Port Operations & Port Productivity

Container Terminals

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PORT / TERMINAL EVOLUTION - ANTWERP
- Terminal as a *nodal* point in the Logistic Chain

- Active role of terminals in the Logistic Chain
  - Vertical Integration
  - Terminalization of Supply Chains

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Source: Rodriguez and Notterboom (2007)
TERMINAL SYSTEM

Productivity is measured in Containers/Moves
Capacity is measured in TEU
TERMINAL - INTERDEPENDENT SYSTEM

Customer Demand: 350 boxes

Quay Capacity: 300 boxes/hour
Yard Capacity: 400 boxes/hour
Gate Capacity: 250 boxes/hour
Labour Capacity: 325 boxes/hour
Equipment Capacity: 250 boxes/hour

Service Provided

System Constraints
MARITIME CUSTOMERS

INLAND CUSTOMERS

Just in time delivery / Low inventory levels

Value Added Services

Develop full logistic corridors

Contractual

Intra and inter-port competition

Higher productivity & reliability - Shipping Lines

Non Contractual

MARKET FORCES

Intra and inter-port competition

Higher productivity & reliability - Shipping Lines
FACTORS AFFECTING PRODUCTIVITY

- Capacity of the subsystems within the terminal
- Equipment
- Processes
- Flow of information / Data integrity
- Labour / Unions
Quay and Crane Productivity

- **Quay Productivity**
  - Containers handled over the quay / length of quay (period)

- **Ship Productivity**
  - Gross Moves per Hour (GMPH): Containers moved to/from a ship/
    Hours between first and last lift (period)
  - Net Moves per Hour (NMPH): Containers moved to/from a ship /
    Hours between first and last lift minus idle time (period)

- **Crane Productivity**
  - Gross Crane Rate: Containers moved over the quay per crane/
    Hours between first and last lift (period)
  - Net Crane Rate: Containers moved over the quay per crane/
    Hours between first and last lift minus idle time (period)
Yard Capacity / Productivity

- Yard Capacity
  - Dwell time
  - Twenty Foot Ground Slots (TGS)
  - Storage Capacity TEU
  - Maximum Stacking Height
  - Optimum Stacking Height
  - Peaking Factor
  - Surge Factor

- Number of inland transport units loaded (truck / rail / barge)
Main KPIs:

- Gross Truck Turnaround Time
- Net Truck Turnaround Time
PRODUCTIVITY GAINS

EQUIPMENT UPGRADES / CAPACITY INCREASE (High level of investment)

- QUAY
  - Faster and more efficient cranes
  - Twin Lift / Quad Lift / Tandem Lift

- YARD
  - Automatic Stacking Cranes (ASC)

- GATE
  - OCR

MORE EFFICIENT USE OF EXISTING INFRASTRUCTURE OR EQUIPMENT (Processes – Lower level of investment)

- QUAY
  - Dual Cycling

- QUAY / YARD
  - Straddle Carrier Pooling

- GATE:
  - Vehicle Booking System (VBS)

BETTER EXCHANGE OF INFORMATION BETWEEN THE DIFFERENT STAKEHOLDERS
Crane Lifting (TEU Ratio)

(a) Twin Lift

(b) Quad Lift

(c) Tandem Lift
(a) Automatic Stacking Cranes (ASC)

(b) OCR
DUAL CYCLING

- Import storage
- Export storage

Single Cycle

- Reduce unproductive/empty crane moves
- Reduce empty trips of horizontal transfer equipment
- Optimization of equipment

Dual Cycle
Increase Productivity of loading and discharge

Optimize equipment utilization (Minimize equipment idle time)

Reduce equipment requirements
Smooth the peaks and troughs in truck arrivals (Service improvement)

Manage differences of information or documentation problems in advance

Reduce truck operating costs, congestion and pollution
RELEVANCE OF PRODUCTIVITY GAINS

- SHIPPING LINES
  - Vessel turn around time (High operational savings)
  - Schedule integrity

- TERMINAL
  - Equipment Optimization
  - Higher number of boxes moved (Increased earnings)
  - Operational savings (e.g. Labour)

- INLAND CUSTOMERS
  - Better organisation of supply chains
  - Lower levels of inventory
  - Lower transportation costs

- COMMUNITY
  - Terminal efficiency relevant for a country’s competitiveness and economic development
  - Lower congestion and pollution on the roads
CONCLUSIONS

- Capacity constraints, increase throughput and clients demands at the water and land sides are moving port operations inland (extended gateways).

- Terminals serve two different sets of clients. High productivity must be kept at the waterside to be competitive but it is in the hinterland where strategies and solutions for capacity, productivity and services are focused.

- Productivity gains can be achieved through different mechanisms. However, start by analyzing your processes, information flow and your clients requirements before additional investments are executed.
Q &A

Thank you very much for your attention