Global Optimisation of the principal Global Supply chains of NZ

To restructure and realign the Global Supply Chain Assets and operations
of the K[illegible]ers, Gateway Ports , Dry Ports, Freight & Inland Hubs
of New Zealand

To be read in conjunction with
Part 1, 2A & 2B, 3 & 4a

PART 4B of 4
THE AGILE SUPPLY CHAIN
POST PANDEMIC GSC

TRANSPORTING RESOURCES ON TIME IN FULL

MANAGING CONGESTION AND CAPACITY UPGRADES

A topline presentation for C-SUITE Managers
By
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Allan Rodrigues – Profile

Allan Rodrigues retired honourably from the Indian Navy in 1994 after serving 21 years. He is the Sword of Honour of his course and winner of the Lentaigne Medal at the Defence Services Staff College in Wellington India. During his Naval Career he has commanded IN Ships Nipat, Himgiri, and Subhadra. He has also been the 'Commander Work-up and Sea Training' of the Western Fleet and the Second in Command (XO) and Chief Instructor of the Naval Academy INS Mandovi. He was cleared for promotion to Captain but chose to join industry. He migrated to New Zealand in 1995.

In New Zealand, Allan has been a senior manager and C-SUITE 'board level' senior Management Consultant. He specialises in aligning strategy, finance, operations, decision engineering and performance management. Over the last 30 years Allan has been the lead management consultant for several major multi-million dollar projects over a range of industry sectors including the development and analytics for the reform of the sea and inland port & freight hub sector, the alignment of key supply chain hubs and assets across New Zealand to increase supply velocity, value based projects for the TV satellite and broadcasting sector, major electricity utilities, kiwifruit and agronomy, a review of the captive insurance sector, a benchmarking project for a major Australian Bank and technology start-ups under risk. He has designed a 4th generation Balanced Scorecard and an IT Portfolio Management Financial Model. Amongst the major projects he has undertaken is a 'Real Options' valuation of a major section of the national electricity grid in New Zealand, a valuation of the worldwide marketplace for the satellite 'occasional-use' time sensitive carriage of news and sports, strategic alliances and several strategic planning and valuation projects under risk and uncertainty.

Allan's qualifications include an MSc (Defence Studies) University of Madras (Lentaigne Medal) and an MBA (Elective Finance) from Henley Management College and Business School, Oxford on Thames, Oxfordshire U.K. He is a noted industry based adjunct professor who has been invited to both lecture (and guest lecture) at the master's degree level at universities in New Zealand and Australia over a period of twenty years from 2001 to 2021. He has conducted advanced logistics and supply chain governance advisories for senior operations/supply chain managers of the major NZ companies and defence services on behalf of the Centre for Supply Chain Excellence (CSCE) at the University of Auckland. He is currently the MD of The Business Binnacle Ltd (www.thebusinessbinnacle.co.nz) a management consulting practice. He is currently semi-retired from full-on consulting work.

Acknowledgements

The project was current during the timeline it was compiled and remains so for the most part. Whilst the data in some cases may be outdated, the underlying analytical methodology is current in many cases. Nevertheless, these methodologies need to be periodically peer-reviewed.

Many of the tools used have been obtained and adapted from peer-reviewed sources. The work of Professor(s) Simchi-Levi, (Wharton) on the 'global optimisation' of the GSCs, Theo Notteboom (Maritime Institute, Univ of Antwerp) and Jean Paul Rodrigue (Texas A & M) on port reform and the port eco-systems, Michael Porter (Harvard) on Value Chains and competitive advantage, Kaplan & Norton on strategy mapping and the balanced score card, G. Bennett Stewart, on Economic Value Added (EVA) , Ashwath Damodaran on valuations under risk and uncertainty, Dixit and Pindyck on 'Investments under uncertainty', Kulatilaka & Abrams on 'Real Options' feature across all four presentations.

The work of Yves Doz & Gary Hamel on Strategic Alliances, Kenichi Ohmae, Simon Benninga (Wharton) on Finance and Strategy, all master strategists in their own right, feature in the detail in presentations 2 to 4.

The author has also used his own work on the nexus of the value chain and supply chains, the de-aggregation of value chains and the 4G Balanced Score Card to inform this project. All models that have been used or adapted have been referenced. They feature at various places in the presentations.

The Author thanks the many senior managers past and present on the C-suite of many of New Zealand's large Sea Ports, Inland Ports, Dry ports and Freight hubs and the principal shippers of the main New Zealand export companies for sharing their practical and hands-on experience in operating and managing some of the most complex global supply chains in the world. Many of the models developed by the doyens of the Global Supply Chains in academia were adapted for this project using the hands-on knowledge gleaned from these practitioners in the marketplace.

Since this is a work targeted at busy C-SUITE senior managers it was essential to make the logic of the approach visible at first glance. Rather than use APA referencing the author has identified the authors by name and date with specific reference to their work to avoid clouding the issues in the short wordage available.

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THE C-SUITE PRESENTATION
PART 4

The Global Supply Chain (GSC)
The overarching methodology for GLOBAL OPTIMISATION

PART 4A –
- DETERMINING THE RHYTHM AND CADENCE OF THE GSCs -SVCs
- MANAGING THE TYRANNY OF TIME AND DISTANCE. MAPPING THE GSC END TO END

PART 4B
- POST PANDEMIC GSC & TECHNOLOGY AND BIG DATA ON THE GSC
- TRANSPORTING RESOURCES ON TIME, IN FULL, WHEN NEEDED
- MANAGING CONGESTION AND CAPACITY INVESTMENT UPGRADES

PART 4C
- MANAGING STRATEGIC ALLIANCES AND SCORECARDING FOR PERFORMANCE
- THE SECURITY OVERLAY

- PART 1 The PORT ECO SYSTEM & Global Transportation Corridors
- PART 2A & PART 2B: The Lean Agile Global Supply Chain Eco System
- PART 3 THE GLOBAL SUPPLY CHAIN & STRATEGIC VALUE CHAIN CONFLICT
- PART 4 In this section as indicated above

The Lean- Agile Global (or Local) Supply Chains (GSCs & LSCs) & their impact on the Global Transportation Corridors

These FOUR presentations capture the Architecture and Construct of the LEAN AGILE GSCs in tandem with the efficient management of Sea Ports or Inland Ports or Freight Hubs on the GLOBAL TRANSPORTATION CORRIDORS .Whilst they do delve into the asset management and operations processes of Sea and Inland Ports, the focus in this section is on the GSCs and their sea-land transportation rhythm and cadence

All four knowledge packs are densely packed as presentation cum data documents laid out in ways that combine the knowledge, data and findings from several investigative reports and presentations written and delivered over a long arc of several years by the author, with inputs from the port and supply chain analysts on the team. The nexus between the GSCs of the world and the Sea/Inland ports on the transportation corridors that interlink the global supply chains going outward or inward to and from New Zealand, and the conflict with the Strategic Value Chains of the individual GSC members have been drawn out by the author in some detail for the first time.

All four presentations cum data- documents answer the question

“ What do Lean-agile **Global (or Local) Supply and Strategic Value Chains** need from the various nodes and hubs on the world’s transportation corridors, so that they can manage the conflict between cost efficiency on the one hand and high agility (or High Fulfilment) on the other?”

Opening Comment.

Note. The presentations may seem a bit crowded and dense. The colours used are loud to draw attention. They are designed to be so

A NUMBER OF SLIDES FROM THE EARLIER PRESENTATIONS IN THIS SERIES ARE REPEATED FOR EASE OF REFERENCE.

The original project papers including the reports and presentations continue to be commercially sensitive and have been redacted. Rather than rewrite a formal report compiling the various methodologies and findings and for the sake of convenience in dissemination, the original reports and slides created for various forums have been repurposed, but with explanatory notes included for the benefit of lay readers and non-supply chain specialists. The author has designed each of the presentations to be a full document and to be readable 'as-is' in pdf without added notes.

This series of four presentation packs have been compiled pro-bono to demonstrate the broad ideation funnel used by some of the global supply/value chains of the world, as a way of educating/training senior managers on the current work being done at the coal face of many of the modern supply and value chains of the world.

The author advises caution with their use. There is a need for peer review and constant updating. Many globalisation strategies have come under fire post 2016 and the pandemic. Nevertheless, the 'Global Optimisation' innovation developed by the many doyens in the field, are just as easily used locally in a single country, or geography ,as well as internationally.

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There has been a market shift post 2016 creating a disequilibrium followed by a cataclysmic series of events from 2019 to 2021

COVID 2019 Pandemic Worldwide impact

UPSTREAM
COVID hit China
Ships lay idling at Chinese Ports
Nov 19 – Feb 20

DOWNSTREAM
Ships left China but idled at EU and US ports as they could not offload CTs as Covid then hit the EU and US. EMPTY CTs were not lifted for the return trip for nearly six months .

UPSTREAM
China began producing goods but could not load CTs as there were no EMPTY CTs in China. The ships finally headed back from EU/US, but massive back logs piled up.

BREXIT EU –UK SCM 2020 – to date

UPSTREAM UK
UK opted out of EU increasing SCM certification for goods in and out the UK

Successive Tory PMs were unable to negotiate a deal with the EU

Impacted on 38% of cargo in and out of the UK. Months of delays in GSCs

UKRAINE WAR Feb 2022 to date

Grain shipments out of the UKRAINE have had a severe impact on grain supply in developing countries

Black Sea initiative negotiated by Turkey released some shipments, but supply risks remain.

Negative impact and increased risk to the world's food supply

SUEZ CANAL Closure MAR 2023 grounding of MV EVERGIVEN & HOUTHI CRISIS 2024

ships were diverted around the Cape of Good Hope

Increase in voyage time of 14 days for 50% of traffic

Follow on Domino effect expected to last several months

PANAMA CANAL DROUGHT 2022 to 2024

Worst drought in 143 years due to the impact of climate change

It created an Increase in voyage time of 14 days for 50% of traffic diverted

New routes from China to the US eastern seaboard had to go from China westwards around the Cape of Good Hope to reach the US East ports

May 24 canal resumed normal traffic but remains at risk from climate change

BIG SHIP > 20K TEU CREATED EXCESS CAPACITY

Big CT ships carrying > 20K TEU were designed to create scale economies. By 2020 they created excess capacity and idling as the ships could only enter large ports which were congested

The smaller 1K to 4 K TEU carriers should have been paid off. Many of them were climate negative and CO2 polluters. The congestion due to COVID, SUEZ and PANAMA crisis created huge back logs at the major ports

Shippers began using smaller ships to carry cargo to small ports to avoid congestion at the major shipping hubs. This created overcapacity for big CT ships recently built. The freight rates which should have dropped increased with the demand for smaller CT ships.

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The architecture of the GSC and SVC construct post pandemic and the Suez Panama crisis

- There has been a concentrated effort to future proof the GSCs of the world. There is also recognition that whilst the GSCs were market efficient they also allowed the large Alpha Males to control the strategic value chains of almost all industries.
- The consequence has seen some long awaited but also some knee-jerk reactions to future proof the GSCs by both regulators and market entities. THE POST PANDEMIC GSCs NOW SEEK TO BALANCE THE CONFLICT BETWEEN GEO_POLITICS and MARKET ECONOMICS. THE EMERGENCE OF BIG DATA & DIGITALISATION WILL PLAY A MAJOR ROLE.

UNCTAD
ESG
GROUPS

THE GLOBAL SUPPLY CHAIN | THE STRATEGIC VALUE CHAIN

MAJOR GSCs
AMAZON
WALMART
APPLE etc

1 GEO-POLITICAL CONSTRUCT

Conflict

2 THE MARKET ECONOMIC CONSTRUCT

SUSTAINABILITY

- Renewable energy sources – Green H, Low sulphur fuel
- Tax Laws for economic zones
- Regulations for critical items
- Service level agreements on guaranteed delivery
- Altered economic mood , inflation, uncertainty, (tensions) inequality
- Fuel IMO Standards Aim 0.10% mass by mass
- Safety Security
- GOODS SHOULD NOT BECOME COLLATERAL DAMAGE OF WAR

INCLUSIVITY

- The GSCs must be long globally and deep locally
- SMEs have a fair chance to benefit as well
- All countries have a voice and not just the key players on the GSCs (VAR must benefit as well
- Build communities from the ground up
- Foster collaboration mitigate the power of the alpha males on the SVCs

TECHNOLOGY

- Global Supply Chains must be resilient. Big Data drives Information and Knowledge enabled by AI, ML and Industry 4.O IIOT tech.
- Digital Factories, Smart Tech, Smart Warehousing, Fulfillment drives efficiency.
- Information between supply partners must be in real time & secure. Block Chain messages/ high tech drives communication.

