

PORT OF VANCOUVER SUPPLY CHAIN SYSTEM

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ABSTRACT

The Port of Vancouver is Canada's largest port, trading \$43 billion in goods with more than 90 trading partners in 2004. The Port handles four major types of cargo namely dry bulk, liquid bulk, break bulk, and containerised cargo and is a homeport for the Alaska cruise business. The Vancouver Port Authority's traffic forecasts indicate that the container sector will be the key business driver for many years to come.

To sustain and enhance its container market share, Port stakeholders continue to expand the physical capacity of terminal and inter-modal assets. However, expanding plant capacity without also streamlining and improving transactions and information flow between stakeholders will undermine asset utilization, operational excellence and customer service and hence, the Port's competitive position.

The main objective of this paper is to identify areas where information technologies can be implemented to resolve processing problems between PoV stakeholders and thus enhance container throughput productivity.

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1 OVERVIEW

1.1 Introduction

Organizations need to react faster and be more agile to survive intensified global competition. If the 1980s were about quality and the 1990s were about re-engineering, then the 2000s will be about velocity. Velocity is about how quickly business itself will be planned and transacted through the use of information technology.

Hence, to succeed in the digital age, it is proposed that Port supply chain stakeholders need to deploy technologies and practices that increase the timeliness and accuracy of source data, integrate information processing across the community and eliminate transaction latency. Much like an Enterprise Resource Planning (ERP) system addresses these issues and integrates information processing across an organization, a Port supply chain system addresses these issues and integrates information processing across relevant Port stakeholders.

The Bitpipe dictionary describes supply chain integration as “the process in which multiple enterprises within a shared market co-operatively plan, integrate and manage (electronically and physically) the flow of goods, services and information from point of origin to point of consumption. Furthermore they do so in a manner that increases customer perceived value and optimises the efficiency of the chain creating competitive advantage for all stakeholders involved”.¹

While British Columbia (B.C.) ports and related suppliers expand the size of the physical assets required handling increased container traffic, they should not overlook the need to invest in

¹ Bitpipe Dictionary, 12 July 2005 <<http://www.bitpipe.com/tlist/Value-Chain-Integration.html>>.

information technology to streamline transactions and to enhance information flow between port stakeholders. A centralized supply chain system allows the Port to run more smoothly and efficiently by providing pre-arrival information on vessels and containers, which can be compared to resource availability (i.e. truck equipment, rail cars, long shore men, etc.) and thus improve resource planning. It allows stakeholders to transact business electronically eliminating labour intensive processes and increasing transaction velocity. As transaction speed increases, the elapsed time for container delivery declines. Centralized electronic management of the routine, many to many transactions between PoV stakeholders reduces the risk of miscommunication.

It is proposed that the successful Port communities of this decade will be the ones that embrace the idea of an integrated supply chain and collaborate in the use of digital tools to reinvent the way they interrelate.

This paper is organized as follows:

- The balance of this Chapter defines the Port of Vancouver (PoV) community. In addition, it explains the Vancouver Port Authority's (VPA) regulatory and management roles and as such, indicates the VPA's role in developing and supporting a community supply chain system.
- Chapter 2 determines whether the PoV's current operating scale justifies a supply chain system and indicates whether overall business and transaction volumes are expected to grow or decline.
- Chapter 3 focuses on container growth. Unlike other business sectors, this sector is characterized by significant inter-modal transaction and information exchange between stakeholders. Growth of the container business will exasperate existing information flow problems. Consequently, container growth is considered the most significant driver for developing a supply chain system strategy. Container forecasts have to be credible and Chapter 3 offers long-term container forecasts for North America (N.A.), west coast B.C. ports and the PoV.
- Chapter 4 offers an industry analysis and summarizes the PoV's competitive advantages that position it to capture the growth forecasts outlined in the preceding chapter.
- Chapter 5 identifies and describes key information processing problems related to the movement of containers through the PoV supply chain.

- Chapter 6 recommends information system solutions for the problems raised in Chapter 5.
- Chapter 7 offers a program organization structure, governance guidelines and recommends immediate next steps.

1.2 Port of Vancouver Community

Located on the southwest coast of B.C., the PoV is Canada’s largest port with a coastline that extends 233 kilometres from Point Roberts at the Canada/United States (U.S.) border through Burrard Inlet to Port Moody and Indian Arm².

The PoV is a major gateway linking Pacific Rim markets to N.A. and vice versa. In 2004, the PoV traded some \$43 billion in goods with over 90 countries³. As shown in Table 1, Asian countries and the U.S. are the Port’s most important trading partners with outbound cargo comprising most of the tonnage handled at the Port. The PoV handles four types of cargo namely dry bulk, liquid bulk, break bulk and containerised cargo.

Table 1: 2004 PoV Trade Total Metric Tonnes (000)

(* Excludes Hong Kong)

<u>Rank</u>	<u>Country</u>	<u>Inbound</u>	<u>Rank</u>	<u>Country</u>	<u>Outbound</u>	<u>Rank</u>	<u>Country</u>	<u>Total</u>
1	China	2,993	1	Japan	14,023	1	China*	15,600
2	United States	1,018	2	China*	12,607	2	Japan	14,373
3	Hong Kong	548	3	S.Korea	6,954	3	S. Korea	7,435

Source: Based on data from the VPA’s Port Vancouver Statistics Overview 2004. (Table prepared by author)

The PoV is comprised of 25 terminals (including 3 container terminals with a capacity of 1.7 million TEUs⁴) that collectively offer 57 berths, post-Panamax capacity and on-dock rail

² Vancouver Port Authority, 2003 Annual Report, (Vancouver: Vancouver Port Authority 2004): 8.

³ Vancouver Port Authority. PORTplan, The land use plan for the Port of Vancouver (Vancouver: Vancouver Port Authority March 2005): 1.

⁴ TEU stands for “twenty-foot equivalent”. This is an industry standard container metric used to normalize container counts across various container sizes.

facilities. In addition, the Port has a full range of marine services that include shipyards, dry docks, chandlers, freight forwarders and shipping agents.

The PoV offers access to local and continental North American markets through its rail and road connections. Four railways serve the Port namely: Canadian National (CN), Canadian Pacific Railway (CPR), Burlington Northern Santa Fe (BNSF) and BC Rail. The Port also offers easy access to the Trans Canada and U.S. Interstate highway systems with interconnecting service provided by some 450 local and long distance trucking companies.

1.3 Vancouver Port Authority

Canada's ports governance regime has evolved since the British North America Act of 1867 granted the federal government exclusive jurisdiction over shipping and navigation. For well over a century the Government of Canada under the aegis of the Canada Ports Corporation and its predecessor, the National Harbours Board, operated the major national ports.

The *Canada Transportation Act* (CTA, 1996), the *Oceans Act* (1996), and the *Canada Marine Act* (CMA, 1998) incorporated the legislation under which the current Port Authorities have been established, with the CMA⁵ being the dominant Act in this regard.

The federal policy thrust over the past decade has been based on the principles of deregulation, subsidy reduction, commercialisation and continued safety. The CMA sought one management regime with consistent criteria applied coast to coast that allowed ports to operate on a more commercial basis, divested the federal government from direct port operations and gave users greater say in how ports work. In sum, Port administration has evolved from being an

⁵ Canada Marine Act, 1998, c.10, An Act to amend the National Harbours Act, the Government Harbours and Piers Act, the Harbour Commission Act, the Canada Shipping Act and the Fishing and Recreational Act.

extension of the federal government to an autonomous agent of the crown operating under commercial principles.

Pursuant to the CMA, the VPA's mission is "To facilitate and expand the movement of cargo and passengers through the Port of Vancouver in the best interest of Canadians"⁶. To fulfil its mission, the VPA employs approximately 170 full time and part time employees reporting either directly to the President or to one of four Vice Presidents (VP). The company is structured into four divisions under the VP Finance, the VP Customer Development and Operations, the VP Human Resources and Corporate Services and the VP Infrastructure Development.

1.3.1 Landlord Role

The VPA's expansion mission is achieved through its landlord mandate and includes land use planning, acquiring land, expanding terminal facilities and managing property leases. Approximately two-thirds of the VPA's employees carry out landlord related activities. Contractors provide specialized expertise and assist with the implementation of major land and terminal development programs.

Over the next five years, the VPA plans is to invest approximately \$475 million, or 88%, of its total capital program on land acquisitions, existing terminal expansion projects and new container terminal expansions⁷.

