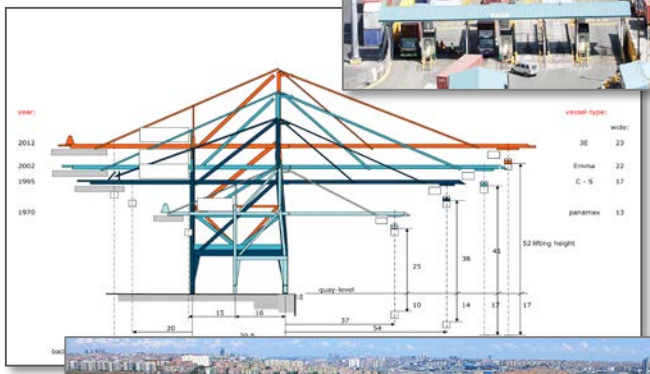


4th Black Sea Ports & Shipping 2015 Turkey

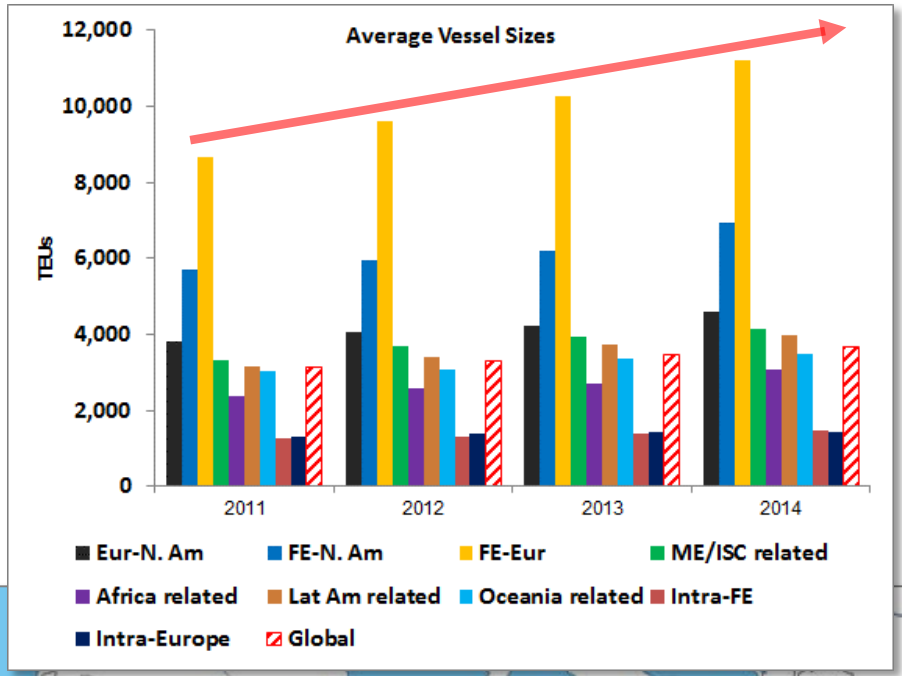
Istanbul 27-29th May 2015

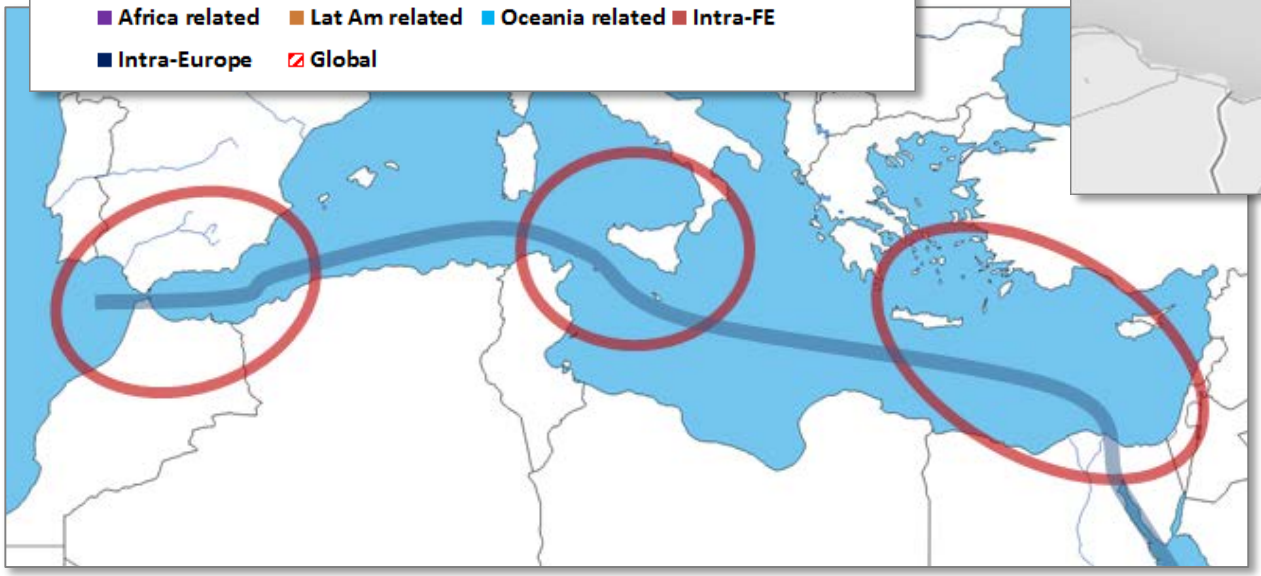
Improving Port Capacity and Performance in East Mediterranean & Black Sea – Impacts from Mega Vessels & New Alliances

Dr Jonathan Beard, Vice President, ICF

What are Ports' Customer Requirements?