FLEXIBILITY

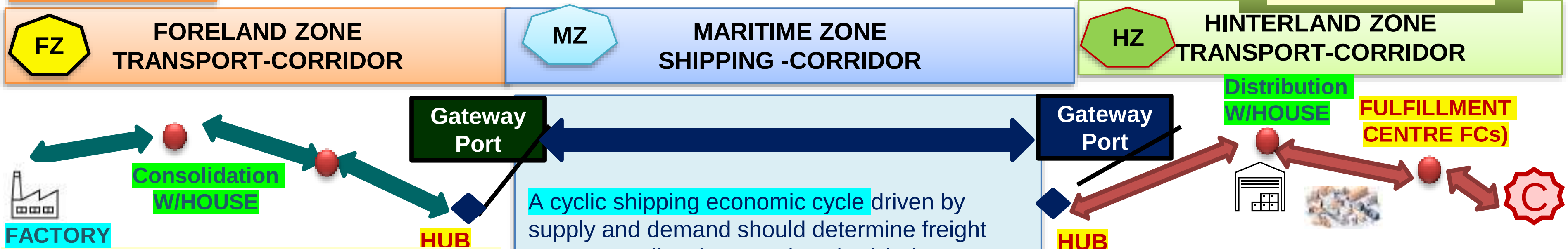
- TIME MUST BE MADE IRRELEVANT WITH INNOVATIVE BUSINES SOLUTIONS
- Proximity to the customer delay manufacturing/assembly
- Dual sourcing with separate logistics clusters of spatial expertise in labour
- End to end GLOBAL OPTIMISATION OF PROFITS
- CO-OPETIONS
- ALLIANCE ADVANTAGES where the alliances compete

Upheavals post 2019 have had a profound impact on the construct of the GSCs & SVCs creating the emergence of Alpha Males who dominate their segments and even the entire GSC

THE GLOBAL SUPPLY CHAIN END TO END FROM THE BIRTH TO THE FINAL DISPOSAL OF THE PRODUCT

UPSTREAM

DOWNSTREAM



The **Foreland** lies upstream where the product is created and produced on the GSC upstream. It must be low cost, and lean. The eco-systems of the Freight Hubs (FH), Shipping Hubs (SH), Feeder Ports , Dry ports Gateway ports must be aligned to low cost. Production is 'push' based to obtain economies of scale. Inventories are designed on 'big data' and aggregate forecasting. Smart inventories with flexible capacity drives the upstream construct of the GSC.

Digital factories using high tech (IT and OT) enabled by Artificial Intelligence (AI) Machine Learning (ML) devices learn and align the ops sensors to communicate to all interfaces using Industry 4.0 and Industrial IOT (IIOT) to create Unified Name Space interfaces and Digital Twins technology to increase efficiency. (see following slide on Digital Factories)

A cyclic shipping economic cycle driven by supply and demand should determine freight rates. In reality, the container (CT) industry was subsidised from the 1990s onwards by the CT industry to drive growth with $100 bn of subsidies which ran out in 2015 or so. At the same time, the large CT ship > 20K TEU began appearing in 2015 onwards. The smaller CT ships with inefficient and climate harming engines were to be paid off but were not, as they became sought after by shippers as the big ports became congested after being hit by the Pandemic, Suez, Panama crisis at precisely the time the subsidies for containers ran out. Excess capacity appeared with the big ships and not the smaller one. The UNCTAD charter on clean fuel and carbon miles were impacted. Freight rate went up with excess capacity not down. Shipping companies operating in alliances created large power bases on the Maritime corridor to negotiate freight rates with the shippers and with the major Private Terminal Operators at the Gateway ports.

The hinterland delivers products to the final customer **(C).** The GSC downstream is AGILE **to "DELIVER IN FULL ON TIME" (DIFOT).** Time connects the parts. The major players **INNOVATE TO MAKE TIME REDUNDANT**. Aligning the eco-systems of the Gateway ports, Freight Hubs and FCs to ramp up at short notice without an increase in cost or time is critical. Value-added Logistics (VALs) and Value-added Facilities (VAFs), co-located at the HUBS using Cross-docking, Marginal pricing strategies instead of volume discounts, global optimisation of profits, delay manufacture/ assembly, reverse logistics are all combined to create an umbrella of coordinated flexible assets, processes, human resources to deliver on time in full. Managing time reduces uncertainty. **COOPETITION exists** between the strategic alliances between shippers, carriers and customers. 3PL and 4Pl providers proliferate

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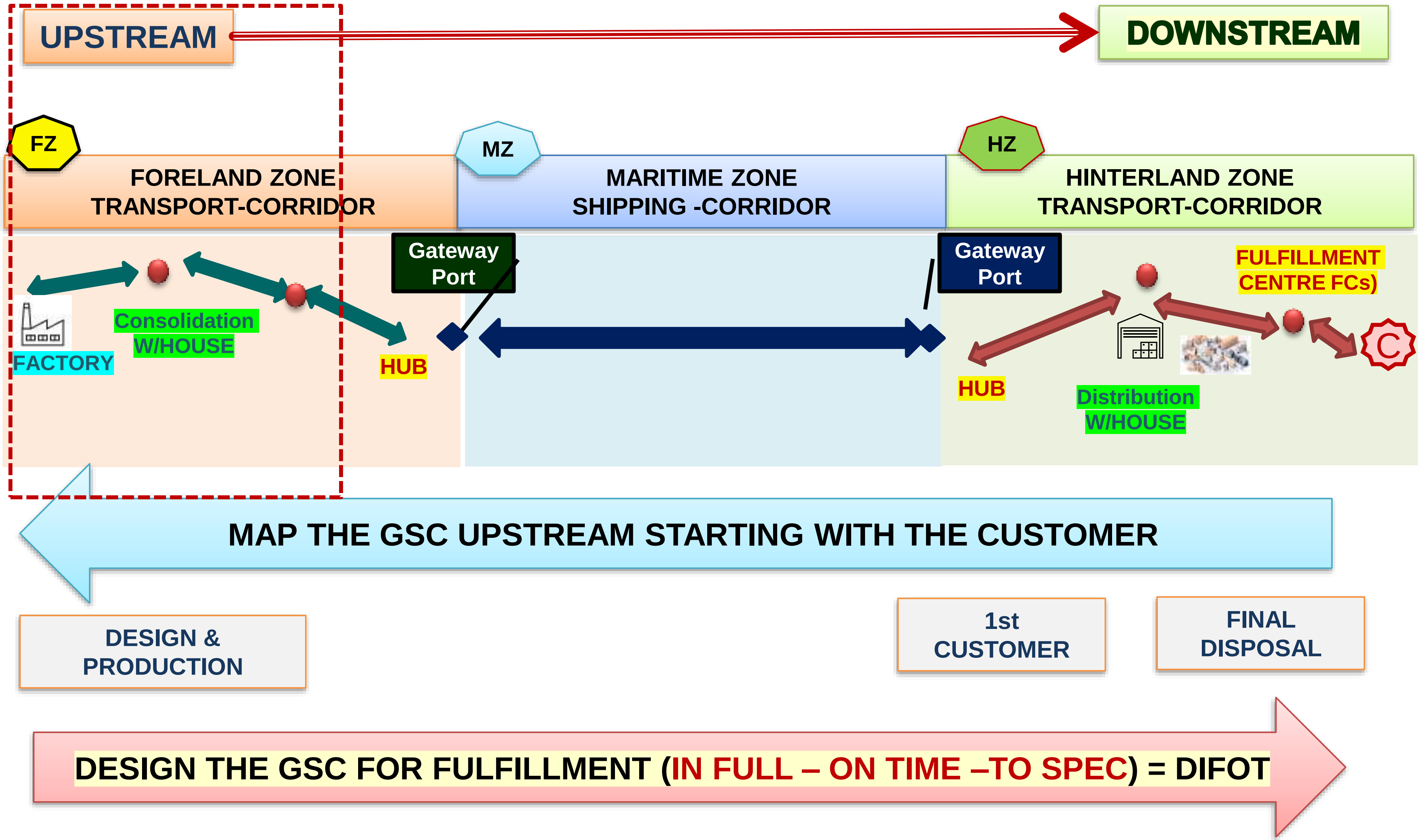
Creating the Lean Agile GSC
Mapping the Supply Value Chain

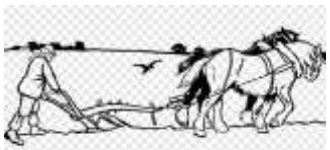


FZ

The timeline to the 4th Industrial Revolution (INDUSTRY 4.0) Mining & turning information to data (IIOT - Digital Transformation)

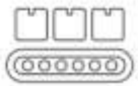
The Digital Factories that lie upstream on the GSC are driven by the 4th Industrial Revolution (Industry 4.0), the Industrial Internet of Things protocols (IIOT) and Digital Transformation (DT). The evolution of Industry 4.0 is as shown below

>>>>>>TIMELINE 1700s to 2030s >>>>>>>>>>>



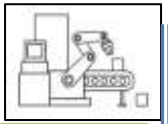
1700s to early 1800s
1st INDUSTRIAL REVOLUTION
INDUSTRY 1.0

Manufacturing based on manual labour using people and/or animals and crude machines



1800s to early 1950s
2nd INDUSTRIAL REVOLUTION
INDUSTRY 2.0

1. Use of steel
2. Manufacturing with electricity
3. Factory machines became more mobile
4. Mass production and assembly lines used



1950s to 2000
3rd INDUSTRIAL REVOLUTION
INDUSTRY 3.0

Manufacturing with electronics/computers, digital replaced Analog hardware, software driven computing & Automation

Connecting machines & devices
1. Mass production
2. Use of analogue machines and early computers in manufacturing
3. Lean production, early connectivity at the enterprise level

2000 to date
4th INDUSTRIAL REVOLUTION
INDUSTRY 4.0

1. Interconnectivity
2. Automation
3. Machine Learning/ **AI**
4. Real time data
5. Smart Factories

IOT
Internet of things
Consumer focus
E.g. Smartwatch, connected cars, Smart homes, that monitor appliances

IIOT (Industrial IOT)
System of Computers, devices, Objects & People to transmit data over a network.
Big data Predictive analytics,

DIGITAL TRANSFORMATION
Moving to a Unified Data space.
An Automated interface between Enterprise and control systems.

CYBER PHYSICAL SYSTEMS
Merging of cyber and physical systems.
Autonomous vehicles, Robots,

Aggregated from the original lecture series by Walker Reynolds and Zack Scriven 2019 and Kudai Manditereza of HIVE MQ 2024

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FZ

Industry 4.0, IIOT & THE DIGITAL FACTORY
Key elements

	TITLE	DESCRIPTION
AI	**ARTIFICIAL INTELLIGENCE**	A concept that refers to a computers ability to perform tasks to make decisions that would require human intelligence
BD	**BIG DATA**	Large sets of structured or unstructured data that can be compiled stored organised to reveal patterns trends opportunities and associations.
CPS	**CYBER PHYSICAL SYSTEMS**	To merge cyber and physical systems or cyber manufacturing using Industry 4.0 in a manufacturing environment with real time data collection and transparency between devices and systems
HMI	**HUMAN MACHINE INTERFACE**	A Human-Machine Interface (HMI) is a user interface or dashboard that connects a person to a machine, system, or device. HMIs are local machines unlike SCADA which are remote machines used to collect data.
IOT	**INDUSTRIAL INTERNET OF THINGS**	A System of computers, devices, objects & people designed to transmit data over a network with a focus on a production facility or an interconnected digital factory.
IIOT	**INTERNET OF THINGS**	A System of Computers, devices, Objects & People designed to transmit data over a network with a focus on a Consumer or customer. Typically refers to Smartwatches, connected cars, Fitbits, thermostats, refrigerators in smart homes, doorbells alarms.
MES	**MANUFACTURING EXECUTION SYSTEMS**	A process turning raw materials into finished goods around **a series of discrete steps.** Each step generates unique data which is organised into 3 categories 1. Asset data or manufacturing data with real time sensors and measurement results 2. Manufacturing data with real time feed of manufacturing events for tracking and control 3. ERP system planning data for finance. The steps are tracked and documented in real time in MES systems MES helps Manufacturers optimise production by understanding the current conditions on the plant floor.
ML	**MACHINE LEARNING**	The ability of a computer to improve through AI without being explicitly programmed to do so.
PLC	**PROGRAMMABLE LOGIC COMPUTERS**	Programmable Logic Controllers (PLCs) are industrial computers, with various inputs and outputs, used to control and monitor industrial equipment
SCADA		**SUPERVISORY CONTROL AND DATA ACQUISITION** - software applications for controlling industrial processes, involving data gathering in Real Time from remote locations to control equipment and operations.