For 2004, rental revenue accounted for approximately 60%, or \$60 million,⁸ of total corporate revenues. There are about 300 commercial leases including about a dozen anchor

⁶ Vancouver Port Authority, 2004 Report on Business, (Vancouver: Vancouver Port Authority March 2005): SideA 2.

⁷ Vancouver Port Authority, 2005-2009 Business Plan, (Vancouver: Vancouver Port Authority December 2004): 3.

⁸ Vancouver Port Authority, 2004 Unconsolidated Financial Statements, (Vancouver: Vancouver Port Authority March 2005).

tenants. Typically, anchor tenants are terminal operators and include West Shore Terminals (a coal terminal managed by the Jim Pattison Group), Deltaport and Vanterm (container terminals operated by TSI Terminal Systems Inc. (TSI), a wholly owned subsidiary of OOCL Shipping), Centerm (a container terminal operated by P&O Ports Canada) and Lynterm/Seaboard (a forest products, steel and break bulk terminal operated by Western Stevedoring Co. Ltd.).

Terminal operator leases are usually long term (20 – 25 years) and include escalation and performance clauses. Leases are triple net whereby the tenant pays all operating expenses, utilities and property taxes. Upon renewal, the VPA continues to restructure its lease agreements to reduce volume dependence and increase its more predictable rental income.

1.3.2 Facilitation Role

Pursuant to various sections of the CMA, the VPA's facilitation roles relate to vessel navigation within Port jurisdiction, port security, environment protection, marketing to Port customers, (i.e. shippers and shipping lines), representing Port interests before relevant public and private groups and resolving disputes between Port stakeholders. Approximately one third of the VPA's employees carry out facilitation activities and services.

The VPA does not have a specific charge or fee to cover the costs associated with the above-mentioned facilitation services. Rather, various vessel tariff fees cover the cost of developing and sustaining facilitation services. Vessel tariff fees account for approximately 40% of the VPA's total revenue and, in order of the amount of revenue generated, include wharfage fees, cruise service charges, harbour dues and berthage fees⁹.

⁹ Wharfage fees for cargo ships are based on the weight or measurement of the cargo and are variable by commodity. Container wharfage is based on the size of the container and the direction of the container movement (import or export). Berthage fees relate to the physical size of a vessel alongside VPA berths. Harbour dues are based on the first five ship arrivals. Cruise ship terminal fees include a service and facility charge (based on the length of time a cruise ship is at berth), a fee per passenger and a fresh water supply fee.

1.3.3 Core Competencies

The results of independent audits and Special Exams indicate that the VPA's landlord and facilitation processes are effective and in many areas both the process and results exceed industry benchmarks¹⁰. This performance flows through to the VPA's bottom line and the VPA is currently Canada's most financially successful Port.

The VPA has recorded increasing revenue and net income (before depreciation expense). Revenue continues to increase driven principally by container capacity expansion. Key operating and financial results are summarized in Table 2.

Table 2: VPA Non-Consolidated Financial Results (000s)

	2001	2002	2003
Revenue	\$89,159	\$92,030	\$97,883
Operating expenses (excluding depr.)	\$35,993	\$38,431	\$42,378
Depreciation	\$15,898	\$19,921	\$21,221
Income from operations	\$37,268	\$33,678	\$34,284
Net income	\$31,060	\$26,067	\$28,886
Interest expense	\$2,776	\$2,726	\$2,255
Operating margin	41.8%	36.6%	35.0%
Operating return on investment	9.1%	7.2%	7.3%

Source: Based on information contained in the VPA's Annual Reports and Financial Statements. (Table prepared by author)

The VPA's risk profile and financial competency is relevant to this paper. Based on Porter's strategic fit model¹¹, the VPA's risk profile and capital structure are typical of a differentiator. The company's moderate-high risk profile is tempered by its conservative capital

¹⁰ All VPA activities are periodically and independently audited. In addition, pursuant to the CMA, each VPA Department is subject to an independent Special Examination every five years. Each Exam covers key governance areas, e.g. planning and risk management, and includes benchmarking Department performance against industry performance indicators.

¹¹ Michael Porter, "How Competitive Forces Shape Strategy", Harvard Business Review, March – April 1979.

structure. Current outstanding debt of \$35 million compares to a borrowing limit of \$555 million as stipulated in VPA's letters patent¹². This conservative position allows the VPA to invest in projects, like a supply chain system, that may be considered too risky by the private sector if for no other reason than it requires the buy in and coordination of several stakeholders each with their disparate objectives and priorities.

On the other hand, it is important to recognize that the VPA has limited expertise in Port operations beyond its regulatory responsibilities and has no interest in getting involved in Port operations where the public interest is best served by a competitive private market. To be clear, the VPA is not directly involved with cargo ship, truck or rail operations and is in the process of transferring its remaining terminal operating responsibilities to the private sector.

The VPA's competencies and limitations are particularly relevant in defining the VPA's role in launching and supporting the supply chain system. While the VPA will likely accept a leadership role in developing a supply chain system, assisting with program financing and providing project management services, it would not likely want to be responsible for ongoing system operations.

Moreover, the VPA would not likely support system implementation until a credible business model is defined and a suitable system operator identified. Furthermore, the system operator would have to be industry knowledgeable and highly trusted for participants to electronically share sensitive data and to have this data stored in a third party controlled repository. The operator would have to uphold governance and risk management standards and practices comparable to those guiding the VPA.

The VPA would have no interest in providing ongoing operating subsidies. Ongoing operations would have to be financially self sufficient and the system operator would have to

¹² Letters patent are the governing documents of the VPA.

have deep enough pockets to carry system operations through the customer and revenue ramp up period. As a system customer, the VPA would be prepared to pay an annual software license or usage fee.

2 IS THE POV BIG ENOUGH?

2.1 Introduction

This section offers two overarching justifications for developing a PoV supply chain system. The first justification is based on size. The PoV's current scale of operations is compared to other North American ports that have invested in a supply chain system. If the PoV is comparable in size, it would be useful to know whether this size is forecast to increase or decrease. Hence, traffic forecasts by sector are provided. If traffic is forecast to decline, the need for a supply chain system diminishes.

The second overarching justification relates to the container sector. Currently, the rapid growth in container traffic is causing operating and information flow problems. It is proposed that these problems will increase in severity and consequence if un-addressed and container traffic continues to grow. Alternately, if container traffic declines, the need for a supply chain system diminishes. This section offers introductory comments on the PoV's container traffic with Chapter 3 offering a more detailed explanation of the PoV's long-term (i.e., 2020) container forecasts.

2.2 Comparative Size

Several studies indicate the relationship between port size and the need for a community system. For example, it has been recognized that when a port reaches a certain level of

agglomeration and shipping activity the maritime business interests will see the need for a coordinated community information service¹³.

Table 3: Comparison of PoV and U.S. Port Size (2003)

Port	Vessel Calls	Cargo Tonnage	TEUs (000)
LA / LB	5,130	120,522,639	7,755
Houston	4,857	190,923,145	933
NY / NJ	4,853	145,889,166	2,803
New Orleans	4,464	83,846,626	237
<i>Vancouver</i>	<i>2,640</i>	<i>73,524,000</i>	<i>1,540</i>
Philadelphia	2,486	33,248,697	103
Savannah	2,087	23,368,591	1,124
Charleston	2,024	25,198,899	1,250
Baltimore	1,635	40,183,371	307
Tacoma	1,029	22,965,750	931
Seattle	1,012	19,448,157	815
Hampton Roads	Not in top 10	41,452,718	Not in top 25
Portland	Not in top 10	26,795,881	210
Boston	Not in top 10	24,832,103	93

Source: Based on data from the U.S. Department of Transportation Maritime Administration, Port of Seattle, Port of Tacoma, and U.S. Army Corps of Engineers, Navigation Data Center. (Table prepared by author)

Table 3 compares various shipping volume metrics for the PoV to U.S. ports that have implemented the earliest and most common form of supply chain system, a marine exchange. It is worth mentioning that the TEU statistics exclude domestic movements (e.g., movements between Tacoma and Hawaii are excluded). These shipments do not have the same level of paperwork and transactions as typical foreign import/export movements. The results indicate that

¹³ Gregory Case. Marine Exchanges: The Evolution of an American Port Institution, (Washington: University of Washington Graduate School, 10 March 1999): Abstract.

the PoV is certainly at a level of activity to justify a systemic, centralized, community approach to information processing.