Container vessels getting ever larger: Maersk EEE 18,000TEU, CSCL /MSC 19,000 TEU, Maersk 20,000 TEU





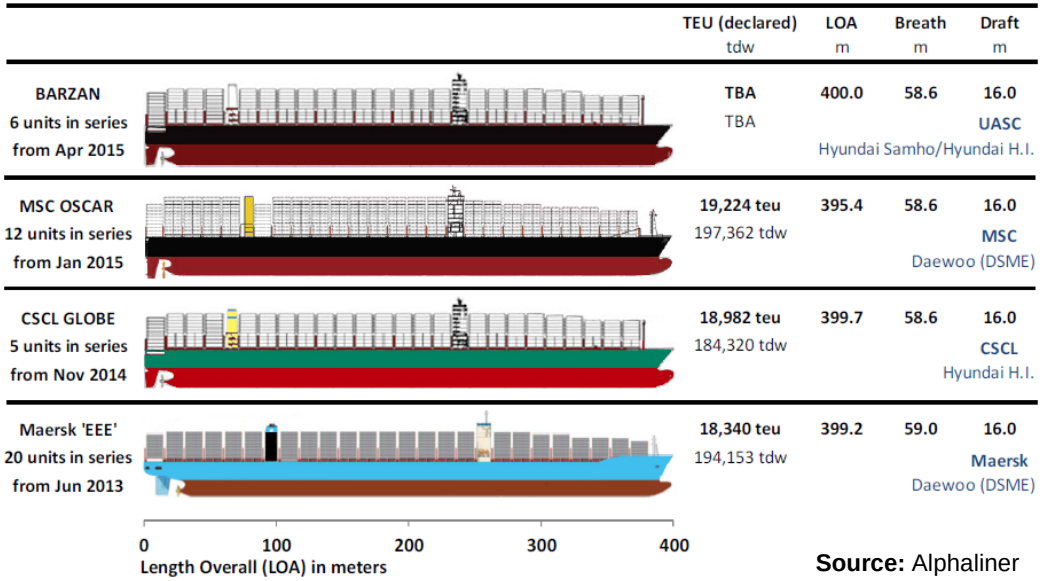
Largest Vessels are Deployed on Asia-EU Trades – Impacts for East Mediterranean Ports?

Source: Alphaliner; ICF

Shipping Lines Looking for Economies of Scale

Vessel Specifications – Wider but not much Longer

- Triple-E Maersk Class (EEE):
  - LOA: 400m versus 396m of Macro Polo (CMA CGM)
  - Draft: -16m versus -16m of Macro Polo, -15.5m of Emma
  - Beam (width): **59m** versus 53.6m of Macro Polo
  - Boxes across: **23 rows** versus Marco Polo 21 rows, Emma 22 rows (Panamax 13 rows)
  - Height: 44-47m above quay EEEs
- 'Herd' mentality – where Maersk leads, others quickly follow



Source: Alphaliner

Source: Maersk

Source: Lloyd's List, ICF

Port Planning & Performance Parameters

Invest to play the game or be relegated to second division?

- CAPEX for mega-vessels
  - min. 17m water depth
  - long straight quays (1,000m or longer): maximum flexibility
  - adequate number of cranes with outreach for 23-24 across
  - land (25ha/400m berth, av. 625m yard depth/m quay)
  - inland connectivity (for gateway ports)

Source: Maersk

- Major shipping lines demand performance
  - > 35 moves per crane per hour, 230-250 moves/ship hr @ berth for *larger* vessels
  - Reliable berth windows and turnaround time
- **Cargo:** Maersk EEE seeking **6,000 moves** within 24hrs from terminals*
- Major hub ports (& some gateway ports, e.g. China) must efficiently accommodate variety of vessels sizes (e.g. from feeder / barges to mother vessels) - flexibility in design
- **Risk/reward:** investment requirements are higher but in the absence of **base-load Import/Export (I/E) cargo**, incentives for largest vessels to call may be insufficient – challenge for transhipment hubs, less so for the major gateway terminals
- Scenario: **Winners "lock in" volume** and establish a virtuous circle, become mega transhipment (& gateway) hubs; losers see captive/direct volume routed via a third port, increasing cost of import/export?

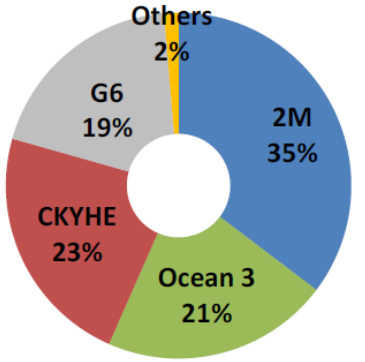
***** Eivind Kolding, CEO Maersk Line June 2011

Filling up the mega-vessels

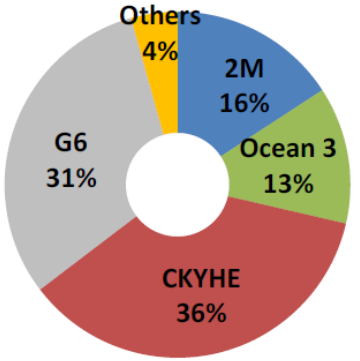
Economies of Scale via Larger Vessels & Alliances