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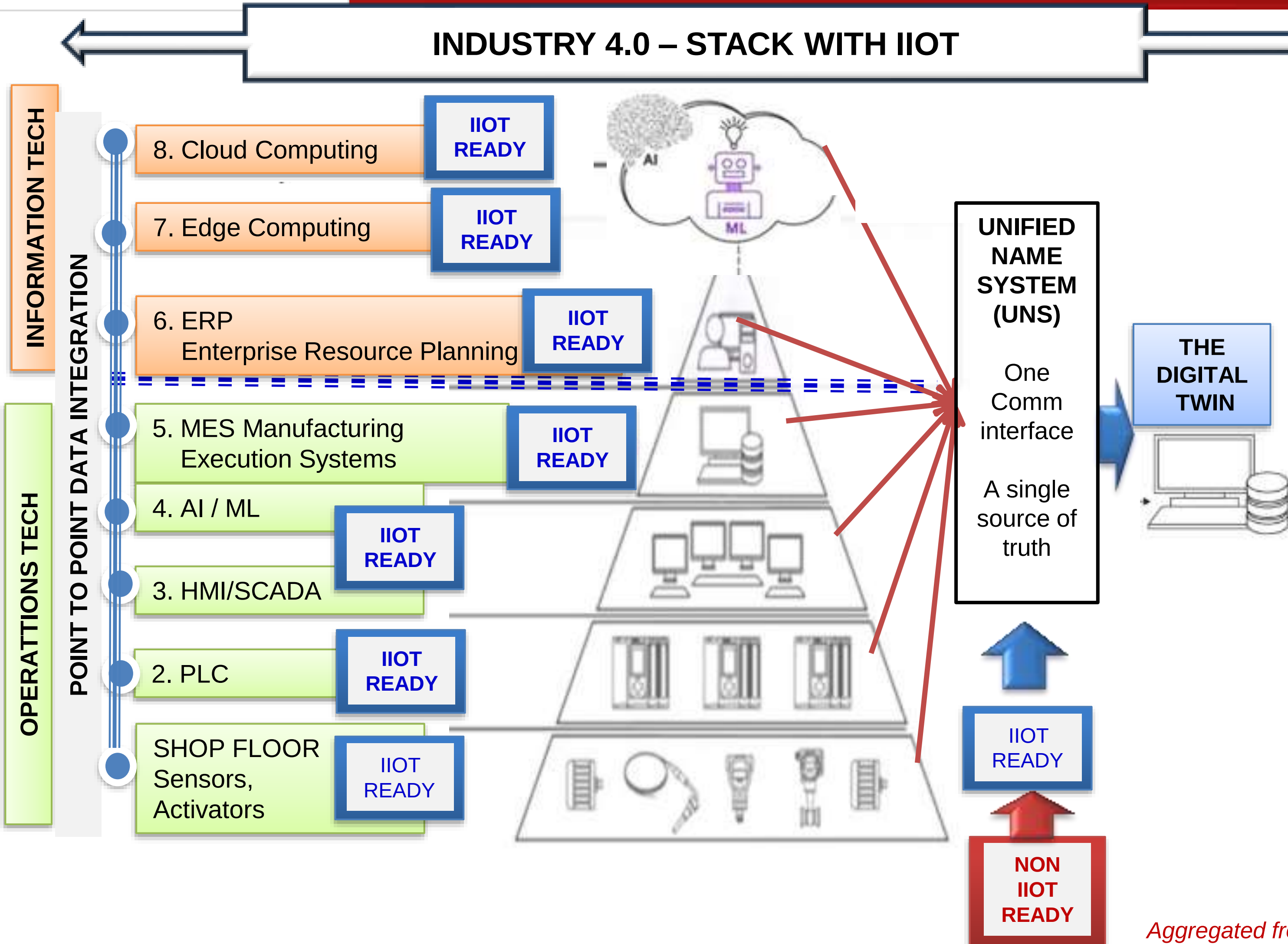
Industry 4.0 is not to be confused with the evolution of mobile communications from 1G to 5G

CLARIFICATION SLIDE

TIMELINE >>>>>>>>>>>

1G FIRST GENERATION	2G SECOND GENERATION	3G THIRD GENERATION	4G FOURTH GENERATION	5G FIFTH GENERATION
1900s to 1980s • Deliver Analog Voice	Early 1990s • Deliver Digital Voice TDMS • (CDMA)	Early 2000s • Mobile Voice and Data • CDMA 2000s • Use UMTS and GSM hybrids	Early 2010s • Mobile Broadband • Downloads of video and • 10 x times speed of 3G • Fast mobile internet experience • Long term evolution (LTE) delivers wireless data to a consumer's phone • reduced latency, scalable bandwidth capacity and backward compatibility with the existing Global System for Mobile communication (GSM)	Early 2019 • Cellular network • Cells connected by radio waves and a base station • Higher download 10-20 Gigabits/sec using mm frequency waves • Ultra-low latency •

The Digital Factory driven by Industry 4.0
IIOT, Digital Transformation and The Digital Twin



Benefits Primary
1. Connected Stack
2. Real Time metrics
3. Digital Data Analytics

Benefits Secondary
4. One Infrastructure
5. IT /OT Convergence
6. Single pane of glass
7. Citizen developers
8. One digital strategy
9. Data as commodity

Aggregated from the original lecture series by Walker Reynolds and Zack Scriven 2019 and Kudai Manditereza of HIVE MQ 2024

Note: A manufacturing tech stack refers to a set of software, platforms, and technologies manufacturers use to support their operations.

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The Digital Factory and the Digital Twin

Aggregated by Allan Rodrigue from the original lecture series by Walker Reynolds and Zack Scriven 2019 and Kudai Manditereza of HIVE MQ 2024

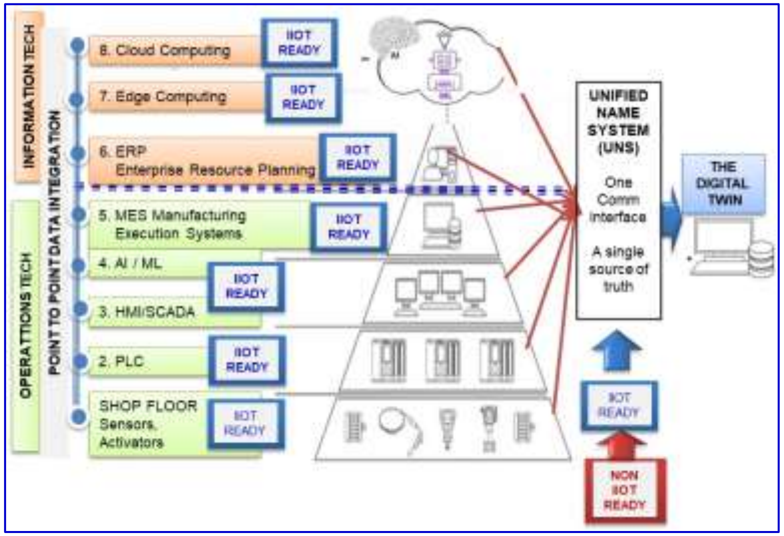
- A digital factory is a paperless connected stack of Operations Technologies (OT) and Internet Technologies (IT) that collate and communicate real time metrics and big data analytics to the users of a network. There is no separate OT or IT domain. IT enables OT to solve problems on a single common platform. The 'extended stack' consists of a common infrastructure extending from the shop floor to the edges of the organisation through **edges** and **cloud** computing.

- The traditional system would have up to eight layers in the stack beginning with the shop floor sensors (PLCs) that interact directly with an HMI/SCADA system control system enabled by intelligent AI driven Machine Learning devices that then capture asset data, manufacturing data and ERP planning data for the MES and ERP systems. The discrete manufacturing steps used to make a product are tracked, controlled and documented in real time in the MES (Manufacturing Execution System to help managers optimise production based on the real time conditions on the shop floor.

- The traditional system using the ISA 95 standard information would normally be transmitted in a series of discrete steps from one level to the next beginning with the sensors in the OT domain moving upwards to IT. There would be data gaps which would limit the scope of the data. E.g. Information from a PLC sensor to the cloud would need to go through each level in the stack, often through incompatible data formats at each level, sometimes using different systems requiring the help of expensive external specialists to make them compatible.

- In the digital factory instead of a stack there is a Unified Name Space (UNS). Each layer in the stack communicates to the UNS directly in real time through an IIOT device which uses smart sensors, actuators, RFID tags networked together to provide enhanced data collection and analysis. Data is no longer in silos but collated in the same IIOT format using the same protocols to communicate to all entities and users not just locally, but through edge computing and the cloud, to the far corners of the network of a global enterprise.

- The single greatest advantage is the creation of a DIGITAL TWIN which is a virtual replication of the actual assets, process and devices



- THE DIGITAL TWIN uses real time data to help in learning and decision making. Management can make changes to the TWIN or replica of the actual process, or experiment with new processes, batch sizes, etc analyse what-ifs and select optimum outcomes without interfering with actual shop floor operations.

- New information from cloud-based AI or ML can be tested. Data is as close to real time as is possible. Testing of new ideas is performed in a safe virtual space.

- The Digital twin can also be used for training of new employees without damaging the system or impacting production runs. It avoids life threatening situations or major down time due to system failures.

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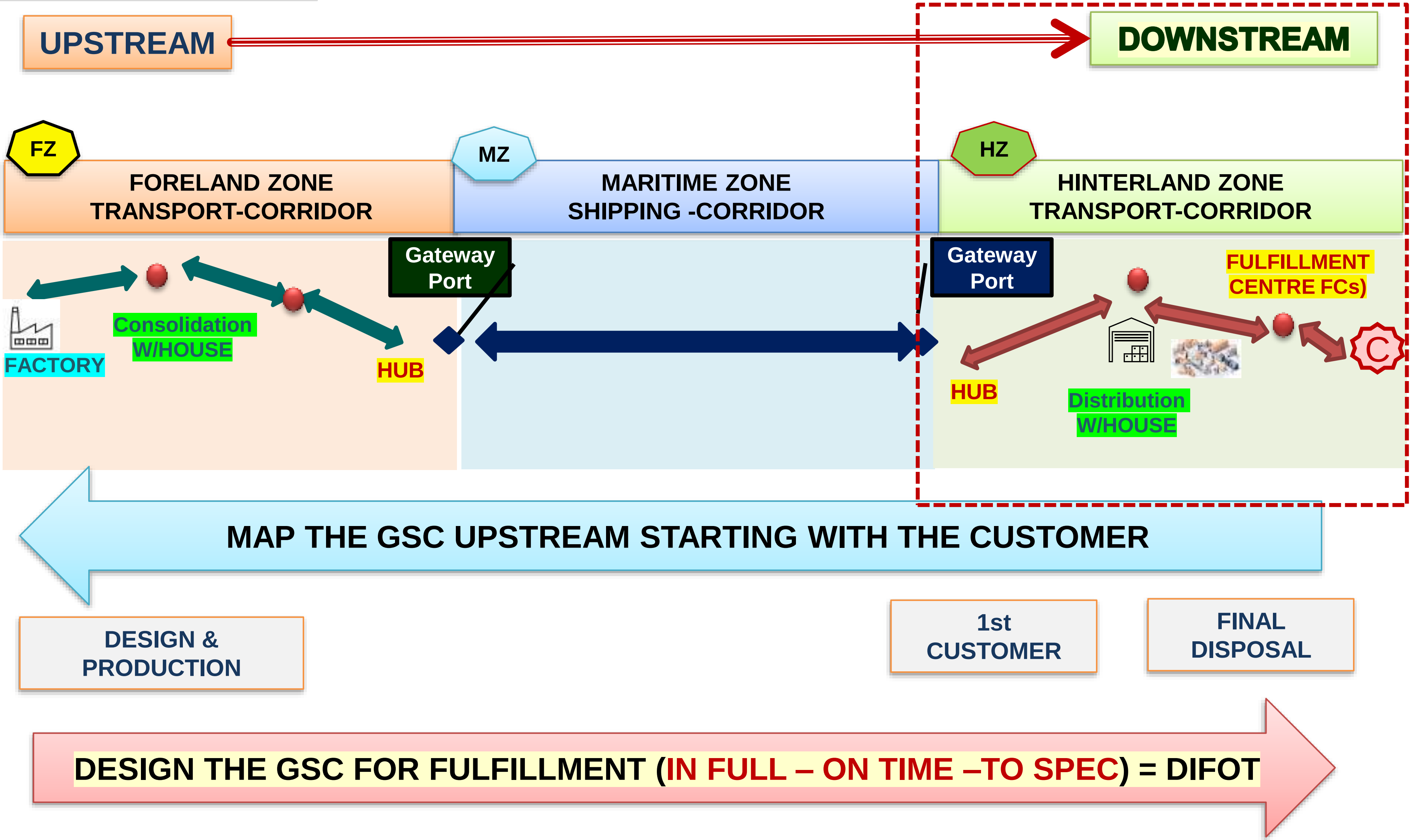
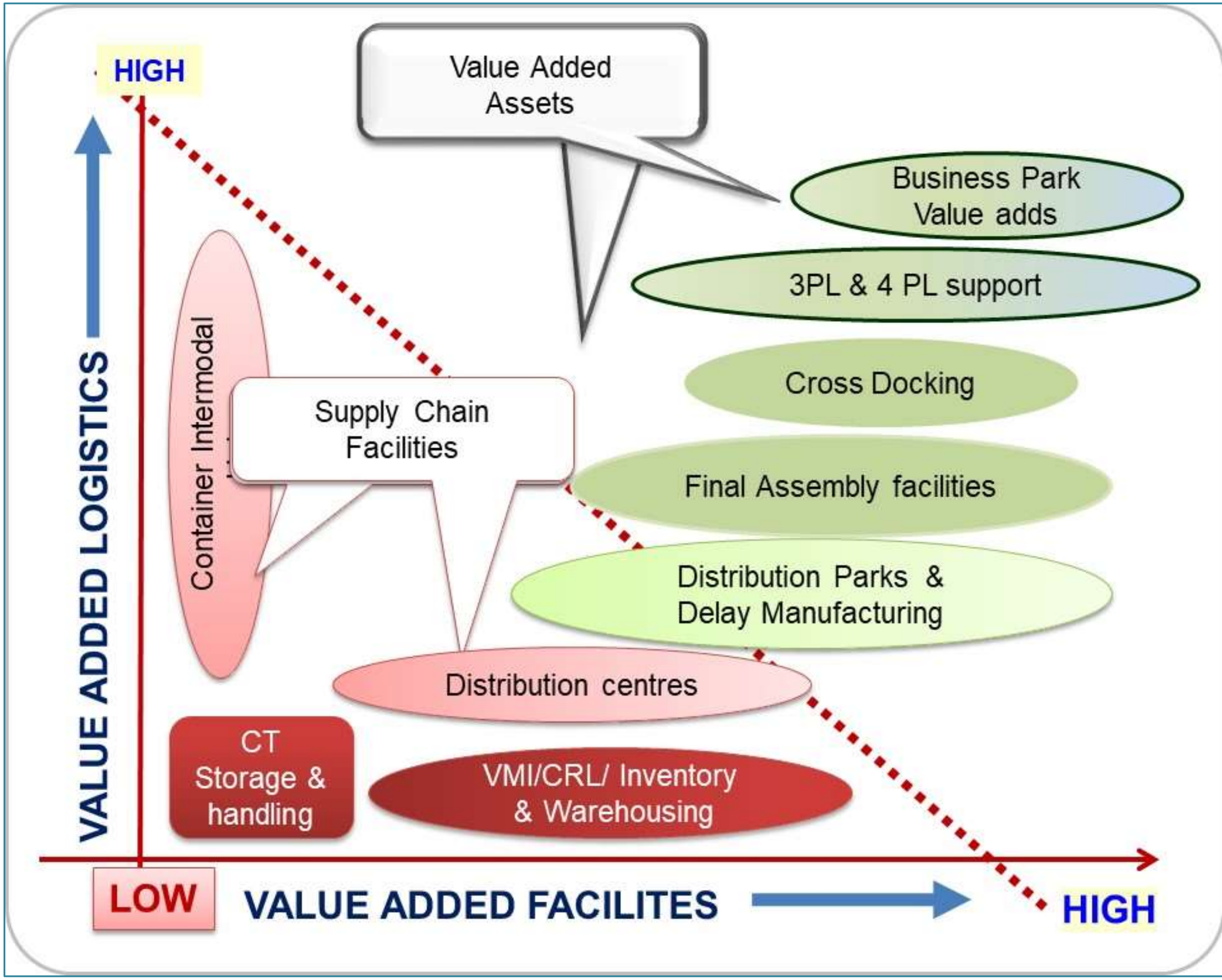
Creating the Lean Agile GSC
Mapping the Supply Value Chain