Table 4 summarizes the projected growth for PoV business sectors to 2020. The VPA's forecasts indicate that the overall volume of business handled through the PoV will continue to increase. Hence, this overall size indicator suggests that the requirement for a supply chain system will be sustained. A brief explanation of the forecast growth for each sector follows.

Table 4: PoV Cargo Forecast

Sector	2004 Volume (million tonnes)	2020 Forecast (million tonnes)	Annual Growth Rate
Containers	14.06 (1.6 million TEUs)	38.6 (4.6 million TEUs)	6.5%
Dry Bulk	49.32	51.4	0.3%
Break Bulk	3.30	4.2	1.5%
Liquid Bulk	6.88	12.3	3.7%
Total Cargo	73.57	106.5	2.3%

Source: Based on data from the VPA's PORTplan, The land use plan for the Port of Vancouver. (Table prepared by author)

2.2.1 Dry Bulk¹⁴

Dry bulk commodities, mainly comprised of coal and grains, account for approximately two thirds of the total tonnage handled through the PoV. Average annual growth in dry bulk traffic is forecast to be 0.3% for the 2005-2020 periods.

Coal demand, in particular metallurgical coal, is primarily driven by Asian steel output. Steel is a cyclical industry with significant variation in annual output but a long-range growth rate

¹⁴ Bulk refers to dry or liquid cargo that is transported without packaging. Such cargoes are usually handled by specialized bulk terminal and shipped in vessels such as dry bulk carriers and tankers. Examples include coal, potash, sulphur, grain (some grains are containerised) and liquid bulk products such as petroleum and petrochemicals.

of about 1% a year. Three countries (i.e., Canada, Australia and the U.S.) account for the world's supply of metallurgical coal; Canada supplies about 12% of the world's demand¹⁵.

Growth in the volume of coal exported through the PoV will continue to be challenged by the world's largest and lowest cost producer, Australia, and by the capacity limits of Canada's only metallurgical coal producer; Elk Valley Coal Corporation. Elk Valley is located in south-eastern B.C. and tied by geography and the CPR to the PoV.

Bulk grain exports through the PoV are cyclical and in recent years have been at very low levels due to drought. The average annual growth in bulk grain exports for the 2005 – 2020 period will be challenged by increased domestic cereal consumption, further containerisation of grains and increased competition.

Competition in Canada's traditional grain market is growing and a trend towards higher value but lower volume speciality grains means that, in the long term, the Port is not expecting to see export levels as high as before.

2.2.2 Break Bulk¹⁶

Break bulk commodities are mainly comprised of forest products (e.g., lumber, wood pulp and newsprint) and account for about 4% of the total tonnage handled through the PoV. The average annual forecast growth rate for break-bulk products is forecast to be 1.5% for the 2005-2020 period.

Some of the markets for B.C. forest products (e.g. Japan and Europe) make the break-bulk forest trade a continuing necessity. While shipping lines such as Gearbulk, Star and

¹⁵ Colledge Transportation Consulting Inc., British Columbia Ports Competitive Profile, British Columbia Ports Strategy, (report prepared for the British Columbia Ministry of Small Business and Economic Development) (Vancouver: September 2004): 38-39.

¹⁶ Break bulk refers to cargo handled in individual units such as bales of pulp or rolls of newsprint.

Westwood are building new general cargo ships to continue this trade, it important to recognize the trend in break-bulk shipping of forest products from general cargo ships to container ships. Low back haul rates due to the significant westbound outflow of empty containers makes this shipping method viable.

Containers offer greater cargo protection and the ability to ship in smaller lot sizes of 25-30 tonnes instead of much larger lot sizes typical of break-bulk shipping (i.e., thousands of tonnes). It also provides exporters with an opportunity to target their markets more narrowly and perhaps achieve greater volumes and margins, allowing value-added wood markets to evolve for B.C. manufacturers. Newsprint and most paperboard and other paper products are now shipped almost entirely in containers.

2.2.3 Liquid Bulk

Liquid bulk is mainly comprised of petrochemicals for pulp and paper production and petroleum products and accounts for about 9% of the total tonnage handled through the PoV. Average annual growth of liquid bulk traffic is forecasted to be 3.7% for the 2005-2020 period.

Petrochemical volumes are expected to remain flat with a slight decline of 0.2% per year to 2020. Steady exports of iso-octane to California, approximately 15-20% of the total traffic in this sector, are expected to continue but rising feed stock costs, high North American demand and the development of new production plants overseas will dampen the amount of petrochemical business flowing through the Port.

The decline in petrochemical volumes will be offset by the increase in petroleum products. Petroleum products are expected to grow 5.7% annually over the 2005 – 2020 forecast period. Increases in U.S. demand for gasoline, diesel, jet fuel and fuel oils will be met by rising production from Alberta's oil sands projects.

2.2.4 Containerised Cargo¹⁷

The remaining tonnage handled through the PoV relates to containerised cargoes. The Port is expecting an increase in container throughput from 1.66 million TEUs in 2004 to approximately 4.6 million TEU's by 2020 representing a 6.5% annual growth rate. This growth is being driven by the strength of the North American economy, the demand for imports manufactured in Asia, the demand for Canadian products in Asia and by the expanding variety of goods being shipped in containers.

This segment is by far the fastest growing aspect of port traffic in B.C., and for that matter, in the world. Consequently, it is the container sector that is fuelling investments in terminals and other handling and transportation assets and driving the need for enhanced operating practices and integrated information processing between Port stakeholders. The following Chapter examines the VPA's container forecasts in more detail.

¹⁷ Containerised cargo refers to cargo that is handled in uniform containers and usually of a relatively high value. Examples include: machinery and equipment, food items (sometimes using refrigerated containers), iron and steel alloys, wood pulp, lumber and agricultural items such as grain products and feed.

3 CONTAINER SECTOR GROWTH

3.1 Introduction

Forecast growth in container traffic and the related business transactions between Port stakeholders is the key rationale for developing a supply chain system. It is therefore important that decision makers and investors understand and have confidence in the PoV container forecasts.

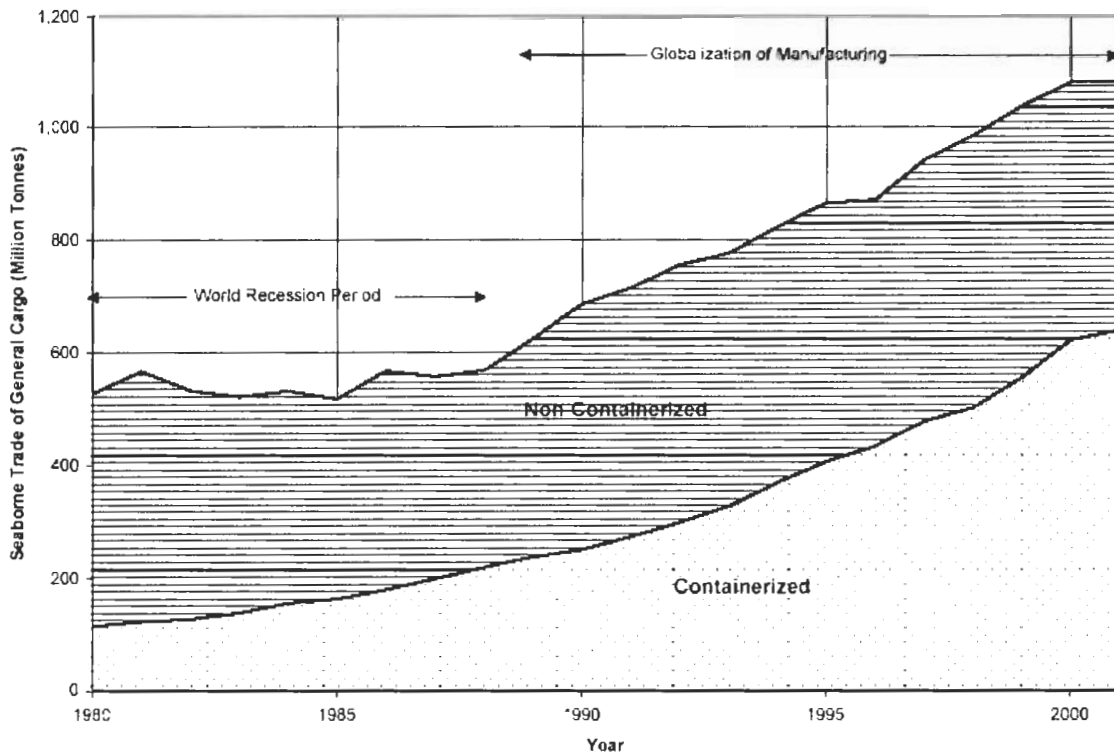
This Chapter begins with a review of historical container traffic growth for the world, North America (N.A.) and the Vancouver port area. The Chapter explains container growth drivers, estimates growth rates and offers 2020 projections. The Chapter concludes by comparing forecast container throughput with actual and planned container terminal capacity. Understandably, one of the key factors defining the upper limit for container throughput and transaction volumes is available PoV terminal capacity.