- New alliances to defray risk of introducing larger vessels in subdued demand conditions…
- …and secure enough numbers of vessels that are of same magnitude of size to offer fixed or weekly schedule
- After P3 rejection, two significant alliances created:
  - **2M** comprising Maersk Line and Mediterranean Shipping Company (MSC)
  - **Ocean Three (O3)** formed by CMA CGM, China Shipping Container Lines Co. and United Arab Shipping Co.
- Other key alliances currently include:
  - The **G6** (formed early 2012) serving Asia-Europe and some trans-Pacific routes: Nippon Yusen Kaisha, Hapag-Lloyd AG, Orient Overseas Container Line (OOCL), APL, Hyundai Merchant Marine, and Mitsui O.S.K Lines;
  - **CKYHE Alliance** serving Asia-Europe and trans-Pacific (i.e. Asia-West Coast North America), incorporating Cosco, "K" Line, Yang Ming, Hanjin Shipping and Evergreen.
- Account for significant portions of capacity on major trade lanes

FE-Europe Capacity Share by Alliance



FE-N America Capacity Share by Alliance



Source: Alphaliner; ICF

Mega vessels & mega alliances driving investment & competition

…*especially for ports exposed to contested markets, notably at transhipment pinch points*

- Carriers seek high moves per ship hour at berth to minimise turnaround times
- For all the obsession with mega vessels, productivity improvements have also been delivered for smaller vessels
- But *absolute* impact from 10,000+ cannot be ignored…likewise concerns from carriers that berth productivity improvements have peaked
- 2014 indicates productivity stagnation for the larger vessels

Asia-Pacific Berth Productivity*				N America Berth Productivity*			
Vessel Size	2012	2013	Change	Vessel Size	2012	2013	Change
10,000 & Over	110	121	10%	10,000 & Over	N/A	83	N/A
7,501 to 10,000	98	112	14%	7,501 to 10,000	78	88	13%
5,001 to 7,500	80	96	20%	5,001 to 7,500	56	66	18%
2,501 to 5,000	63	75	19%	2,501 to 5,000	44	56	27%
2,500 or Less	42	53	26%	2,500 or Less	28	36	29%

Notes: * Number of total container moves (on-load, off-load, and re-positioning) divided by the number of hours during which the vessel is at berth

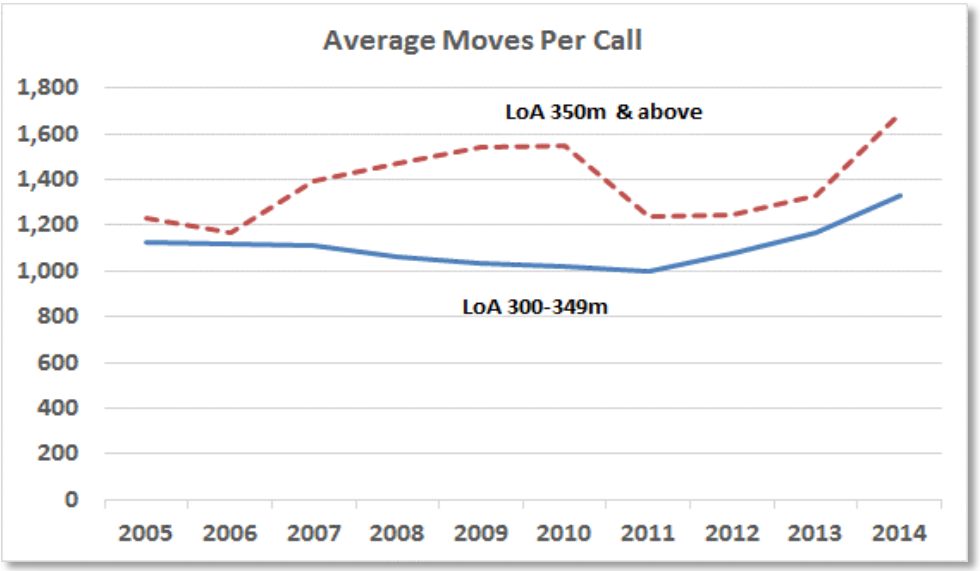
Source: JOC Port Productivity Research 2013

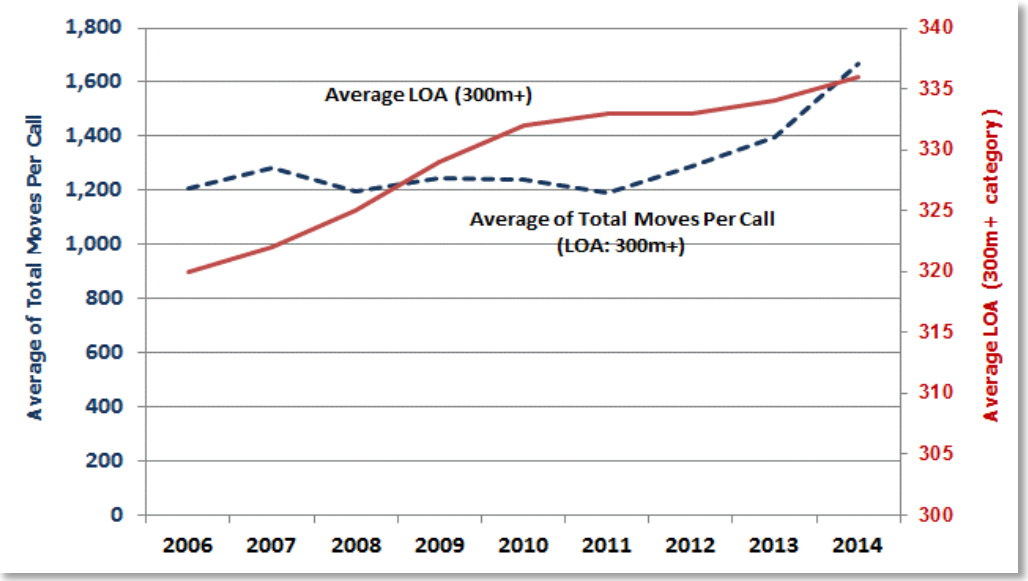
Top Improvers Berth Productivity*				
	Vessel Size	2012	2013	Change
Tianjin	10,000 & Over	126	155	23%
	7,501 to 10,000	117	137	17%
	5,001 to 7,500	103	120	16%
	2,501 to 5,000	69	93	36%
	2,500 or Less	44	64	45%
Ningbo	10,000 & Over	136	157	15%
	7,501 to 10,000	107	138	29%
	5,001 to 7,500	87	103	18%
	2,501 to 5,000	73	83	15%
	2,500 or Less	45	61	34%
Nansha	10,000 & Over	72	107	48%
	7,501 to 10,000	93	115	23%
	5,001 to 7,500	73	98	34%
	2,501 to 5,000	46	86	86%
	2,500 or Less	50	97	92%