Concept of the Port Eco System (PES) and its alignment with the 'optimisation construct' and rhythm of 'Global' and 'Local ' Supply Chain connectivity end to end.

VAFS & VALS
At each hub
On the transport corridors

- PES = PORT ECO SYSTEM
- VMI = Vendor Managed Inventory
- CRL = Continuous Replacement Logistics
- 3PL = Third party logistics
- 4 PL fourth Party Logistics

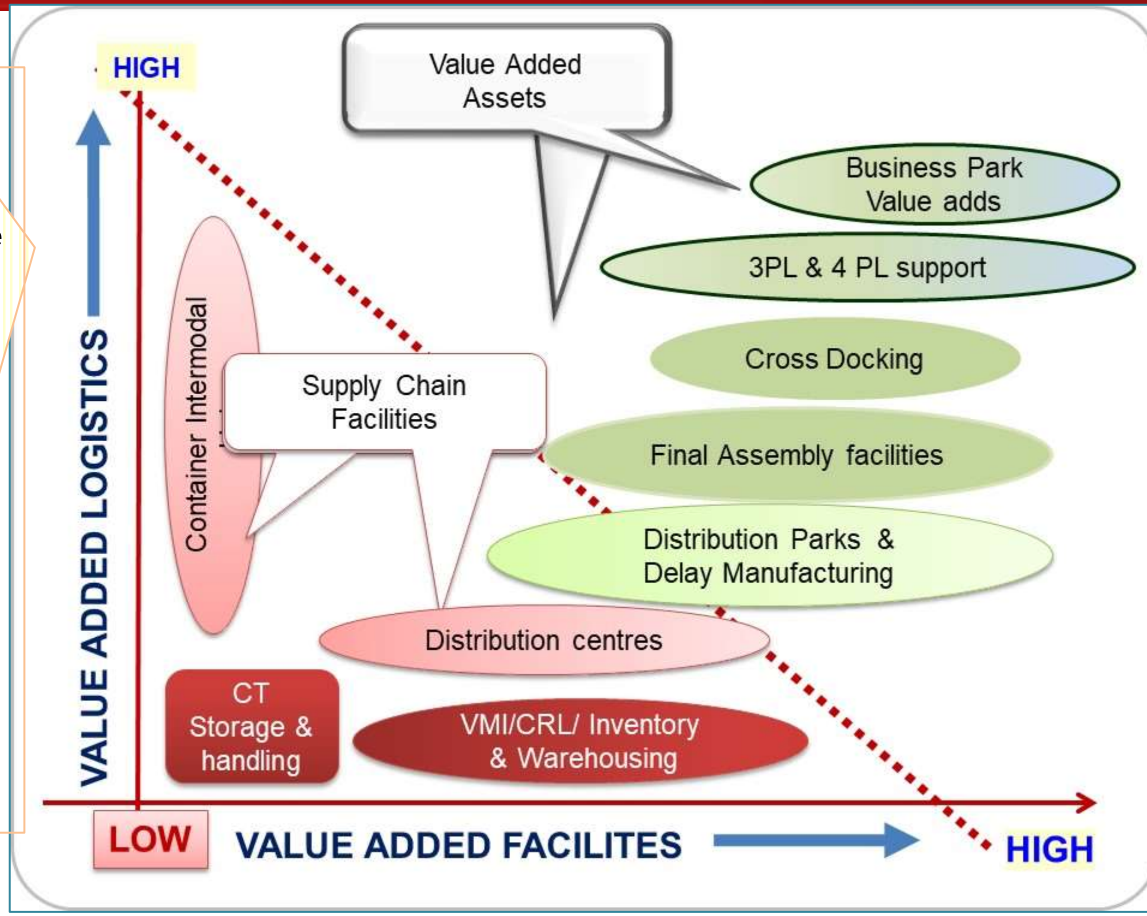


Concept of the Port Hub Eco System (PHES)
Focus on supply velocity, rhythm and cadence

EXPLANATORY NOTE (SEE PRESENTATION 2 FOR DETAILS

A typical PORT HUB ECO SYSTEM (PHES)
The mistake is to design systems that add value only to the shippers in the hinterland. Instead, **the PES MUST ADD VALUE TO THE RHYTHM, VELOCITY CADENCE OF THE GLOBAL SUPPLY CHAINS END TO END.** Global supply chain build optimisation algorithms that manage delay in manufacturing particularly for high clock speed items.

Each PHES has a combination of Break-bulk value-added logistics for import GSCs that tend to collect around key Value-Added facilities. On the reverse export chain, they form the aggregation collection point Value Added Logistic. Delay Manufacturing driven by Information dense Algorithms cater to demand uncertainties.



THE HUB ECO SYSTEM THAT IS COMMERCIALLY ATTRACTIVE TO A GSC IS THE ONE WHERE THE PRODUCTION OR DISTRIBUTION SUB-CONTRACTORS CO-LOCATE AROUND THE HUB. THE SYSTEMS THEN BECOMES A ONE STOP SHOP WITH ALL THE ELEMENTS OF THE DELAY PRODUCTION CONSTRUCT IN EASY DRAYAGE DISTANCE FROM THE MAIN GATEWAY PORT

PES = PORT ECO SYSTEM
VMI = Vendor Managed Inventory
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3PL = Third party logistics
4 PL fourth Party Logistics

Port KPIs

1	Strategic Location	Captive users of the port Distance and connectivity with the hinterland users
2	Adequate Infrastructure	Berths, terminals, wharf gear Cranes, storage facility and stacking Adequate intermodal links
3	Ability to serve high ship service frequency	The > the frequency of ship visits the > choice to the Freight Forwarder (FF) Increased frequency of ship visits increases competition between carriers
4	Port efficiency (Speed and Reliability)	Reliability and availability of port services Reduced turnaround times by the terminal Reduced cargo dwell times
5	Port charges & Quick response	Smart pricing for value Adequate sharing of information
6	Port reputation (Service quality/damage)	Quality and reliability of stevedoring and labour Low damage and shrinkage losses

Port Congestion

Port congestion occurs when ships face delays in loading or unloading cargo due to bottlenecks in the approaches to or at the ports itself. The reasons are varied and often depend on numerous factors from ownership models, the connectivity with the hinterland and with the association of the port with the shippers and even the GSCs.

Public ports that are owned by the state tend to operate as monopolies and are legacy assets that are often retained by the state for strategic reasons.

Most other ports are either fully privatised or are part privatised with models that range from Landlord Port models based on the councils owning the land and infrastructure but privatising the superstructure, assets and operations to PRIVATE TERMINAL OPERATORS (PTOs) who make long term investments in plant machinery and operations and pay concessions for the lease of these facilities. Many of these concessions have fairly complex structures and last for as long as 60-years.

Port congestion has a major impact on the ability of a port to provide an ROI that is commensurate with the risk and reflected in the Cost of Capital. Shareholder expect a return that creates wealth effectively requiring an ROI that is greater that the WACC (Weighted average cost of capital).

Port Congestion Measures

1. **Throughput volume**: increases or decreases over time measure both efficiency but also to the adequacy of investments in capacity
2. **Turnaround time**: increases or decreases, indicate the efficiency of port terminal operations.
3. **Berth occupancy rate**: high occupancy rates indicate that the port is operating at or beyond its capacity
4. **Vessel wait time**: the longer wait times indicate higher levels of congestion. Vessel wait times have a follow-on effect.

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Port Throughput versus Congestion

PORT THROUGHPUT (TEU)

Frequency of ship visits

# of berths (ports cargo handling ability)

CP = Container productivity (# of containers lifted by crane)

DT = Delay Time (hrs) The difference between the total berth time and waiting time to berth, plus the time to start work to the time to finish)

PORT CONGESTION

Customs/regulatory delays: lengthy inspection & paperwork processes

High cargo volumes: surges in global trade or seasonal demand spikes overwhelm port capacity

Adverse weather conditions: storms, fog, or high winds shut down port operations

Geopolitical issues: strikes, conflicts, or trade restrictions can disrupt port activities

Vessel bunching: multiple ships arriving at the same time creates backlogs

Labor shortages: lack of dockworkers, truck drivers, or crane operators

Inefficient operations: (bottlenecks)a poor coordination, outdated technology, suboptimal scheduling

Limited port capacity: insufficient infrastructure, insufficient berths or storage space

Adapted from Abraham (2024) Freightos.com.

Tongzon, J. (2009)

Pricing levers

The strategic objectives any Global Supply Chain asset (Production facility, Warehouse, Distribution Centre, or all along the Foreland, Maritime and Hinterland corridors are threefold

- ❑ To maximise throughput,
- ❑ To maximise value-add to the supply chains of the entire supply chain, and
- ❑ To maximise employment and productivity at the asset and across the .

Four levers are manipulated to change the impact of pricing (positively) on the profitability and Return on Capital Employed at a Supply Chain asset of a port:

- **Increasing Sales Revenues** obtained from increased marketing (and communication) of the GSC value proposition (and its increased value benefits), to its customers;
- **Decreasing Fixed Costs** with better productivity and asset efficiency, or with strategies that reduce the need for incremental Capex to support growth, or mitigate congestion;
- Reducing **Variable Costs** with better productivity (economies of scale for direct labour, stevedoring and or buying power for products and services); and
- Reducing price per unit over the long term, which not only has the largest impact on volume, but also the largest impact positively, on the ROC of the port.

Adapted by Allan Rodrigues from Smith. T. Pricing Strategy (2012): Impact Pricing Podcast (2020:2024).

Smith’s ‘Economic Price Optimisation’ (EPO) Model

()

EPO focuses on a profit sensitivity analysis calculation that measures the impact of a change in price on volume and on the profits of the firm. The aim is not just to offer discounts but to create Economies of Scale (volume economies) that make the unit cost lower for the buyer with increase volumes. The price point however must be profitable for seller.