3.2 Historical Perspective

Figure 1 indicates the evolution of world trade has seen major growth in container cargo. From 1980 to 2003, while world sea borne general cargo trade grew at an average annual rate of 3.5%, world container port traffic grew at an average annual rate of about 8.5% (from 35 million to 302 million TEUs)¹⁸.

¹⁸ Drewry Shipping Consultants Ltd., Global Container Terminals : Profit, Performance and Prospects, (London: Dewry Shipping Consultants Ltd., October 2002).

Figure 1: Containerised and Non-Containerised World Cargo Trade Trends



Source: Based on data from Drewry Shipping Consultants Ltd. (Figure prepared by author)

Table 5 indicates the volume of container trade by continent and the average annual growth rates from 1980 to 2001. Since 1980, container growth rates for Asia and other developing countries (e.g., Southern and Eastern Europe, Africa and Latin America) have expanded at an average annual rate of approximately 12%, while the growth in container trade with more mature North American and European markets averaged between 5% and 6% a year.

In 2001, N.A.'s share of world container port trade was about 13%, compared to Europe's share of about 14% and considerably less than Asia at 48%.

Table 5: World Distribution of Container Traffic

Country	Container Traffic (million TEU, 2001)	Average Growth Rate (%/year, 1980 – 2001)
North America	30.5	5.5
North Europe	33.2	5.1
Asia	105.9	12.4
Other	58.5	11.6
Total World	228.1	9.1

Source: Based on data from Colledge Transportation Consulting Inc. (Table prepared by author)

Within N.A., the division of container traffic between West Coast and East/Gulf Coast ports is approximately 52% and 48% respectively. In 2003, West Coast ports logged 21.2 million TEUs, compared to 16.2 million TEUs on the East Coast. Los Angeles and Long Beach alone accounted for more total container units shipped in 2003 (i.e., 11.8 million TEUs) than the 11.1 million TEUs logged by the East Coast's top six container ports combined (NY/NJ, Charleston, Hampton Roads, Savannah, Miami, and Montreal)¹⁹.

Since 1985, West Coast throughput has increased at a faster rate than the East Coast for the following reasons:

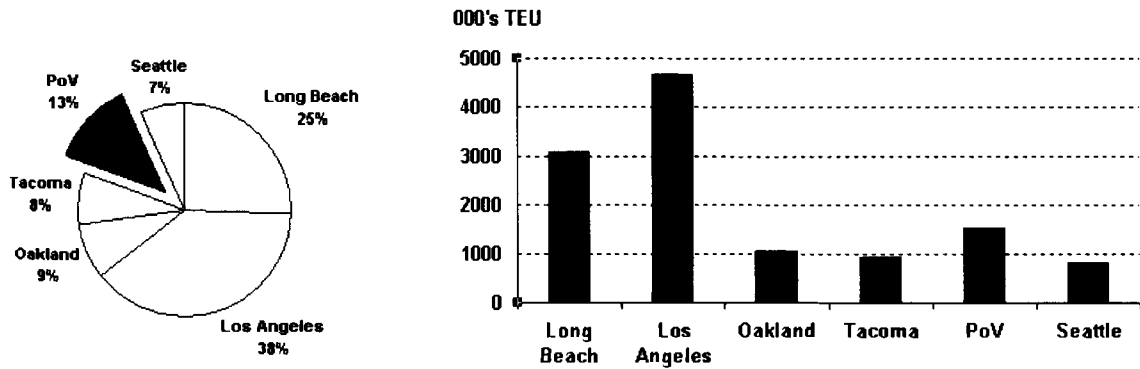
- Trade with Asia expanded much more rapidly than did trade with Europe, thereby favouring West Coast ports.
- The first post-Panamax container ships²⁰ came into service in 1988 and the post-Panamax fleet has expanded rapidly since 1995. Many shipping lines replaced trans-Canal services between Asia and the U.S. East Coast with post-Panamax ships routed directly between East Asia and the West Coast.
- In conjunction with the shipping services to the West Coast, inter-modal rail services to inland markets have expanded rapidly thus increasing the scope of hinterland market.

¹⁹ Joseph O'Reilly, "East Side Story: Ocean's New Direction," Inbound Logistics.com, June 2005 <http://www.inboundlogistics.com/articles/features/0605_feature01.shtml>

²⁰ Post-Panamax vessels are those too large to transit the Panama Canal.

Figure 2 illustrates the distribution of container traffic between West Coast ports for 2003. The figure excludes domestic trans-shipment traffic between U.S. ports (e.g., between the Port of Seattle and Alaska or Hawaii). The majority of this traffic, some 12.1 million TEU, moved through U.S. ports. The PoV handled some 1.54 million TEU.

Figure 2: PoV Share of West Coast Container Traffic (TEUs, 2003)



Source: Based on data from the VPA and the U.S. Department of Transportation Maritime Administration. (Figure prepared by author)

For the reasons favouring the West Coast mentioned above, the PoV's share of the Canadian market has increased significantly, from 37% in 1998 to almost 50% in 2003.

As indicated in Table 6, China accounts for some 51% of the PoV's import container traffic and approximately 88% of the growth in import container traffic between 2000 and 2004. Hong Kong, South Korea, Thailand, Japan and Taiwan account for another 36% of inbound container traffic²¹.

Containers exported through the PoV are mainly routed to consumers in China, Japan, Taiwan and Indonesia. Historically, Japan received the largest export volume, but has recently

²¹ 2000 data, "PortView™ database", Vancouver Port Authority, 14 July 2005, 2004 data, Vancouver Port Authority, Port Vancouver Statistics Overview 2004, (Vancouver, Vancouver Port Authority March 2005): 7. http://www.portvancouver.com/statistics/docs/2004_Statistical_Report.pdf

been overtaken by China. China again contributed the largest growth increment for Canadian containerised cargo exports, growing at about 35% a year²².

Table 6: PoV Container Traffic (tonnes)

Import Container Traffic					
	Tonnes			% of Total	
	2000	2004	Growth	2000	2004
China	957,531	2,774,496	1,816,965	28.8%	51.4%
Hong Kong	635,011	548,344	(86,667)	19.1%	10.2%
South Korea	311,390	390,364	78,974	9.4%	7.2%
Thailand	231,095	354,789	123,694	6.9%	6.6%
Taiwan	320,980	345,904	24,924	9.6%	6.4%
Japan	299,781	319,277	19,496	9.0%	5.9%
Total	3,329,108	5,400,347	2,071,239		

Export Container Traffic					
	Tonnes			% of Total	
	2000	2004	Growth	2000	2004
China	1,057,685	2,623,129	1,565,444	15.9%	30.3%
Japan	2,587,778	2,551,185	(36,593)	38.9%	29.5%
Taiwan	786,311	863,272	76,961	11.8%	10.0%
Hong Kong	501,276	397,798	(103,478)	7.5%	4.6%
South Korea	428,058	559,669	131,611	6.4%	6.5%
Thailand	153,288	223,861	70,573	2.3%	2.6%
Total	6,649,354	8,659,780	2,010,426		

Source: Based on data from the VPA's "PortViewTM database" and the Port Vancouver Statistics Overview 2004 (Table created by author).

Inbound container cargos are primarily made up of consumer products (e.g. furniture, clothing and electronics) and industrial products (e.g. machines, auto parts and building products). Containerised imports have shown high and consistent annual growth rates.

