking of NH₂ or LOHC in H₂) and even production of electric energy (placing fuel cells) (ports as green energy hubs).

The Role Of Moffatt & Nichol For Generating / Improving Port Efficiency

All that is needed

- › Factually, improving/creating efficiency in maritime ports is MN's main purpose that drives us. For this, we have a 360° service portfolio covering all aspects necessary for 5th-generation ports actively involved in many automation and digitalisation projects, especially in Europe and the US.
- › MN supports during all phases of a port development project for the private and public sectors.



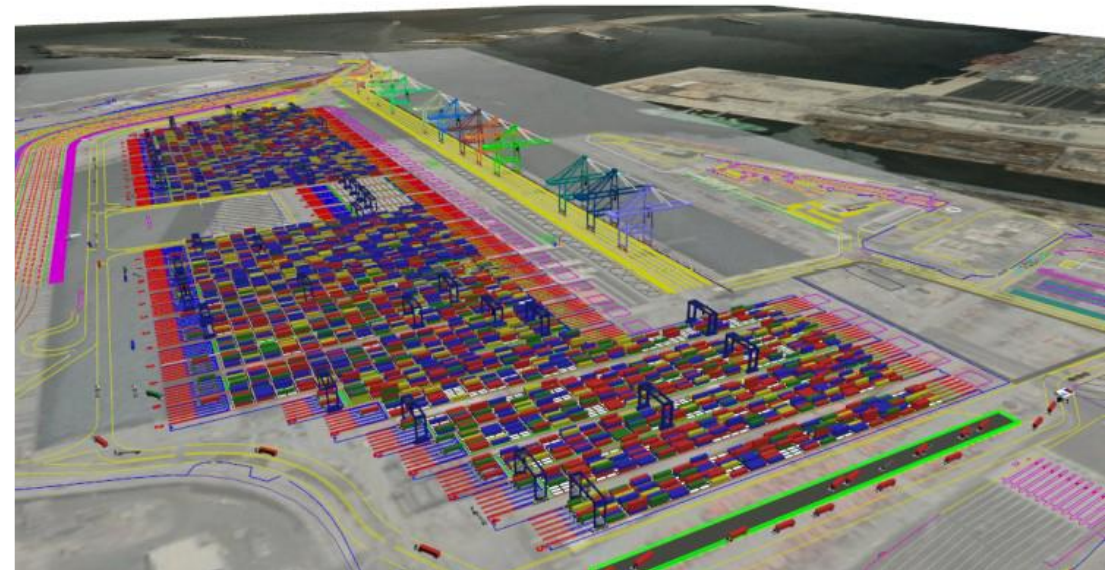
The Role Of Moffatt & Nichol In Generating / Improving Port Efficiency

› Product Sample: Automation Planning and Implementation of LBCT

Flexterm simulations were key to marine terminal planning and analysis for the 325-acre port of long beach middle harbour development.

The project created a fully automated container terminal capable of handling more than 3 million TEUs a year, establishing one of the world's most technologically advanced port terminal facilities.

As terminal planners and designers, Moffatt & Nichol used Flexterm simulation models to work with the port and the port's terminal operator to thoroughly integrate infrastructure and equipment. During master planning for the container terminal and intermodal yard layout, initial simulation studies using Flexterm compared various quay crane configurations to determine their relative productivities and then related the simulated results to real-world expectations.



The Role Of Moffatt & Nichol In Generating / Improving Port Efficiency

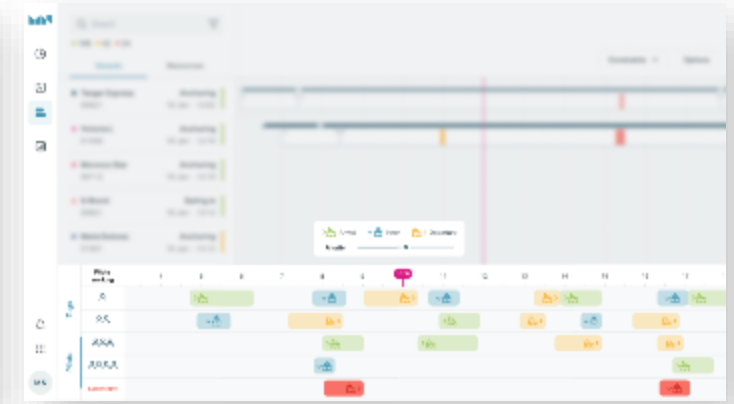
› Product Sample: NextPort & FlexTerm – the scenario we are implementing in Port of Algeciras, Spain



Port Digital Twin
 >> RT Mirroring

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2:00	Tanger Express	Tanger Express	Tanger Express	Tanger Express	Tanger Express	Tanger Express
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23:00	Tanger Express	Tanger Express	Tanger Express	Tanger Express	Tanger Express	Tanger Express
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OPS Visual Management
 >> Dynamic Berthing Dashboard

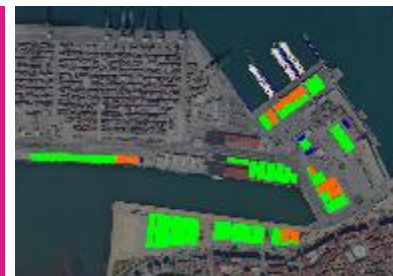


A.I. Models
 >> Conflicts Alerts



Data Analytics (Balance Scorecards)

Port Simulator
 >> FlexTerm



What-If-Scenario Analysis

Thank You

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