Pricing causes two effects on the profitability of any firm operating in a reasonably competitive market

(a) There is **a direct effect** or a linear relationship **between price and profits**, and

(b) (b) An **indirect effect** (particularly over the medium/long term), where pricing begins to **drive volume behaviour** and **customer demand**

- A key insight of the model is the recognition that it is critical that increased volumes must lead to economies of scale through commensurate reductions in variable costs that accrue from better purchasing power for labour and goods, and better economies all round.
- Without this key driver, increasing volume by itself, adds little in the way of value.
- On the supply chain the variable costs and fixed costs should be averaged on a per container basis

Future profit

Initial profit

$$\Pi_f \geq \Pi_i$$

Eqn 1

$$\%dq \geq \frac{-\%dp}{\%Cm_1 + \%dp}$$

Eqn 2

Where

%dq - % increase in quantity for a given price

%dp – % Magnitude of price change

%Cm1 – % Initial price contribution margin (Ratio between initial profit and initial price)

Adapted by Allan Rodrigues from Smith. T. Pricing Strategy (2012): Impact Pricing Podcast (2020:2024).

Gain loss graphing diagram

Adapted by Allan Rodrigues for the Tongson Container throughput for a Sea Port in New Zealand from Smith's (2012:2024) Pricing Strategies.

G = Gain from Increased Qty

$$G = (Pf - V) * (Qf - Qi)$$

$$\geq$$

L = Loss from reduced pricing

$$L = (Pi - Pf) * Qi$$

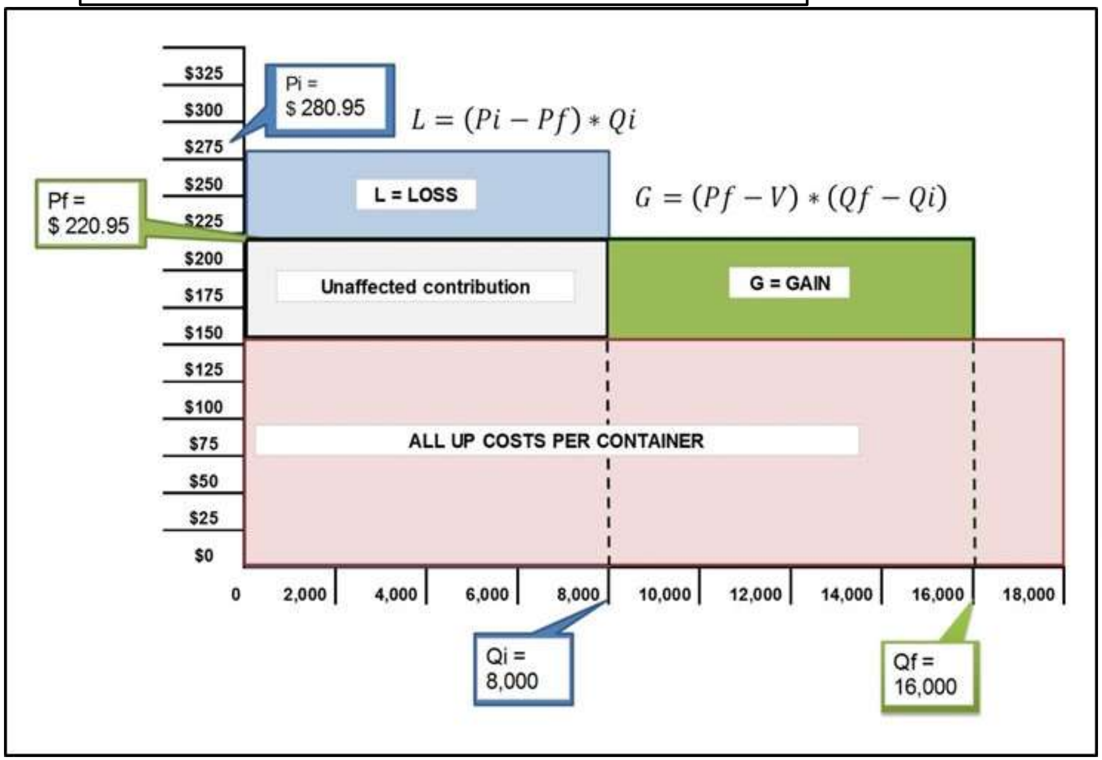
Where
Pi - Initial price
Pf - Future price
Qi- Initial Quantity (TEU)
Qf- Future Quantity
V - Variable price

$$(Pf - V) * (Qf - Qi) \geq (Pi - Pf) * Qi$$

Divide both sides by Qi and (Pi – V)

Impact of Quantity Increase in Profits ≥ *Losses due to price reductions*

$$\frac{Qf - Qi}{Qi} = \frac{Pi - Pf}{Pf - V}$$



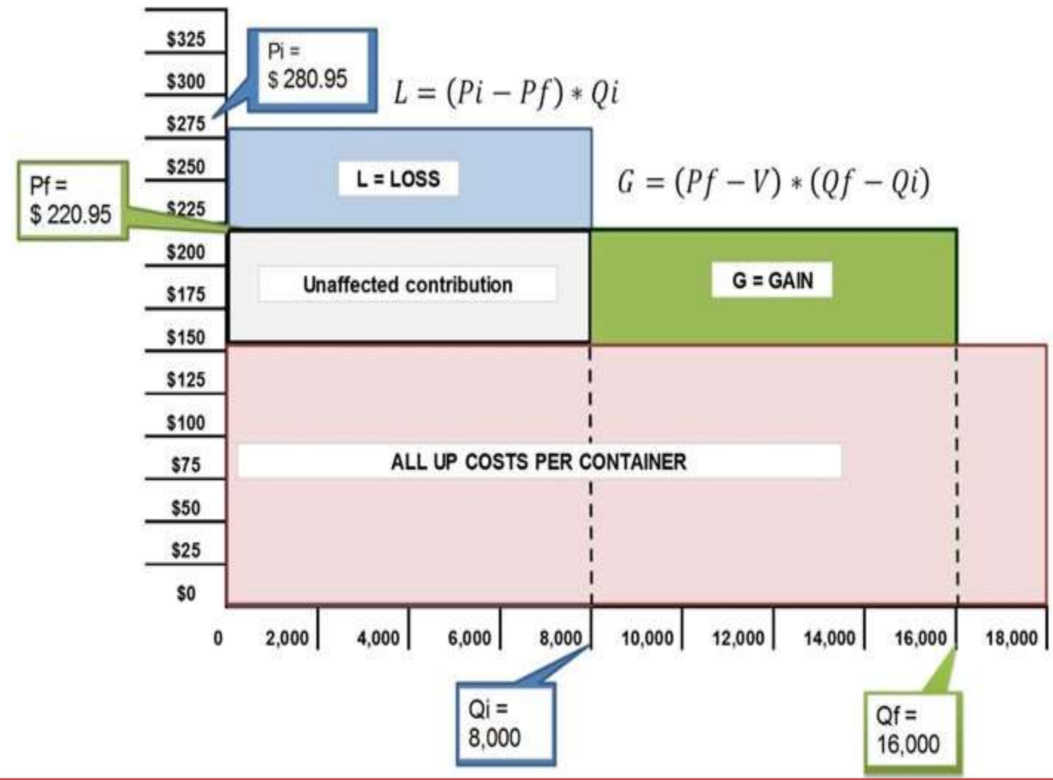
Pi = Initial Price ($)
Pf = Future Price ($)
Qi = Initial quantity
Qf = Future Quantity
V = Variable Cost
FAC = Fully Allocated Costs

V = FAC
Variable costs can be replaced by Fully allocated costs when FAC are used instead.

Economic Pricing Optimisation Policy (EPO) done intelligently

Adapted by Allan Rodrigues for the Container throughput for a Sea Port in New Zealand from Smith's (2012:2024) Pricing Strategies.

- Supply Velocity and the need to increase throughput results in many Supply chain facilities and Seaports offering volume discounts to large customers. The fundamental logic is to drive scale economies by spreading the costs of a product or service over a larger volume. It is critical that the lesser profit made by the discounted price offered does not reduce the overall profitability of the firm.
- The Price volume model and formulae design by Tim Smith (Pricing Strategy Series) demonstrate how losses or gains can be figuratively demonstrated. In this example a seaport container terminal has been used. The base price offered to handle a container at a seaport in New Zealand is e.g. $ 221 for volumes less than 8000 CTs. From 8001 CTs up to 16,000 containers a discount price drop of $ 150 has been used. (representative example only)
- The EPO is the price at which the volume discount creates an even balance between the loss of Revenue due to the Price of discount and the gain in revenue with the increase in Volume
- Any EPO model seeks to find the balance between the price-quantity-service quality trade-off. A price greater than EPO damages profits by losing customers. In addition, the long-term impact of capacity lying unused, destroys shareholder wealth. Conversely a price less than EPO, leaves money on the table, and therefore reduces profit margins needlessly.



Warning: Volume increases only provide scale economies up to a point. As volumes increases the Port reaches the limits of its capacity. Variable Costs begin to rise exponentially as the wear and tear of machinery, breakdowns, and labour & overtime costs begin to bite. The EPO MODEL MUST BE USED IN TANDEM WITH MARGINAL COST MODELS TO BE ABLE TO FIND THE POINT AT WHICH DISECONOMIES OF SCALE OCCUR.

Short run and Long run Marginal Costs

Adapted by Allan Rodrigues from the original lecture series by David Longstreet on Economic Pricing and Talley W (2017) Port Economics).

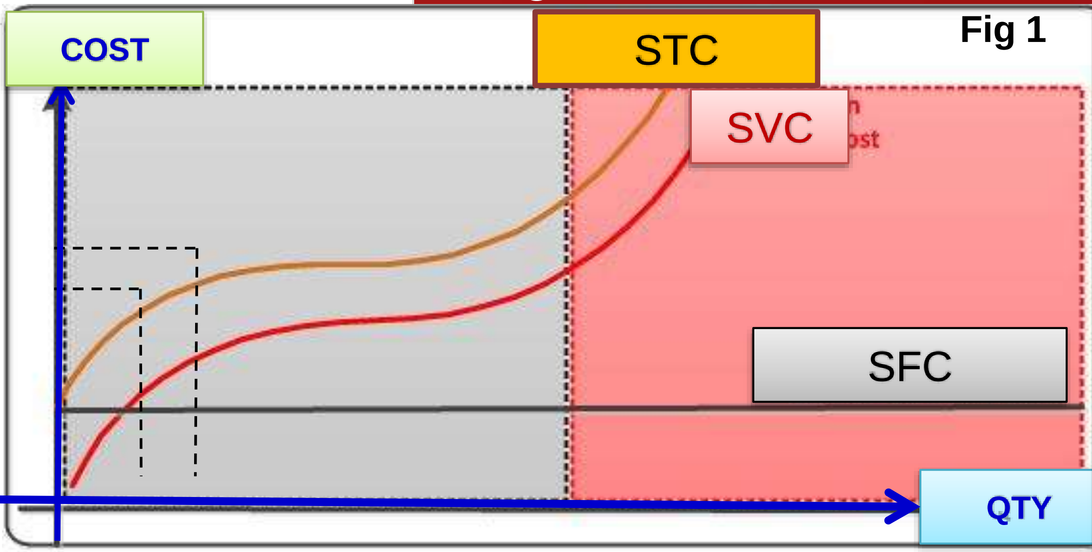


Fig 1

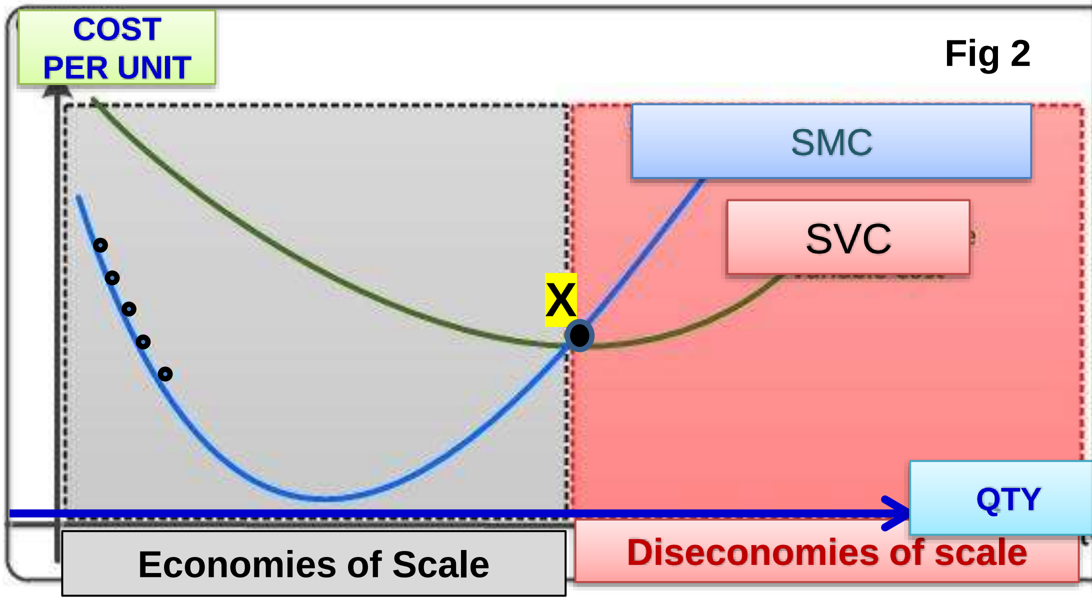


Fig 2

- The marginal price of a transportation unit e.g. (TEU) on the GSC is equal to the marginal cost of the last TEU produced serviced or transported.
- In a normal cost graph (FIG 1) cost is on the Y axis and Qty on the X axis. Short run Fixed costs (capex) SFC are the same across the capacity of the firm. SHORT RUN VARIABLE COSTS (SVC) and therefore SHORT RUN TOTAL COSTS (FC + VC) at any point increase with Qty. As the QTY increases costs drop as the firm gains economies by spreading its costs over larger volumes. The curve flattens but begins to rise exponentially as the increased volumes reach maximum capacity. At which point the SVC rapidly increases with increases in breakdowns and labour costs.
- FIG 2 plots the graph that measures the marginal increase in cost with each CT added on. The marginal difference in total cost (C2 –C1) is divided by the marginal increase in Quantity (Q2 – Q1). The points are plotted as SHORT RUN MARGINAL COSTS (SMC) per Container CT added.
- Comparing the marginal cost curve (SMC) with the standard SVC shows how the curves bifurcate. The SMC shows the cost savings from scale economies until point X is reached usually at full capacity. Adding on additional CTs creates diseconomies. The Port loses money. PORT CAPACITY NEEDS TO BE INCREASED FROM POINT X

The juxtaposition of demand versus marginal cost

Adapted by Allan Rodrigues for the GSC and Port industry from the original model by Talley W (2017) Port Economics).