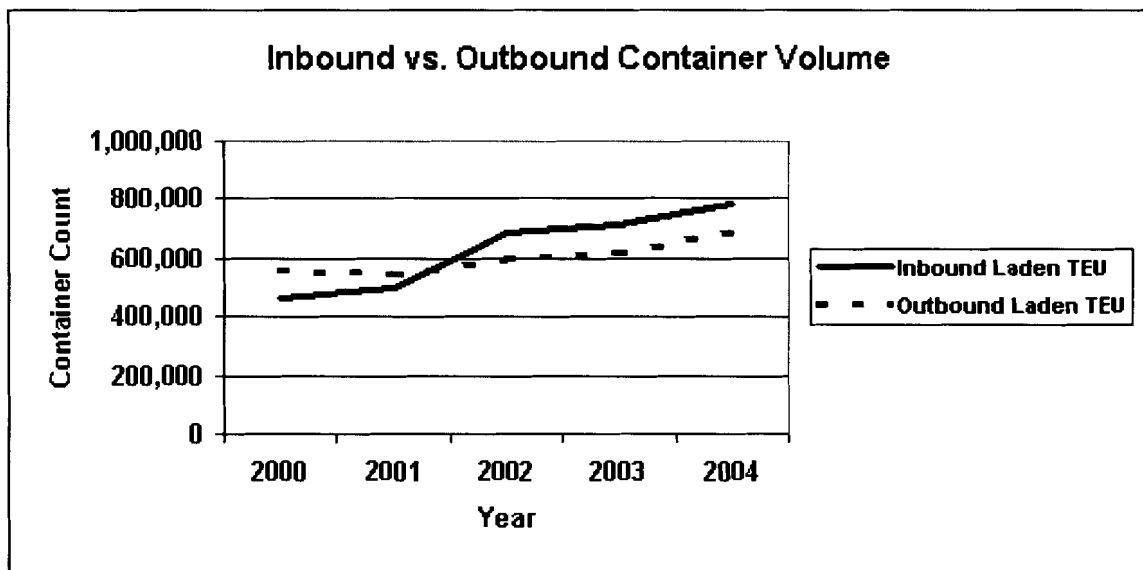
Outbound commodity types are more diverse and have a more erratic growth rate. Top containerised export products include forest products, including wood pulp and lumber and specialized agricultural products including peas, beans, lentils, alfalfa, soya beans and malt. They exhibit the typical cyclical pattern of natural resource and basic industrial commodity markets.

²² Ibid

From 2003 to 2004, PoV containerised imports grew by 10% to 824,784 TEUs, with full imports also increasing 10% to 782,675 TEUs. Total exports recorded a gain of 6% to 840,124 TEUs, with full exports increasing 13% to 694,787 TEUs.²³

As illustrated in Figure 3, in 2002 inbound loaded TEUs exceeded outbound loaded TEU for the first time in many years. Loaded inbound TEU continued to exceed full outbound TEU in 2003 and 2004. In the future, it appears that the volume of inbound loaded containers will be the critical variable driving overall container volumes in the Vancouver port area. Hence, the accuracy of container forecasts will depend on how well inbound loaded volumes are predicted.

Figure 3: Loaded Container Traffic Trend



Source: Based on data from the VPA's "PortViewTM database". (Figure created by author)

3.3 Container Traffic Forecasts

Historically, there have been three primary drivers for the growth in PoV container traffic, namely (1) growth in the world and North American economic output (2) the shift in the transport of break bulk cargos from general cargo ships to container ships (i.e., container market

²³ Ibid

penetration) and (3) globalisation of manufacturing and the increase in containerised trade with Asia. This section explains these drivers and uses related growth rates as independent variables to develop N.A., West Coast and Vancouver port area (Fraser Port and Port of Vancouver) container traffic forecasts.

3.3.1 N.A. Economic and Container Growth Rates

Economic output as measured by gross domestic product (GDP) provides a good reference point for understanding traffic growth. The use of GDP to estimate general cargo growth is explained as follows.

GDP measures the economic output of the economy of a country, a region or the world. If an economy produced only physical goods and the value and characteristics of these goods did not change from year to year, real GDP growth would provide a good measure of the growth of the physical output of the economy (i.e., in tonnes or dollar terms). Further, if the world had constant trading relationships among countries or regions, real GDP growth would also provide a measure of the physical growth in trade.

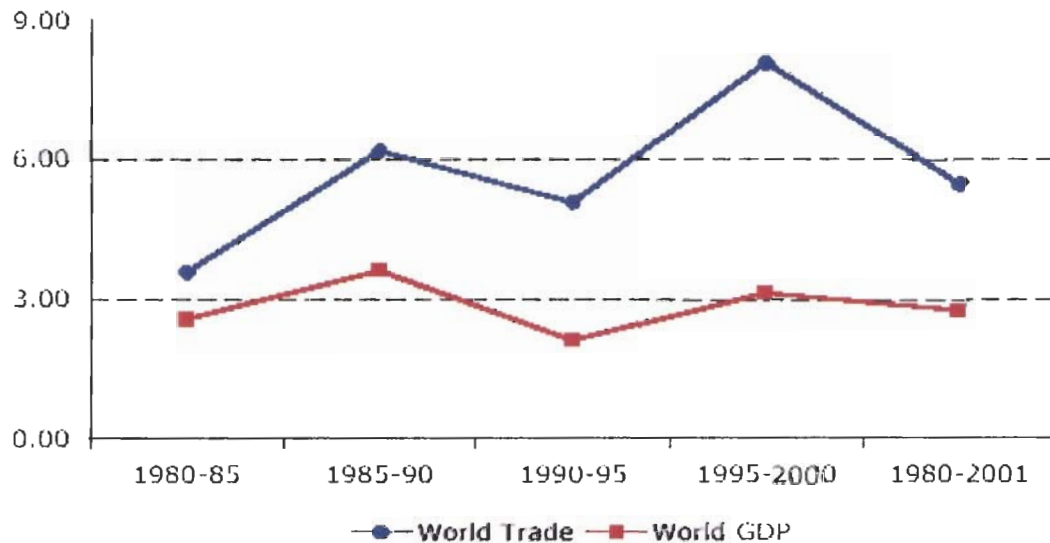
The world is not so simple, however, since physical production and trade do not track exactly economic output, and economic structures are changing constantly as are the trade relationship among countries. Many container traffic forecasts use GDP as an independent variable. The forecasters either develop modelling relationships that link trade to GDP or apply subjective adjustments to GDP to make it suitable for trade forecasting.

Since 1980, North American GDP growth rates have averaged about 3% a year over longer periods (5 to 15 years).²⁴ The growth in North American GDP will likely continue at this average 3% rate over comparable future periods.

²⁴ 1980-2001, "World Development Indicators 2003", The World Bank Group, Sept. 2004 <<http://www.worldbank.org/data/datatopic/gdp.html>> 2002-2004 "World Economic Outlook, September 2003" International Monetary Fund, Sept. 2004 <<http://www.imf.org/external/country/CAN/index.htm>>

As illustrated below, world general cargo trade has expanded faster than world economic output in all 5-year periods since 1980 by approximately 3% per year mainly due to the increase in global production and the corresponding increase in the flow of goods, particularly manufactured goods.

Figure 4: World Trade Growth Outpacing Economic Output (annual growth, % per annum)



Source: Based on data from The World Bank Group. (Table prepared by author)

In more recent years, the point spread between world economic growth and containerised growth rates has exceeded 3% primarily due to container penetration. That is, the degree of container penetration increased from 22% of general cargo in 1980 to about 60% in 2001 on a world basis, a rate of increase of about 4.86% per year.²⁵

While there are still prospects for increased penetration of break-bulk cargo, much of the containerisable general cargo trade to or from developed countries is already in containers. Hence, the penetration rate is expected to slow down. Consequently, the spread between N.A.

²⁵ Drewry Shipping Consultants Ltd., Global Container Terminals : Profit, Performance and Prospects, (London: Dewry Shipping Consultants Ltd., October 2002) and “World Development Indicators 2003” The World Bank Group, Sept. 2004 <<http://www.worldbank.org/data/datatopic/gdp.html>>

GDP and container port throughput rates is forecast to continue but by a lower differential, perhaps 1% to 2% a year. Therefore, the overall forecast container port growth for *North America* is estimated to be 4% to 5% a year.

3.3.2 West Coast Container Growth Rate

For reasons mentioned in Section 3.2, from 1985 to 2002, growth in West Coast container port throughput has exceeded that of N.A. by 1% to 4% a year, with an average of 1.6%²⁶ primarily due to the rapid trade expansion with Asia. The key question is will trade with Asia continue at the same pace?