Economies of Scale Require High Moves per Call

Without Large Box Exchange Volumes Where's the Return to Additional Terminal Investment?

- Increase in vessel length (LOA) without increase in moves per call is bad news for productivity
- Moves per call now appear to be 'catching up' with increase in LOA – some sharp rises on recent years
- But with few exceptions, we're a long way away from having high enough box exchanges or productivity for **6,000 moves per 24 hours**





Notes: * Data is a weighted average of 5 terminals in China & SE Asia

Source: ICF; Terminal Operators

Key challenge to meet customer service requirements at *minimum* cost

…competing ports may be subsidized / compete with less regard to financial returns

Port TRANSHIPMENT	Berth Productivity*	TEUs /m of quay / per annum#	TEUs / QC / per annum#	Port VESSELS < 8,000 TEUs	Berth Productivity*
Qingdao	96	2,370	238,770	Qingdao	80
Shanghai	86	2,430	238,440	Shanghai	79
Jebel Ali	81	1,770	174,870	Nhava Sheva (JN)	79
Busan	80	1,410	155,180	Ningbo	77
Khor al Fakkan	74	?	?	Busan	77
Salalah	72	?	?	Jebel Ali	77
Hong Kong^	68	2,360	192,000	Taipei	73
Westport (Klang)	66	1,500	154,000	Tainjin	70
Tanjung Pelepas	63	1,750	162,960	Salalah	70
Rotterdam	63	1,440	163,660	Elizabeth (US)	69

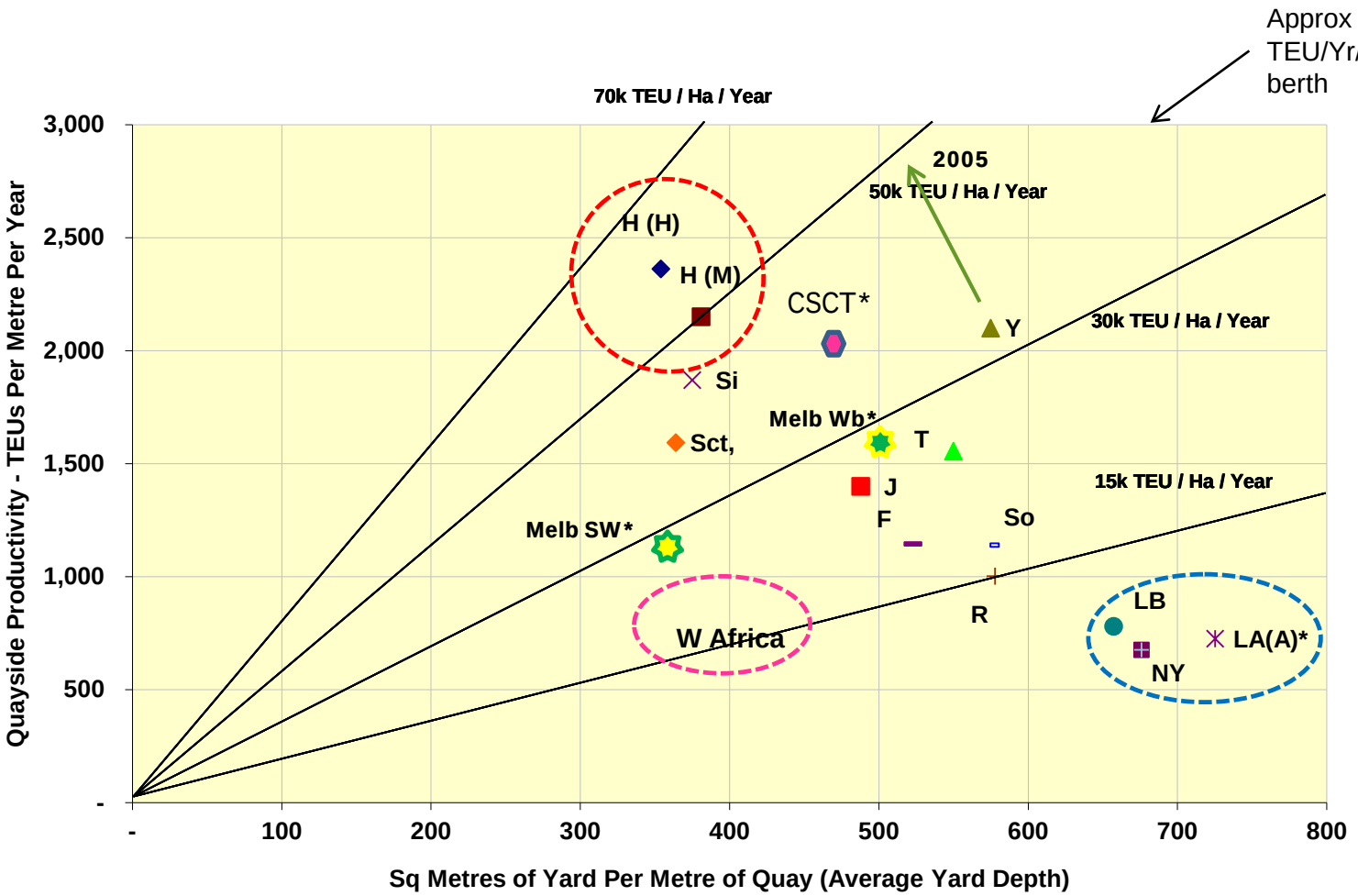
- Deliver customer productivity KPIs (e.g. Berth Productivity) whilst also maintaining high utilisation (e.g. TEUs/m of quay/per annum; TEUs/Quay Crane/per annum; TEUs/hectare of yard/per annum; etc.)