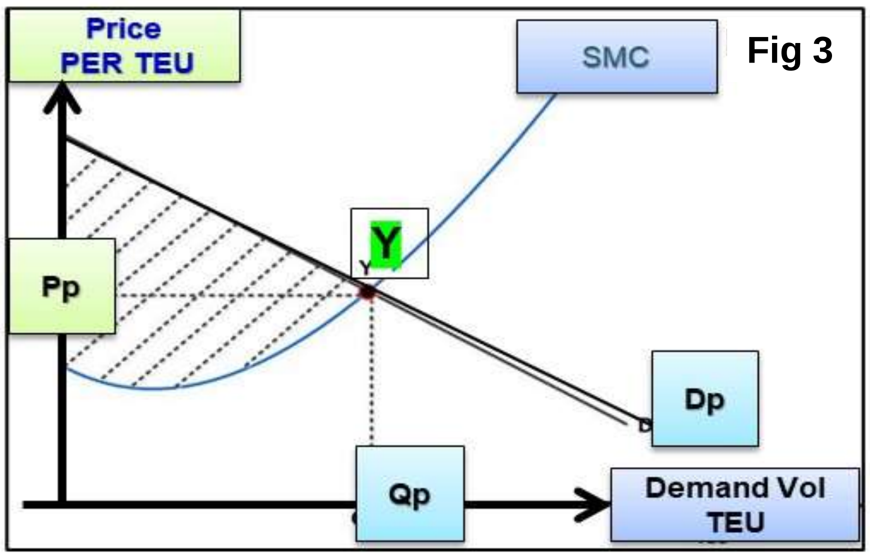
- Price elasticity of demand plays a crucial role in the application of marginal cost recovery pricing models. Container ports however are constantly under threat. Whilst the threat may be lesser in the short run, it is worsened in the medium to long run

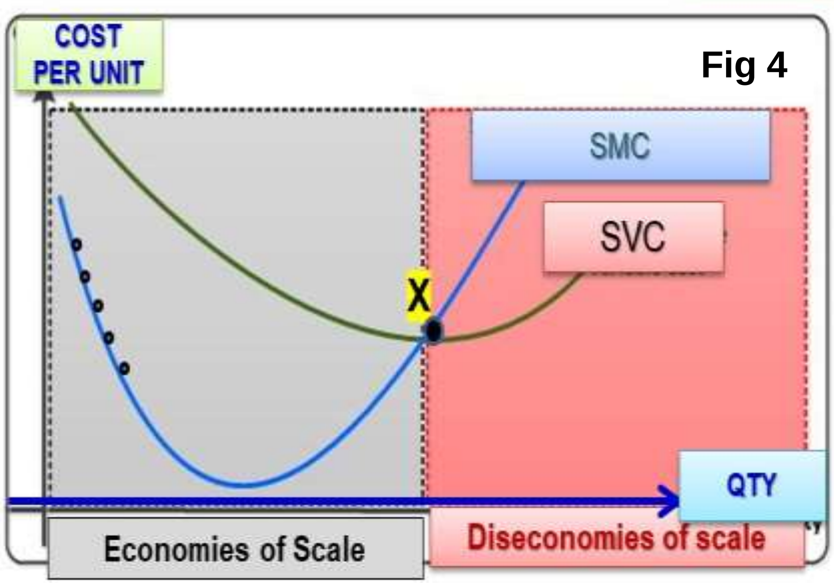
- Marginal cost recovery and marginal pricing, are a core pricing technique used to drive volume behaviour in CT terminal operations The impact of the demand line on the marginal cost curve is a key element in this dynamic.

- Figure 3 highlights a second key point of intersection. This intersection takes place at the point the marginal cost curve meets the demand line (Point Y) which is the point where the net benefits from the port service are at a maximum. For a port this means that the TEU throughput represented by quantity Qp in the graph is the point at which its quality of service for the price offered is at its maximum.

- The juxtaposition of Point X, where the marginal curve separates the areas between economies/diseconomies at Fig 4 should be plotted with reference to point Y, which is the point where the marginal cost curve meets the demand line and quality of service is maximised.

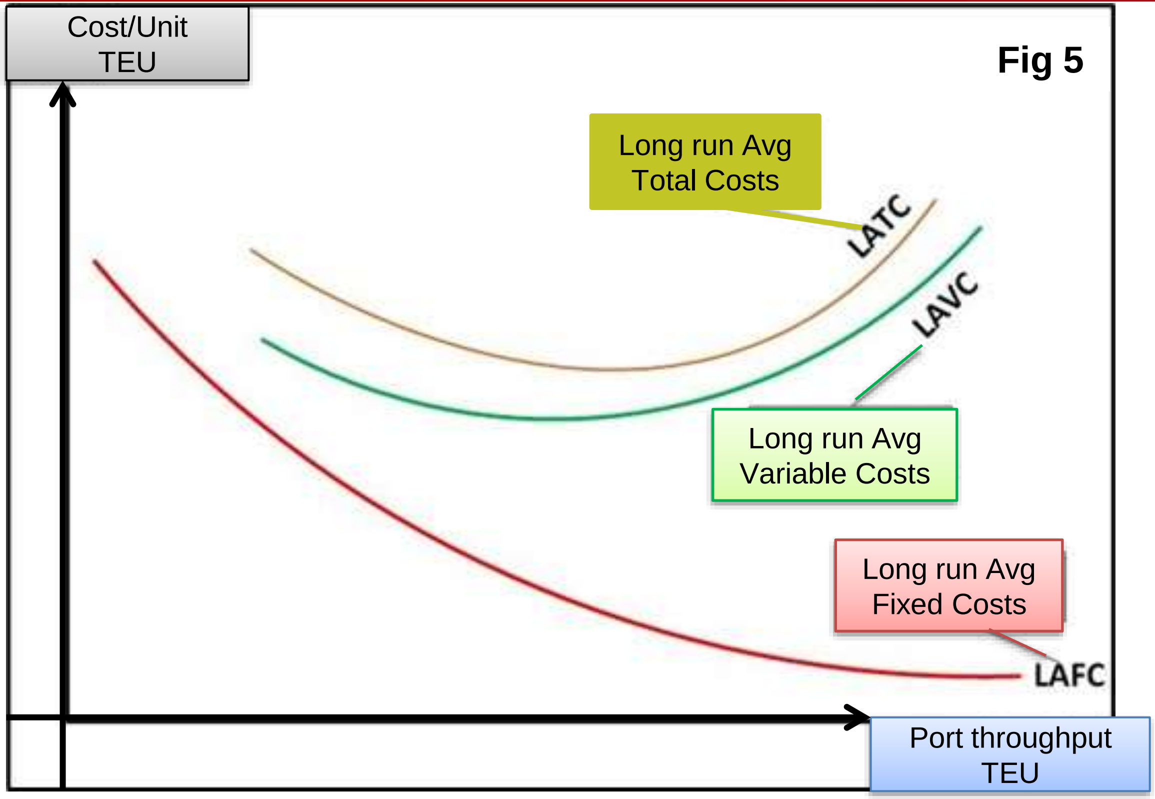
- **Point X and Point Y therefore indicate the upper and lower bounds of each investment tranche, where technical efficiency and cost efficiency are maximised. This is a key insight that should inform all supply chain hubs and Ports.**





Long run marginal costs designing the investment tranches

Adapted by Allan Rodrigues for the GSC and Port industry from the original model by Talley W (2017) Port Economics).



- In the long run all costs including fixed costs are variable. Pricing is treated as a series of short-run tranches of fixed cost investments. The objective is to gain scale economies with volume increases, and constantly reduce the total costs per unit TEU increase in volume, over the long run. This is captured by the **long-run-total-costs (LATC) curve at Fig 5 above** which constantly reduces with volume increases.

- This happens only if the port is able to use its volume growth to create scale economies, a constant mantra in the price-quantity trade-off.

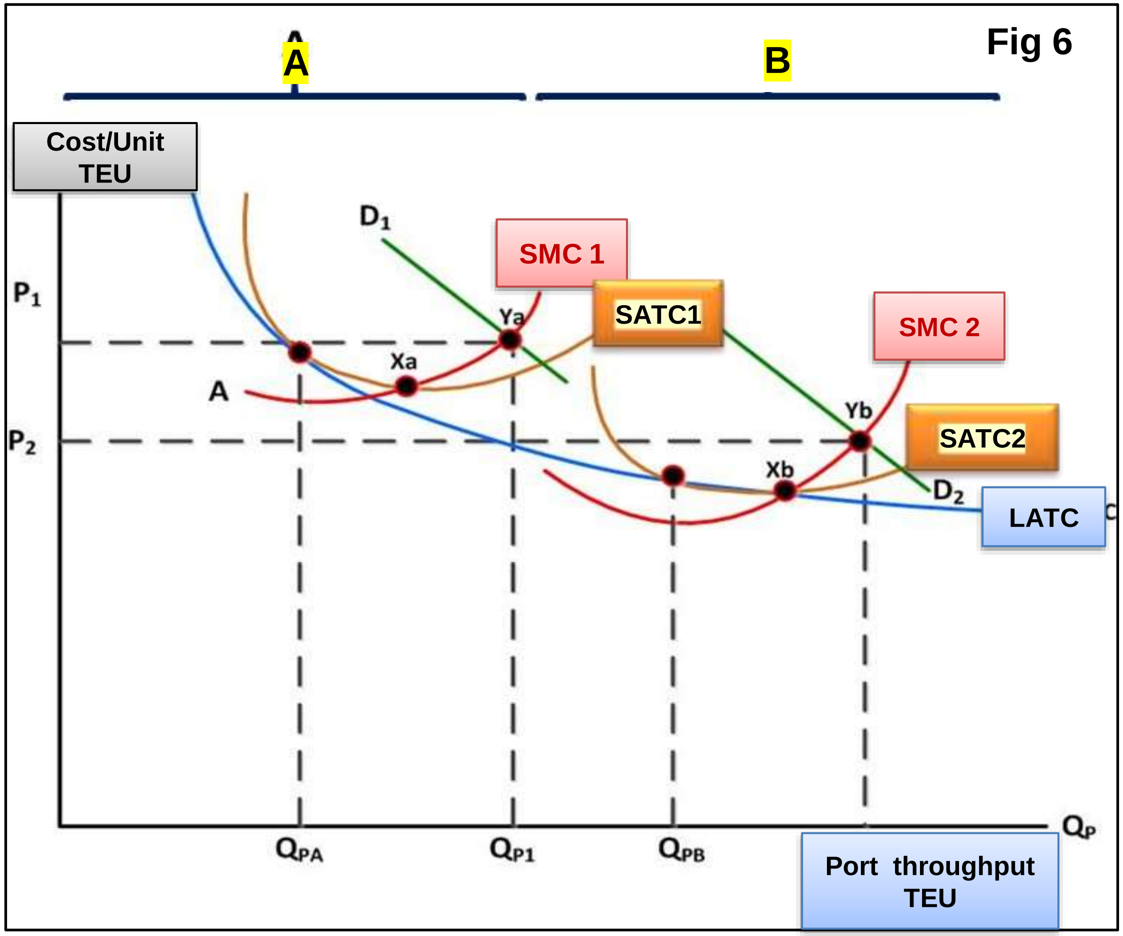
Talley's Model for designing investment tranches to efficiently increase capacity

Adapted by Allan Rodrigues for the GSC and Port industry from the original model by Talley W (2017) Port Economics).