The Asian business has grown the fastest of any region in the world and this growth has major implications for West Coast container port expansion. Between 1980 and 2001, China's real GDP grew about 10% a year, and real trade expanded at about 13% a year.²⁷

The container throughput of Chinese ports increased at 30% a year from 1.3 million TEU in 1990 to some 40 million TEU in 2003.²⁸ The Port of Shanghai, despite the severe draft constraints at the mouth of the Yangtze River, handled over 10 million TEU in 2003. Development of a new port for Shanghai is underway with a planned ultimate capacity of 20 million TEU.

A key factor supporting past and future Asian economic growth is foreign direct investment (FDI). That is, FDI is a leading indicator of growth in world trade and in exports from countries that receive FDI.

²⁶ "US/Canada Container Traffic in TEUs", American Association of Port Authorities, <http://www.aapa-ports.org/pdf/CONTAINER_TRAFFIC_CANADA_US.xls>

²⁷ The World Bank Group and International Monetary Fund.

²⁸ "China Claims Box-Handling Crown," Journal of Commerce, 13 January 2004
<<http://www.globeexpress.com/news/articles.asp>>

China's share of world FDI increased from 1.7% in 1990 to 20.7% in 2002²⁹. It was one of the few countries to experience a rise in FDI inflows in 2001 and 2002 at a time when world FDI plummeted. Some of the investment has come from Hong Kong, Taiwan and Japan, representing a transfer of manufacturing operations from these areas to China. Further evidence of this shift is provided in China's increase in iron ore imports. Chinese iron ore imports grew at 16% a year from about 7% of world imports in 1992 to about 19% in 2001.³⁰

The FDI and iron ore indicators suggest that China's growth will continue, however, the next question is for how long? A recent article dealing with technology in China makes the point that China's competitive advantages lie in its low-cost labour and in the labour-intensive manufacturing of the kind that has been driving exports in recent years. *The Economist* states: "China can compete for the next 50 years on labour costs."³¹

Even with China's expansion, it is forecast that the impact on trade growth rates will decline over time simply because of the increasingly large magnitude of exports in future years. A fitted trend line for the 1984 to 2003 period offers additional evidence that the West Coast will continue to increase its share of continental N.A. container port throughput but at a lower rate than in the past.

Hence, it is concluded that the West Coast vs. North America differential will probably continue but at a lower rate than in the past, perhaps 1% a year. This implies *West Coast* growth of 5% to 6% a year (i.e., the N.A. growth rate + 1%).

²⁹ United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2003, July 2003.

³⁰ International Iron and Steel Institute, Steel Statistical Yearbook 2002, December 2002
<http://www.worldsteel.org/media/ssy/iisi_ssy_2002.pdf>

³¹ "Technology in China: The allure of low technology," The Economist, 20 December 2003.

3.3.3 Vancouver Port Area Growth Rate

Historically, growth in container port throughput of the Vancouver port area has exceeded the overall traffic growth on the West Coast by 6% to 10% a year due to container penetration rates³². Between 1997 and 2003 the percentage of inbound cargo handled in containers increased from 36% to 64%, a rate of increase of 11%.³³ As mentioned, outbound container shipments have also shown significant growth driven by the shift of forest products from break-bulk shipping to container shipping.

As analysed in Chapter 4, the PoV is expected to maintain its competitive position and a positive growth differential is forecast to remain. However, the differential is expected to be lower, perhaps in the 2% to 3% a year range due to limits in container penetration. The size of the differential is also expected to decrease due to slower growth of PoV inter-modal capacity relative to competing West Coast ports. This implies growth for the *Vancouver port area* of 7% to 9% a year (i.e., the West Coast growth rate +2% to 3%).

3.3.4 Container Traffic Forecast

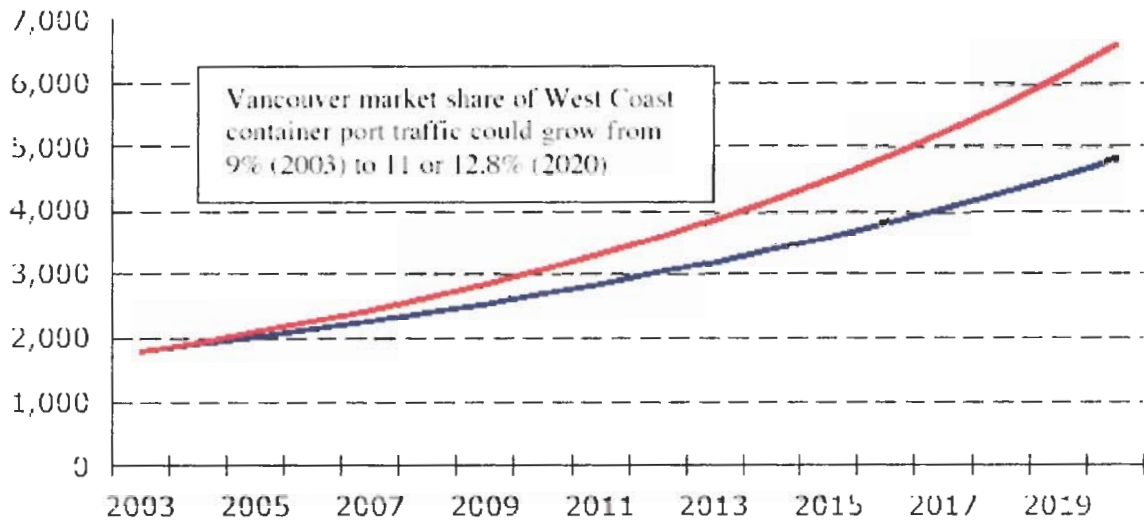
In sum, growth rates used to project West Coast and Vancouver port area (Fraser Port and Port of Vancouver) container traffic shown in Figure 5 are based on the following assumptions:

- Growth in N.A. GDP will continue to average 3% per year.
- Growth in N.A. container port throughput will exceed GDP growth by 1% to 2% a year. Therefore, the container port growth for *North America* is estimated to be 4% to 5% a year.
- Growth in West Coast container port throughput will continue to exceed that of N.A. by 1% a year. Hence, the *West Coast* growth rate is estimated to be 5% to 6% a year.
- Growth in container port throughput of the Vancouver port area will continue to exceed the overall traffic growth on the West Coast. The differential is expected to be lower than in the past in the 2% to 3% a year range. Growth for the *Vancouver port area* is estimated to be 7% to 9% a year.

³² Vancouver Port Authority, Waterborne Cargo Statistics, 1997 – 2002 and Waterborne Containerised Statistics 1997 - 2002, (Vancouver: Vancouver Port Authority 1998 - 2003).

³³ Ibid.

Figure 5: Vancouver Port Area Container Projections (TEU, 000)



Source: Based on growth rates covered in this Chapter. (Figure prepared by author).

The 2020 projections for the Vancouver port area range between 5.0 million TEU and 6.8 million TEU. This compares to the VPA’s 2020 forecast of 4.6 million TEU for the PoV alone. The VPA’s forecast is generally consistent with the lower projection indicated in Figure 5. That is, Fraser Port could handle about 500,000 TEU in the latter years of the projections.³⁴ Summing the VPA’s 4.6 million TEU forecast and the FRPA’s 500,000 TEU forecast amounts to 5.1 million TEU.

3.3.5 Sensitivity Analysis

The Prince Rupert Port Authority (PRPA) has targeted a market that includes: inbound inter-modal traffic destined for Canada, the U.S. Midwest and the U.S. East Coast. In late 2003, the PRPA forecast TEU traffic ranged between 350,000 and 500,000 TEU in its 15th year of operations (generally corresponding with 2020).³⁵

³⁴ Ministry of Transportation, B.C. Ports Strategy Final, March 18 2005: Appendix C: 27 <http://www.gov.bc.ca/ecdev/down/bc_ports_strategy_sbed_mar_18_05.pdf>

³⁵ American Association of Port Authorities, Advisory, Prince Rupert Plans (Advisory August 16, 2004) 25 April 2005: Vol. 40, No. 14 <http://www.aapa-rts.org/members/advisory/html/2005/advisory40_14.htm>