Notes: * Number of total container moves (on-load, off-load, and re-positioning) divided by the number of hours during which the vessel is at berth, 2012. Data on TEUs /m of berth and TEUs per QC 2012:#2012 unless otherwise stated, rounded to nearest 10, ^HIT 2011

Source: JOC Port Productivity Research; ICF

Increased Terminal Productivity ➡ Increased Capacity

Sweet spot for operators / investors…but external factors also shape productivity



LA(A)* = LA Pier 400 at capacity

NY = New York (2012)

LB = Long Beach (2012)

H(H) = Hong Kong HIT

H(M) = Hong Kong MTL

Si = Singapore

Sct = Shanghai SCT (2008)

J = Jakarta (JICt)

T = Tanjung Pelepas

R = Rotterdam ECT

F = Felixstowe

Y = Yantian (TICT)

So = Southampton

CSCT* (CICT) = Colombo South CT at design capacity (i.e. theoretical rather than achieved productivity)

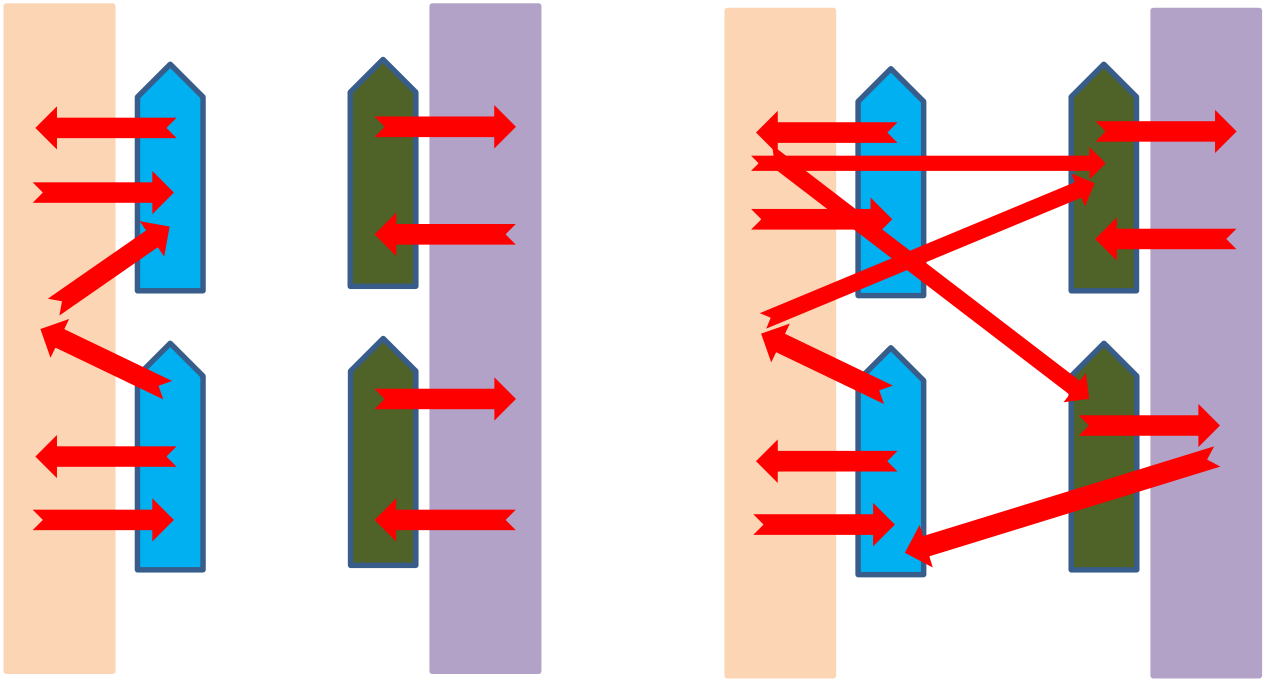
Melb SW = Melbourne Swanson West

Melb Wb = Melbourne Webb at full capacity

Source: ICF; data are for 2011 throughput unless otherwise stated

Box Moves Get More Complicated with Alliances

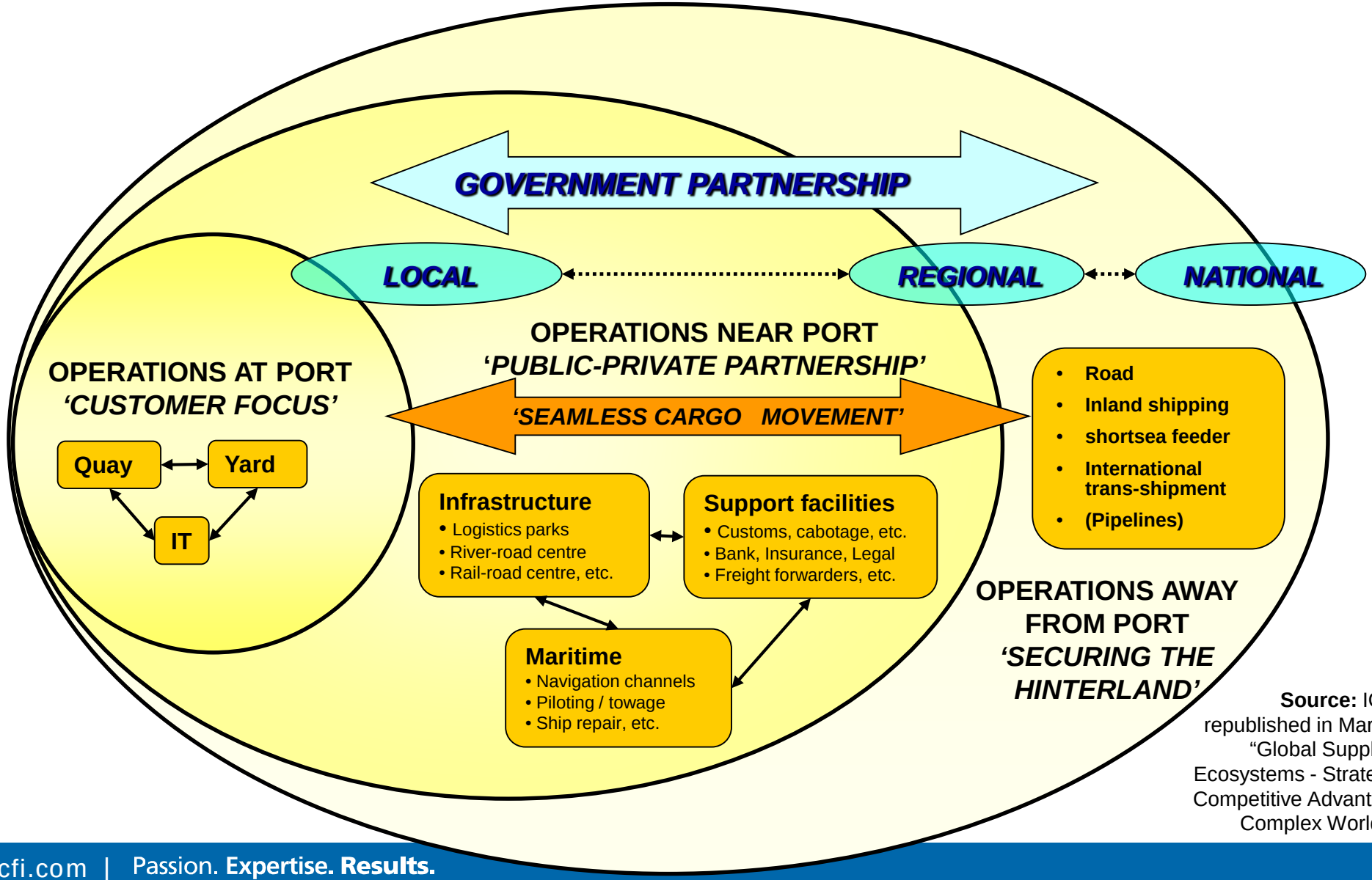
Volumes per call increase….as does complexity



- Inter Terminal Transfers (ITT) are becoming more complex