The long run costs of the port at fig 6 should guide the separation of investment tranches in the long-range development plan of the SCM asset or a port. Fig 6 shows two such investment tranches named A and B. Each tranche has its own points of intersection between the marginal costs, variable costs and the demand line (depicted as Xa and Ya) in the first tranche, and (Xb and Yb) in the second tranche of fixed cost investments. In the short run the fixed costs do not change. The average variable costs represent the short run total costs (shown as SATC) above.

Talley's diagram demonstrates how recovering the marginal costs in each major investment tranche, reduces the fixed cost per TEU as volumes increase. Over the long run, all costs including the major fixed costs are variable. At some stage, earlier or later, breakeven in each tranche is achieved based on how the price-quantity trade-off is manipulated.

It follows that Point X and point Y represents the TEU quantities that best capture the ports price-quantity-versus- demand-quality of service trade-offs for a given tranche.



- When the TEU throughput QTY represented by Point X in each tranche, is less than that of Point Y, there is a shortage of capacity nearer point Y. Demands can be met, but with diseconomies of scale, as congestion impacts on quantities beyond X
- OTH if point Y is located before point X, the port has spare capacity. The demand can be easily met with capacity to spare ergo there are economies of scale yet to be utilised. The danger here is that overcapacity comes with the risk of capacity lying underutilised.

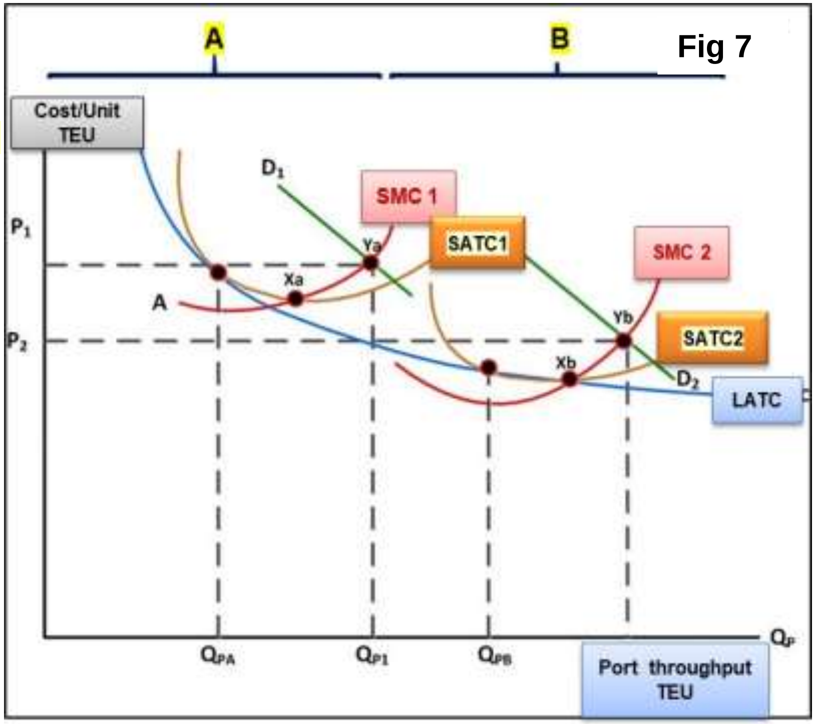
Talley's model for balancing out demand (TEU throughput velocity) versus congestion

Adapted by Allan Rodrigues for the GSC and Port industry from the original model by Talley W (2017) Port Economics).

A marginal pricing policy is essentially based on the principle that there is no 'further' increase in fixed costs in a particular capacity tranche; and that, the only costs that need to be considered in the short run, are the variable costs. So long as the demand is within the port's capacity, there is no congestion. But the fixed costs in a particular tranche will in any case need to be recovered at some point in time.

Marginal cost recovery takes the opposing view of fully allocated cost recovery methods. Prices are based on the marginal cost of each increase in unit volume. Early users of the firm's capacity are rewarded. Later users pay a higher price or a premium. This approach actual allows the service providers to leverage the economies of scale from marginal low-cost pricing at the very start. Conversely as capacity use begins to near congestion levels, a premium is charged for services.

A key requirement in marginal cost recovery is firstly for the marketplace for services to be reasonably competitive. Secondly, marginal cost recovery works best when there are early takers of capacity, when the marginal curve is in the volume zones where the maximum economies of scale occur, and well before diseconomies begin to kick in.



Several methods of marginal cost recovery are in use. Fiercely competitive industries like the airline industry, typically begin with a low marginal price based on (variable cost-plus pricing) to fill aircraft seats early. This strategy greatly mitigates the risk of having high -cost capacity (aircraft flights at scheduled times) lying unused. As time elapses, the demand for seats begins to rise, as does the price. The maximum price is paid just before the flight departs.

In this avatar of the yield model, the price offered to the customer increases, as capacity nears exhaustion through a process called 'dynamic nesting'. Hotels typically follow similar discount driven yield models. It is this model that can be efficiently used on the Global Supply Chains of the world end to end across all Freight Hubs, Inland and Sea ports from the Foreland to the Hinterland.

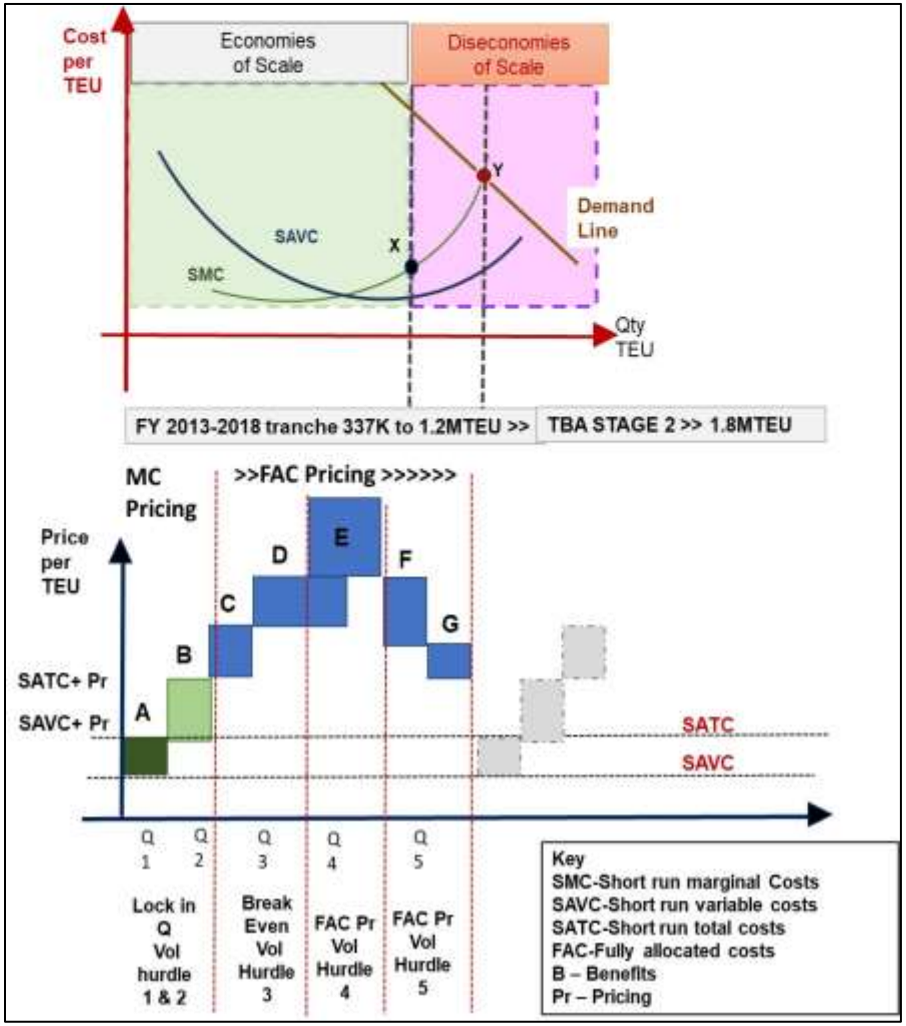
Roddy's Three tier Waterfall Model TIER1

Original design by Allan Rodrigues circa 2012

TIER 1

RODDY'S 3 x TIER WATERFALL YIELD is designed for Sea Ports and Supply Chain nodes to ensure that that volume price discounts offered to large customers use the Port capacity efficiently, profitably and without creating congestion.
The aim is to use an investment tranche of say 5 to 7 years efficiently using marginal pricing to use the economies of scale and find the point at which the next investment tranche in capacity is needed.

- The model uses the Marginal pricing model to offer steep discounts that exploit 'economies of scale'. Volumes that lie beyond and inside the diseconomies of scale curve are penalised with higher prices. This is the antitheses of the standard EPO model that offers higher discounts for higher volumes.
- STEP 1. Use data to design the VOLUME hurdles where the price point changes. Form hurdle groups e.g. 0-8000 TEU, 8000 to 16000 TEU. The actual group parameters depends on the volume numbers in that group and how they impact on efficiency and congestion Use a fully allocated cost (FAC) approach. The Port needs to extract a high starting price that is linked to a strong value proposition and a clear competitive advantage. Calculate a breakeven point per container. Set the minimum price at the break even. Find a weighted average median price.
- STEP 2 Offer the lowest price to the shippers providing guaranteed TEU throughput. This is the first hurdle price point. E.g. a large shipper usually shipping 500K containers a year can see great value and little risk in guaranteeing 20% say 100K CTs in this first hurdle group and so on. Offer all shippers guaranteeing throughput the lowest price. (Breakeven +). The longer the term guarantee the lower the price.



Roddy's Three tier Waterfall Model TIER 2 & 3

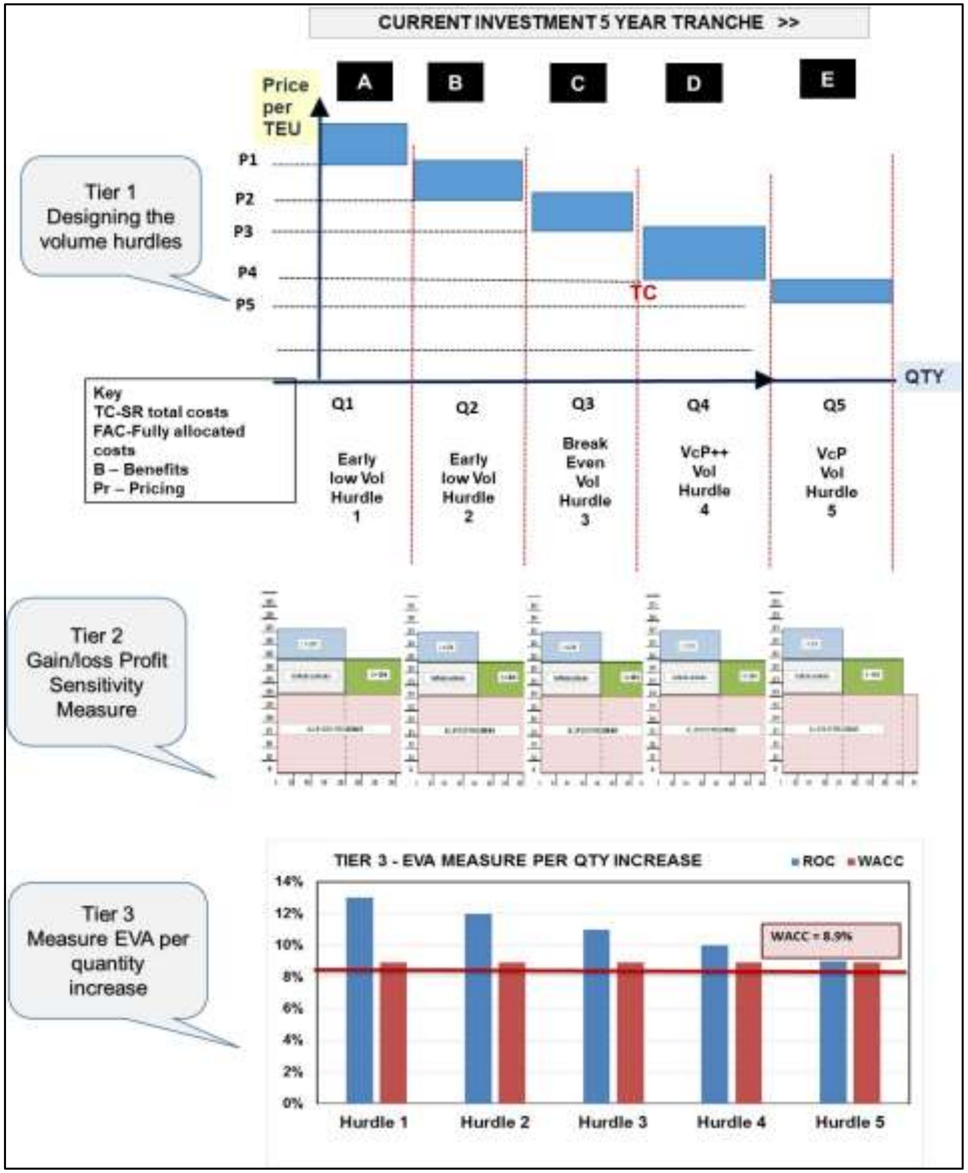
Original design by Allan Rodrigues circa 2012

TIER 2 & 3

- At TIER 2 each Price volume hurdle or group acts as the basic EPO model within the price-volume group. The EPO model seeks to find the balance between the price-quantity-service quality trade-off. A price greater than EPO damages profits by losing customers who do not see the value. Conversely a price less than EPO, leaves money on the table, and reduces profit margins,
- AT TIER 3 The model measures the wealth generation potential of the pricing strategy by measuring EVA per CT. It allows the price strategy to be tweaked until the best price value point in each hurdle group is reached.