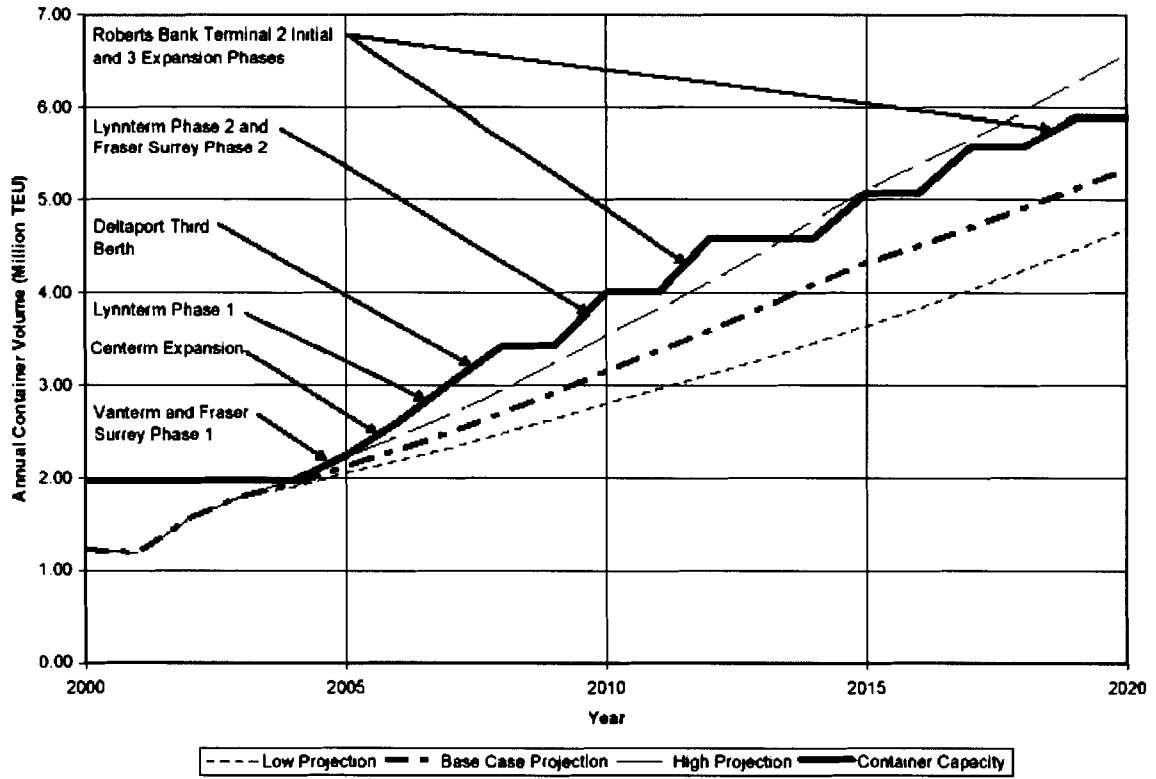
If PRPA achieves 425,000 TEU by 2020 and all of this volume comes from the market currently served by the Vancouver port area, the impact on the throughput of the Vancouver port area is within the uncertainty in the projections themselves. That is, the PRPA projections are well within the range of uncertainty for the Vancouver port area; the low and high cases above vary by about 1.8 million TEU in 2020.

Sensitivity analyses also examined alternative scenarios of traffic growth for the Vancouver port area. These range from a low case in which globalisation tapers off and the rate of container trade expansion falls to the forecast GDP growth of 3% a year (container throughput reaches 2.2 million TEU by 2010) to a case in which inbound containerised cargoes continue to grow at 18% a year as they have for the past five years and drive overall container throughput at a similar rate of expansion (container throughput reaches 6 million TEU by 2010).

Finally, the demand projections should be within Port terminal capacity. The balance between container demand and terminal capacity is shown in Figure 6, which also lists the projects that will contribute to expansion of container terminal capacity.

If all expansion plans proceed according to the VPA's schedule, the terminal capacities will generally track the high case projections up to 2015, but with periods of tightness in 2004 to 2009. Capacity will be above the base case and low projections if all projects proceed according to plans.

Figure 6: VPA Container Forecast Compared to Terminal Capacity



Source: (Copyright: Vancouver Port Authority. Used with permission)

4 INDUSTRY ANALYSIS

4.1 Introduction

Despite the container forecasts covered in Chapter 3, if the PoV does not maintain or improve its competitive position, it faces the risk of losing business and the need for a supply chain system diminishes. While a supply chain system can enhance the PoV's competitive position by improving transaction speed, reducing costs and increasing customer service, other root forces will determine the PoV's overall competitive position. Hence, this Chapter analyses the PoV's competitive position.

Michael Porter's framework³⁶ is commonly used to assess industry dynamics. While this Chapter touches on all of Porter's competitive forces, emphasis are placed on those deemed to be the most relevant for establishing and sustaining a supply chain system. The following Sections cover competitive forces as follows: Section 4.2 covers customer (shipping line) bargaining power. Substitute routes/ports (e.g., substituting the transpacific route with an all water route from Asia to the East Coast), increases shipping line bargaining power hence, substitutes are also covered in Section 4.2. Finally, supplier (particularly stevedoring companies) homogeneity increases shipping line bargaining power hence, it is also covered in Section 4.2.

Section 4.3 covers port rivalry and includes discussion on the government structures and regulations that affect port competitiveness.

³⁶ Wikipedia, 15 July 2005 < http://en.wikipedia.org/wiki/Porter_5_forces_analysis >.

The threat of entry is considered low mainly due to the high upfront costs to develop a port, scarce suitable land including naturally deep-water berths, requirement for a large local market and the need for adequate inland inter-modal connection services to serve the port hinterland. These are all very significant requirements and limit the opportunity for new port entrants.

One could argue that this threat is more like low – moderate if a government wants to develop a region. Entry may happen through government assistance, not purely for financial reasons.

However, a recent *Globe and Mail* article³⁷ indicates that even government will is not enough. The article discusses the poor viability of the Port of Prince Rupert container terminal plans. The article indicates that Prince Rupert has no infrastructure, no local customers, no warehousing and distribution and limited railway services. The article concludes that Prince Rupert will only be marginally viable as long as Vancouver and Los Angeles are at capacity.

4.2 Customer Forces and Supplier Homogeneity

For the purpose of this paper, the PoV is considered to have three container related groups of customers: (1) Asian shippers exporting containerised cargo to Canada (2) Canadian shippers exporting containerised cargo to Asia and (3) the shipping lines.

Chapter 3 addresses Asian and Canadian shippers. Growth in GDP, containerised cargo trade and transaction volumes support the need for a community supply chain system. This Section focuses on the shipping lines. Specifically, this Section provides additional support for PoV container growth forecasts by examining shipping line fleet strategy, particularly as it pertains to fleet size and deployment to transpacific routes. This is a powerful signal and it is

³⁷ Young, Mary Lynn, “Prince Rupert port plan may be sinking”, *Globe and Mail*, 22 July 2005

reasonable to argue that if the shipping lines are making significant investments in, and ramping up container fleet capacity, they too believe that container traffic and transaction volumes are going to continue to grow over the long term.

This section also addresses the bargaining power shipping lines have over port suppliers. Shipping lines are considered to have high bargaining power and as such it would be in the PoV's best interests to collaborate with the lines to alleviate transaction workloads and improve customer service.

4.2.1 Container Fleet

In the past few years, shipping lines have focused on the development of very large cellular container liners. The development of the container fleet is illustrated in Table 7, where the development of the total container ship order book is contrasted with existing cellular fleet capacity.

The capacity of vessels on order has remained at very high levels since 1990. Initially this peaked at 0.99m TEU at end-1996 when orders accounted for some 31 per cent of the existing fleet. This period represented the first surge in orders for 5000TEU+ capacity vessels that was a major feature of the container market of the mid/late-1990s.

Subsequent weakening in container revenues and the digestion of these new buildings saw total ordering fall-off significantly over 1997/98, with this falling to a minimum of 0.69m TEU in 1998.

Since early 2000 the order book has once again accelerated sharply, with this placed at some 1.58m TEU at yearend. This equates to some 33.4 per cent of capacity and reflects the surge in ordering for 6000TEU+ vessels as owners seek to benefit from the scale economies of such units.

Table 7: Development of the Cellular Fleet (TEU, 000)

Year	Existing	On-Order	%
1990	1755.4	337.6	19.2
1991	1912.7	297.1	15.5
1992	2098.1	246.8	11.8
1993	2217.1	469.0	21.2
1994	2531.7	585.9	23.1
1995	2761.3	754.8	27.3
1996	3178.8	991.8	31.2
1997	3563.3	898.9	25.2
1998	4150.4	691.8	16.7
1999	4237.0	717.5	16.9
2000	4716.1	1577.5	33.4

Source: Based on data from the VPA's Port of Vancouver Container Market Study, Final Report, April 2001. (Table prepared by author)

The trend of larger capacity vessels has continued and the new shipping standard now exceed 8000 TEU. Presently about 300 ships make up the post-Panamax fleet with another 119 ships exceeding 8000 TEU on order and the largest about 9500 TEU³⁸.