- Challenge for ‘split ports’…..and also ports with different terminal operators
- E.g. Busan (spilt) compared with Hong Kong or Jebel Ali; Hong Kong (several operators) compared with Jebel Ali or Singapore

Major Impacts Outside the gate - you're only as good as the weakest link

…and terminal operators / ports do not control all the supply chain links



Source: ICF; also republished in Mark Millar, "Global Supply Chain Ecosystems - Strategies for Competitive Advantage in a Complex World", 2014

6,000 moves per day

Glorious Carrot or Poorly Conceived Stick?

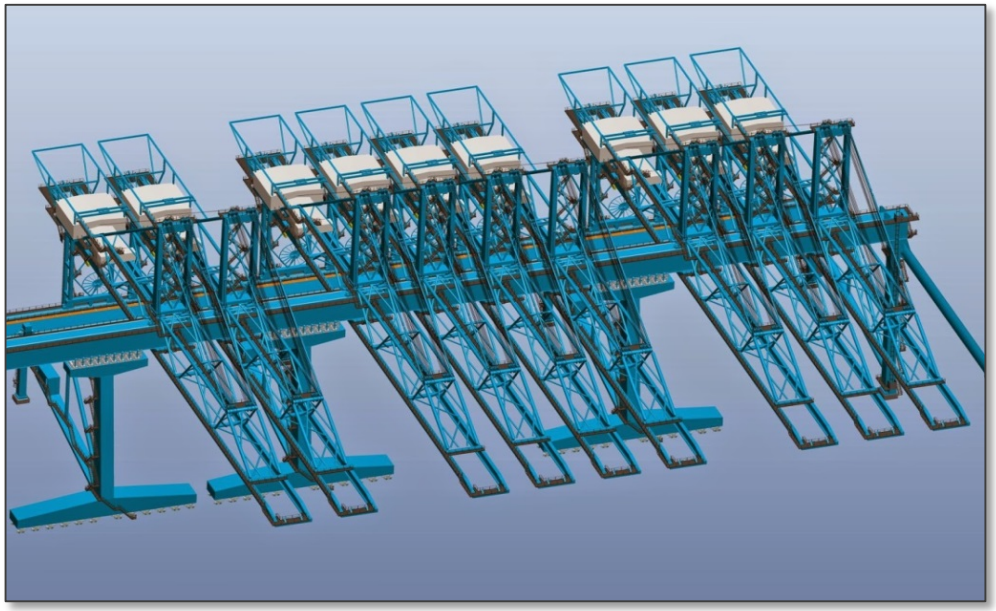
- Requires 250 moves /hr over three shifts for 24 hrs on **a regular basis**.
- 19,000-TEU ship would require **8 cranes**, each working at 31-32 moves per hr, generating berth productivity of 250 moves per hour (MPH)
- An 18,000-TEU box ship is only 25 per cent longer than a 7,400-TEU vessel yet has 150 per cent more capacity, hence cranes have to reach further, but difficult to deploy more cranes
- Therefore 8 cranes per 400m or 1 per 50m: a high crane density
- Remember - travelling distances increase by 40-50% for mega vessels (13,000 TEUs+ vs Panamax) due to their scale
- Crane MPH is reduced unless shipping lines proactively plan their stowage to support port productivity