RODDY'S 3 x TIER WATERFALL YIELD accordingly operates at three levels

- TIER 1 It creates groups that offer volume discounts at the lower capacity usage levels. Shippers who guarantee CT are offered the lowest price at precisely the moment when the volume economies to be gained are highest thereby avoiding the volume discounts that are the cause of congestion.
- TIER 2 & 3 use the EPO in tandem with Marginal Costs to find the exact volume where the Port or SCM node needs to invest in the next tranche of Capacity.
- Guarantees by shippers for a % of their CT traffic e.g. 30% to 40% reduces the risk of the port and makes it much easier for The Port to raise investment capital to increase capacity



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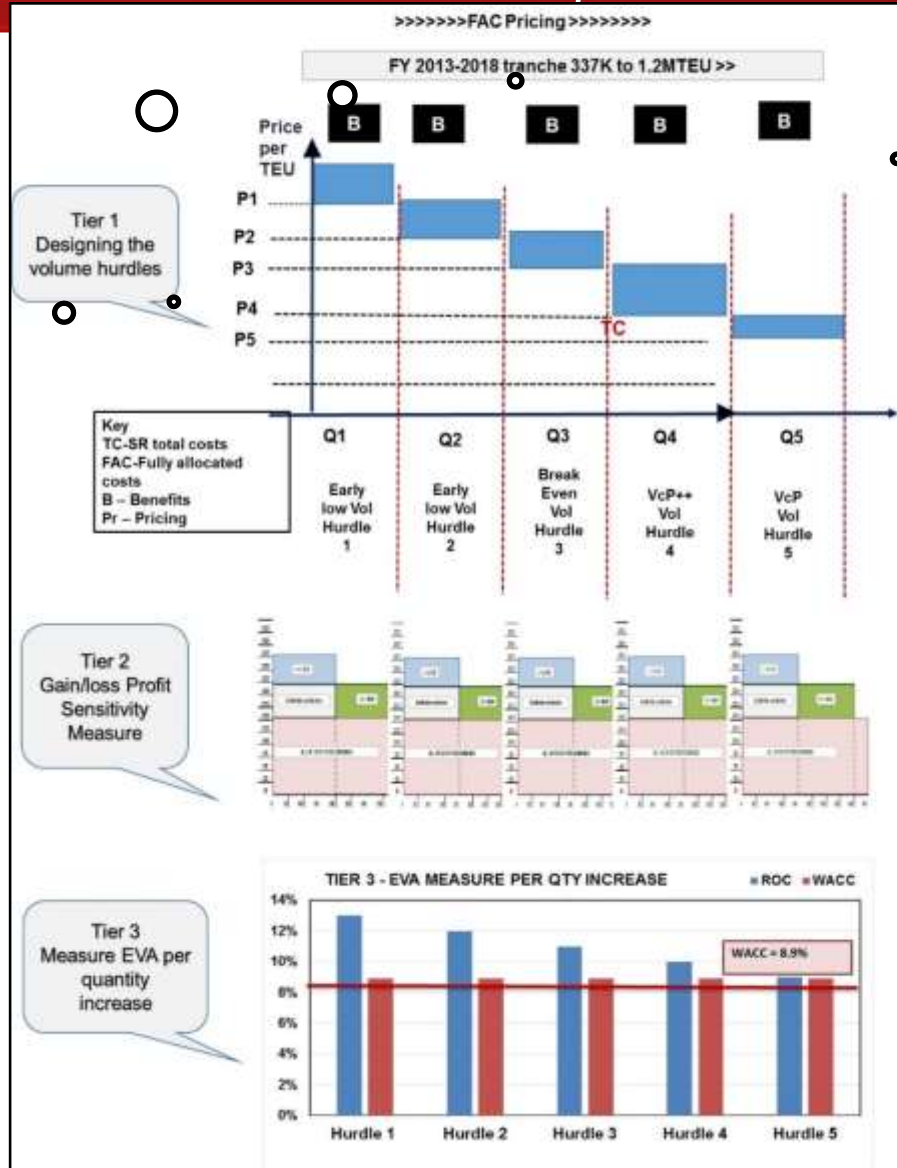
Roddy's Three Tier Waterfall Model
Final thoughts

Needs a high starting price that demonstrates visible competitive advantage

It needs A fast break even point



Visible Benefits

A drop in pricing will attract a matching response from other ports competing for the same business

- ❑ The price hurdle groups must have attractive discounts between groups. Customers must see the benefit of DYNAMIC PRICING.
- ❑ Secondly, marginal cost recovery works best when there are early takers of capacity, when the marginal curve is in the volume zones where the maximum economies of scale occur, and well before diseconomies begin to kick in.

THE BUSINESS BINNACLE
FINDING YOUR TRUE NORTH

Use an overarching non-financial measure easily understood by all ranks in the firm

BRITISH AIRWAYS

Club Europe

THE MISSION

To Fly and To Serve

THE MEASURE

Seats per kilometer

Reduce MTBF
Reduce Wasted Miles
Reduce turnaround time
Reduce number of hubs
Pre-packed meal

$$\frac{\text{Revenue per seat}}{\text{Kilometers Run}}$$

Efficient Mgt capacity (one world alliance)
Manipulate demand
Customer satisfaction
Loyalty programmes

- The Mission Statement and overarching Measure of SEATS PER KM who is originally designed by British Airways and is now the gold standard in airline and other industries on how mission statements can be both efficient, effective, and yet motivating.
- TO FLY refers to the ability of the airline to be airborne, avoid defects requiring repair and loss of business.
- TO SERVE captures the customer service/satisfaction. If customers are satisfied, they will return and fill up the seats. Unhappy customers avoid the airline, seats lie empty. SEATS PER KM can be universally applied on all routes and in all travel classes. Each seat provides a profit that can be measured.

Also Use an overarching financial measure EVA captures the ability for each asset to create wealth

- Overcomplicating finance tends to disincentivise rank and file staff far removed from complex financial reporting. Stern Stewart designed A simple to use measure captures the wealth generation and if properly used can be used to generate bonuses and profit shares for employees at all levels.
- ECONOMIC VALUE-ADDED uses three elements to measure value

1. Opening Capital invested in the firm i.e. the Debt and Equity invested at the start (e.g. $ 300m+$700m)= $ 1 million
2. The PERFORMANCE SPREAD which measures the difference between the NOPAT Net Profitability after Tax (%) e.g. 18% minus the Cost of Capital or (WACC) weighted average of the cost of Debt (Interest) and the equity return demanded by shareholders for the capital invested in the firm. Which in this example totals (12%) for both debt and equity.
3. In this case the performance spread is positive and equals 18% - 12% = 6% . The EVA or wealth generated is $ 1 million x 6% = $ 60,000.
4. If a company's EVA is negative, it means that the NOPAT or ROCE is less than the cost of investing. E.g. if the company produces a NOPAT of 4%. The performance spread is negative i.e. 4% minus 12% = - 8% (minus 8%) . The EVA is 1 million x (– 8 %) = $ -80,000 ($ minus 80,000).
5. In the former case the company has generated wealth of $ 60,000 for its shareholders. In the latter case it has destroyed $ 80,000 of the shareholders money. Obviously, bonuses would be given for the former and not for the latter.

ECONOMIC VALUE ADDED

Opening Debt+ Equity + incremental CAPEX, replacement capital and inventory

EVA = (Opening Capital) X (Performance Spread)

i.e. EVA = (Debt +Equity) X (ROCE – WACC)

Return on Capital Employed (ROCE) = NOPAT / DEBT + EQUITY

Estimate the WACC or Weighted Average Cost of capital or the average of what the cost of debt plus the cost of raising equity from shareholders.

Direct lever
to maximise profitability or asset efficiency
Indirect lever
Change customer behaviour to your advantage

Measure EVA PER CONTAINER (CT)
The overarching financial measure

Price (pr) per TEU

MARGINAL COST PER TEU

K =INVESTMENT CAPACITY (CAPEX)

$$EVA = [(Pr - Mc) * Q] - WACC * K$$

ECONOMIC VALUE ADDED

QUANTITY Q

WEIGHTED AVERAGE COST OF CAPITAL

Adapted by Allan Rodrigues for the Sea Port industry from Stern Stewart's original EVA Model , Smith, T (2012:2024) Pricing strategies, Talley, W (2017), Port Economics

							CAPEX $ NZD 200,000,000			
SHIPPER/ CARRIER	TEU Volume	Price (Pr) Per TeU	Marg Cost (Mc)	Revenues (NZD)	P - Mc * Q	WACC	Allocated Share of Capex	% Share of CAPEX	EVA per shipper $ NZD	AVG EVA Per CT $ NZD
X	150,000	$ 200	$ 110	30,000,000	13,500,000	12%	50,000,000	25%	7,500,000	50
Y	200,000	$ 180	$ 120	36,000,000	12,000,000	12%	66,666,667	33%	4,000,000	20
Z	250,000	$ 160	$ 140	40,000,000	5,000,000	12%	83,333,333	42%	(5,000,000)	(20)
	600,000			106,000,000	30,500,000		200,000,000	100%		10.83

- Calculating the ECONOMIC VALUE ADDED PER CONTAINER as an average across the ports operations indicates whether the port is creating or destroying wealth for its shareholders. Calculating the average EVA PER CONTAINER for each carrier or shipper indicates which price value combination contributes the most to the port's objectives.

All supply chain assets can use the EVA per CT logic to improve profitability or drive customer behaviour. Using EVA makes operations visible to all stakeholders.

Technical Slides Follow

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EPO with changing Variable & Fixed costs (achieving economies of scope)

Changes in variable costs V

$$\% \, dQ = \frac{-dCm}{dCm + \; Cmi}$$

Where

$dCm \equiv (Pf - Vf) - (Pi - Vi)$

$Cmi \equiv (Pi - Vi)$

Using the same profit equation but allowing for changes in variable costs
The increase in volume required under changing variable costs is highly dependant on the contribution margin

Changes in variable costs V

$$\% \, dQ = \frac{-dFc}{Cm + \; Qi}$$

Where

$dF \; = Ff - Fi$

The increase in volume required equals the ratio of the increase in fixed costs to the existing marginal profits

Smith. T. (2012: 2024): Pricing Strategy, Impact Pricing Podcast

Competitive Pricing

Adapted for the Port Industry by Allan Rodrigues from the original model by Smith. T. (2012: 2024): Pricing Strategy, Impact Pricing Podcast

$$dq = \frac{dp - (1 - cm) * dc}{cm - dp + (1 - cm) * dc}$$

Reducing the marginal costs has the highest impact on incremental break even volumes needed to justify the price drop

Where
dq - Break even sales % increase
dp – Magnitude of price cut %
cm – Initial Contribution margin %
dc - % reduction in marginal costs due to a price cut

	No change in dc		dc reduced by 10%		Dc reduced by 20%	
	Initial	Future	Initial	Future	Initial	Future
Price	\$200.00	\$180.00	\$200.00	\$180.00	\$200.00	\$180.00
MC (Var costs)	\$80.00	\$80.00	\$80.00	\$72.00	\$80.00	\$64.00
CM	\$120.00	\$100.00	\$120.00	\$108.00	\$120.00	\$116.00
	dp	10%	dp	10%	dp	10%
	dc	0%	dc	10%	dc	20%
	INITIAL CM	60%				
B/Even sales incr needed		**20%**		**11%**		**3%**

The same mantra keeps repeating itself. While price reductions may increase volumes, unless POAL is able to translate these volume increases into economies of scale, the port will not emerge as a winner in any price competition.

Understanding risk and return
The Sharp Lintner Model

Technical Risk

Market Risk

$$Re = [\text{Risk free rate}] + \text{Beta X } (\text{Market risk premium}))]$$

Unique Risk Beta

- **Project risk** (OT/OB/ Right Info)
- **Process Risk** (Right Inputs/Outputs)
- **Technical Risk** (functionality)
- **Organisational risk (Stakeholder accept)**

Market Risk (Rm – Rf)

- **Market risk (**change in environment)
- **Commercial Risk** (right price and value)

$$\text{WACC} = \left(\frac{D}{D+E}\right) * \text{Int}\,(1 - \text{tax}) + \left(\frac{E}{D+E}\right) * [Rf + B\,(Rm - Rf)]$$