Source: MTL; ICF

6,000 moves per day

Glorious Carrot or Poorly Conceived Stick?

- Push up moves per crane per hour (e.g. new automated terminals at Maasvlakte 2 RWG & APMT: end goal 40)
- New crane operating arrangements?



E.g. APMT FastNet

- Crane legs dictate minimum spacing of one bay, resulting in lost opportunities to maximise production
- With APMT FastNet cranes are as narrow as a 40ft container – aims to double berth productivity
- Return on investment?

Source: APMT

- Need to look at relative costs to achieve a realistic balance (best terminal operators already do this) …sensible cooperation rather than relying on market power.
- What level of productivity does the line want and will they pay for it?

Limits to Size?

Do we need more co-operative planning around vessel sizes?

"The only way to add another 25% [carrying capacity] is in length, as the 18,000 TEU ships are very wide. Also trading flexibility and frequency must be considered; you would need a huge market share to fill them…I just don't think we can accommodate larger vessels in the foreseeable future, maybe never".

Søren Skou, Maersk CEO, quoted in Container Management, **April 2013**

"Maersk Line…in discussion with Asian shipbuilders for up to ten 20,000 TEU ultra large container vessels (ULCVs) at a cost of around US$1.5bn."

Wall Street Journal, **Jan 2015**

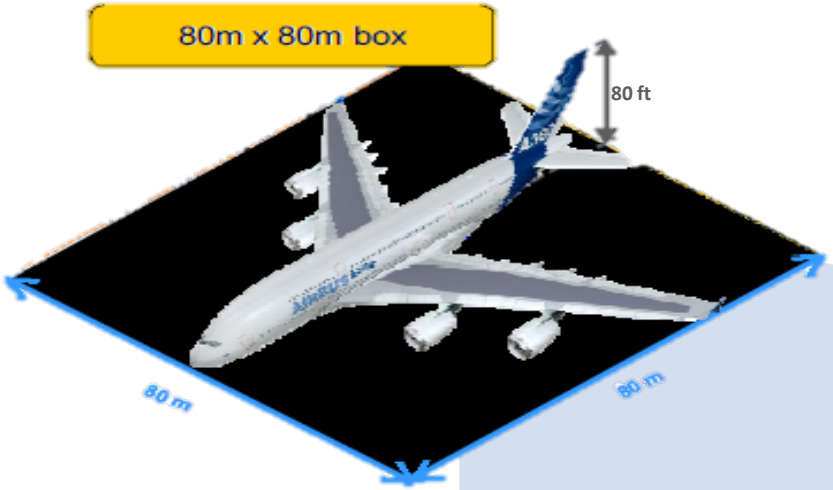
"We continue to build ships that are bigger and bigger and if we can't get the containers off faster the whole thing will come to a grinding halt."

Søren Skou, Maersk CEO, TPM 26 Feb 2015

He cited the example of the **Airbus A380 double-decker jet**. *"They have the same problem, how do they get the passengers on and off this double-decker plane? They solved it by making a double-decker jetway. What I am asking is, what is the container terminal industry's version of the double-decker jetway? I ask that question to terminal operators and I never get any good answers."*

Lessons from the Aviation Sector?

Airbus worked with aviation authorities and airports to better define the A380 and minimize the impact on existing infrastructure



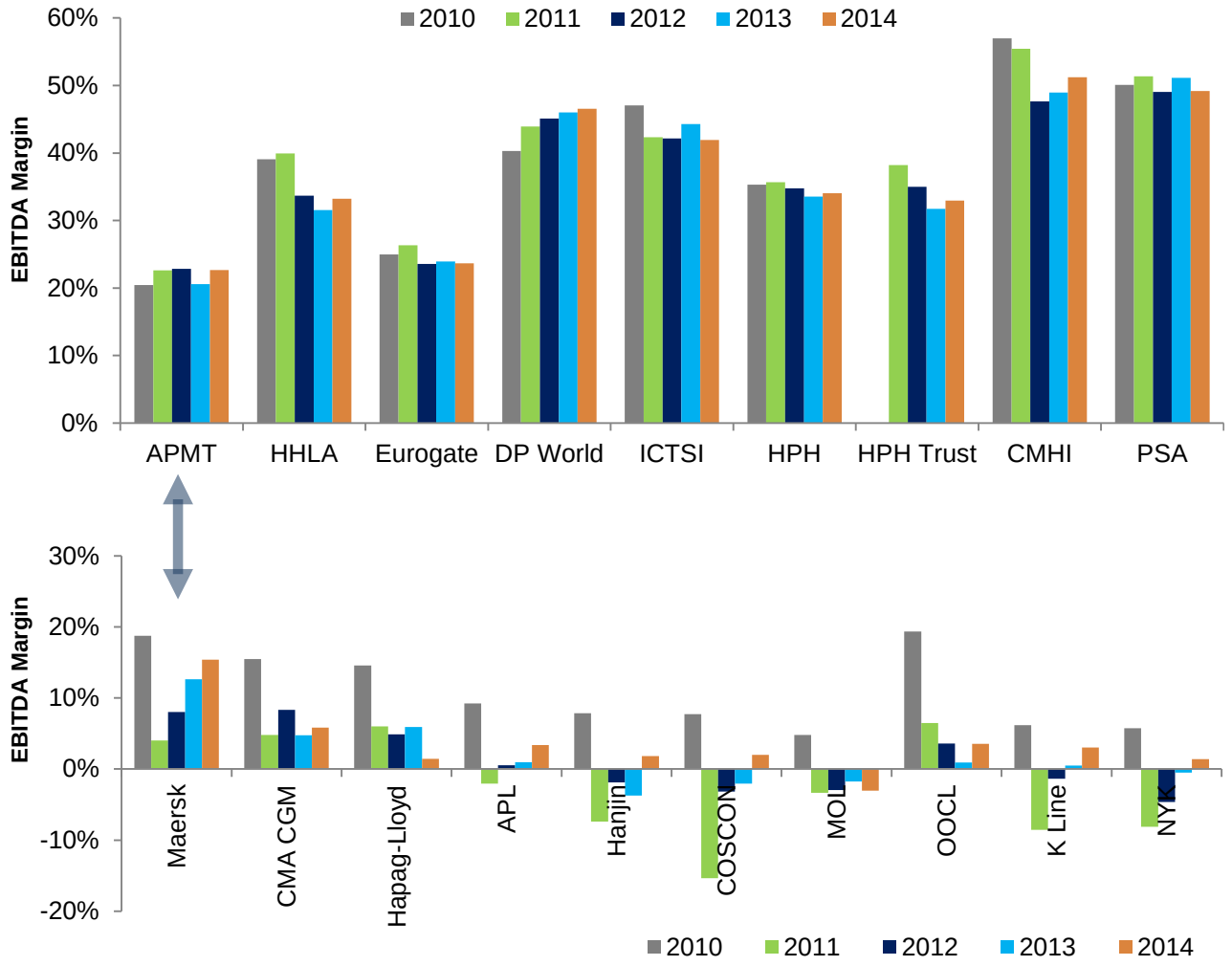
- Initial aircraft design was done with compatibility in mind, e.g.
  - Designed to “fit in a 80m x 80m x 80ft box (24.4 m)” – not significantly larger than a Boeing 747
  - Similar ground equipment used for A380 as to other widebody aircraft
- Main impacts:
  - Double decker jetways
  - Higher reach loaders for upper deck galleys, etc.
  - Larger plane separation
  - Larger luggage carousels
- Worked closely with groups of aviation authorities, airlines, and airport operators in Europe and North America to facilitate A380 operations at existing airport with minimum infrastructure change
- Supported the International Civil Aviation Organisation in drafting guidelines for New Large Aircraft operations

…but not a hugely successful aircraft – limited to a few carriers and key routes.

Furthermore, there has been not been a continual introduction of ever larger aircraft, with different handling requirements - as there has been with shipping lines and mega-vessels

WRAP – What's the Impact on Profitability?

Increasing customer requirements, downward pressure on tariffs - will terminal operators retain their position; will carriers finally deliver sustainable profits; can we have win-win?



Source: ICF; Annual Reports
Notes: EBITDA / Revenue

Capex and opex requirements increasing, revenue per TEU decreasing (especially if targeting transhipment) – even with improved productivity, what impact on returns?

Port Operators

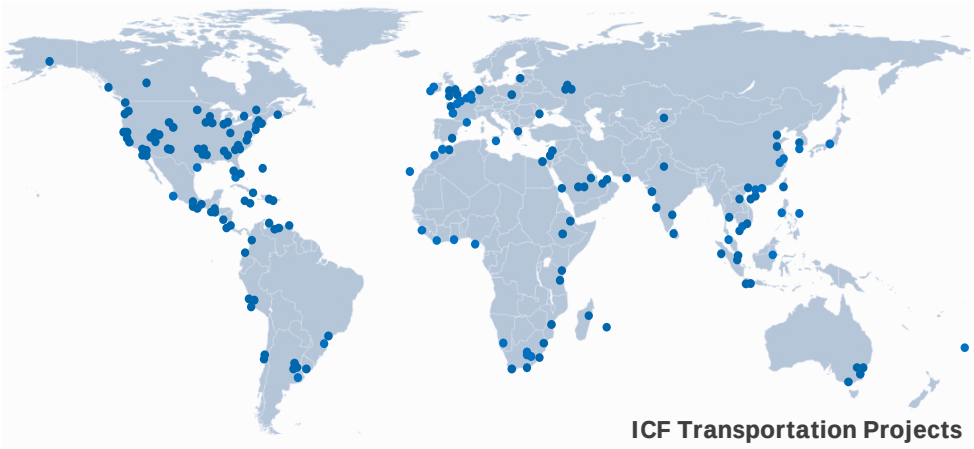
- Relatively stable EBITDA
- Very market / region dependent

Liner Companies

- Less successful
- Still very diverse although consolidation ongoing
- With such low & unstable margins **will carriers pass on mega vessel cost savings to customers?**
- **Supply / demand** still drives performance…and the failure of the market to clear

Thank You – Any Questions?

Ports, Logistics & Transport Services



ICF Transportation Projects

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