Table 8 summarises the general development of container ship designs since the early 1980s and provides an indication of the likely course of future development. Since the Panamax barrier was broken in 1988, there has been a progressive increase in vessel sizes.

Further detailed designs are underway for vessels of up to 17000TEU capacity.³⁹ There are no technical or market obstacles to the introduction of such vessels. This process of increasing vessel sizes in the trades still has considerably further to progress.

Table 8: Growth in Container Vessel Size and Draught

	TEU	Design Draught	Required Berth Depth
		metres	metres
Second Generation			
1970/80	2000	10.8	12
Panamax			
1980/90	3000/4000	12.2	12.8/13.0

³⁸ Ministry of Transportation, B.C. Ports Strategy Final, March 18 2005: 9, 26
<http://www.gov.bc.ca/ecdev/down/bc_ports_strategy_sbed_mar_18_05.pdf>

³⁹ Ibid 26

Post-Panamax			
1988/2000	4000/5000	12.7	13.5/14.0
New Generation			
1997/2005	6400/7500	14.2/14.5	14.8/15.3
2003/2008	8000/8500	14.5	15.3
2008 and later	12500/17000	14.5/15.0	15.3/15.8

Source: Based on data from the VPA's Port of Vancouver Container Market Study, Final Report, April 2001. (Table prepared by author)

The rationale for increasing vessel size has been the search for scale economies (i.e., lower, fully-laden slot-mile costs), and commercial advantage for the lines (i.e., Maersk and P&O Nedlloyd) that commit to this cost cutting strategy. This pattern is being accelerated as other owners come under pressure to follow suit if they are not to be left with uncompetitive costs in the major deep-sea trades.

It is important to note that the progressive increase in the average draught of the relevant fleets⁴⁰. Handling the latest generation vessels requires 15m deep berths. The water depth currently available at TSI's Deltaport terminal is highly competitive from this perspective. Deltaport has the capability of berthing larger vessels than Seattle, (i.e., 8000+ TEU vs. 4000 TEU).

Table 9 summarises the development of trade by ship size range for the transpacific route. Within an overall background of steady demand growth the major trend has clearly been in favour of the development of market shares of the largest classes of vessels.

By focussing on the development of market share of 3500TEU+ vessels it is apparent that this has increased from 20 per cent in 1996 to an estimated level of 38.7 per cent in 1999. This represents a very rapid and dramatic increase and has followed directly from the introduction of

⁴⁰ In the current market vessels are seldom fully laden by weight and the design draught is not always utilised. However, in port planning it remains essential to be able to berth such units on all tides and assuming maximum utilisation.

new generation vessels into the trades. This increase has been focused on the very largest size ranges and has been reciprocated by a decline in the market share of medium size vessels.

Table 9: Transpacific Container Trades by Vessel Size

	1996		1999	
	000 TEU	%	000 TEU	%
<1500/3500	5966.7	79.8	5895.9	61.3
3501/4500	1510.4	20.2	2808.5	29.2
>4501	0.0	0.0	913.7	9.5
Total	7477.0	100.0	9618.0	100.0

Source: Based on data from the VPA's Port of Vancouver Container Market Study, Final Report, April 2001. (Table prepared by author)

The estimated future deployment of container vessels on the transpacific route is summarised in Table 10. For the major trades, the current position is characterised by the deployment of vessels of up to around 8000TEU, with typical vessels for major owners dominated by 5500/6500TEU units. Between 2010/2015, it can reasonably be assumed that 12500TEU vessels will be a feature of these long-haul trades, with a resulting increased use of transshipment operations and increased pressure on improving relevant transaction and information processing.

Table 10: Forecast Vessel Sizes in Vancouver Deep sea Container Trades

	2000	2005	2010	2015
Transpacific				
Typical Vessel (TEU)	4500/5500	5500/6500	6500	7500
Largest Vessel (TEU)	6700	8000	9200	12500

Source: Based on data from the VPA's Port of Vancouver Container Market Study, Final Report, April 2001. (Table prepared by author)

There have also been increased pressures to rationalise the number of port calls that are offered by the major lines and alliances. Clearly, if the scale economies associated with larger capacity vessels are to be maximised then it will become increasingly important to reduce the number of port calls in the major regional markets.

It is likely that major shipping lines/alliances will opt for a single port call in the Pacific North West (PNW). This implies that the PoV may see an increase in the number of containers unloaded per port call. This process of port concentration will present both opportunities and threats for the PoV. It will be essential to provide the required handling capacities and services in the short-term to improve the *relative* position of the PoV in the PNW

In sum, the trends in the container fleet may be characterised as follows:

- There has been a rapid increase in fleet capacity;
- The emphasis has been placed increasingly on 8000+ TEU capacity vessels;
- There will be a further acceleration in the trend to design larger vessels requiring a deeper draught;
- Average vessel sizes are rapidly increasing in the major arterial container trades and the transpacific trade will come under pressure to introduce ever-larger capacity vessels.
- The introduction of larger vessels will see a reduction in the number of port calls within a range.

4.2.2 Shipping Line Bargaining Power

Shipping lines typically coordinate the movement of goods from point of origin to the final destination⁴¹. Thus, the shipping line will choose a container terminal that will get containers to the end user at the most competitive rates and time-sensitive delivery. If a terminal operator cannot meet its contractual obligations and service diminishes, the shipping line may elect to switch to another port and terminal. Eastbound transit containers to the U.S. are highly price and service sensitive and could be diverted to competing U.S. ports at any time.

The homogenous nature of container terminals increases shipping line bargaining power. Although the development of the containers in the 1960's facilitated trade, this made container

⁴¹ Douglas Long, International Logistics – Global Supply Chain Management, (Norwell, Massachusetts: Kluwer Academics Publishers, 2003): 170.

terminals a homogenous product. The design and operation of a container terminal is a complex task but the overall design is similar.

The homogenous nature of container terminals was illustrated during the long shore workers strike at 29 West Coast (U.S.) ports in the fall of 2002. Some shipping lines easily moved their business to the POV and, as a result, the Port of Seattle lost business to the POV⁴². During the strike, the Port of Seattle officials acknowledged that the POV had come from nowhere to become a serious rival. Conversely, during the April 2004 B.C. tug and barge strike, incoming ships to the POV were diverted to the ports of Tacoma and Seattle⁴³.

Standardized containers also make it easy for shipping lines to relocate, as the shipping line does not need a specially built terminal to load and unload its containers. The inter-modal equipment used by trucking and railway companies to serve competing port gateways is also standardized. Hence, the switching costs for the shipping lines are low.

In addition, shipping line alliances and consolidation agreements⁴⁴ increases the volume of business represented by the alliance and hence, increases its bargaining power. In the POV⁴⁵, New World Alliance members (APL, Hyundai Merchant Marine and Mitsui O.S.K.) use the services of P&O at Centerm. The Grand Alliance (P&O Nedlloyd, Hapag-Lloyd, Nippon Yusen Kaisha Line and Orient Overseas Container Lines) uses the services of TSI at Deltaport and Vanterm. When representatives of these alliances sit down with stevedoring companies and other

⁴² "US Ports fear success of Canadian Waterfront", OnlineMarine.com, 13 October 2002, http://onlinemariner.yellowbrix.com/pages/onlinemariner/Story.nsp?story_id=33598106

⁴³ "B.C. tug and barge strike ends", Today's Trucking, 25 April 2004, <<http://www.todaystrucking.com/displayarticle.cfm?ID=3112>>

⁴⁴ The consolidation movement in the container shipping sector started with slot sharing arrangements, where carriers purchased slots in other carriers' ships to provide service flexibility and more extensive geographical coverage. This expanded into multi-trade alliances among carriers that focused on achieving efficiencies and better service by sharing vessels, utilizing common terminals, joint feeder service, joint purchase of containers, etc.

⁴⁵ Dennis Pervis, "Container Shipping Lines Serving Vancouver", Agri-Food Trade Service, 18 May 2004, <<http://atn-riac.ca/can/e3108.htm>>

service suppliers to negotiate contract terms, suppliers are dealing with a formidable alliance of carriers that previously had been individual customers.

If the shipping lines cannot negotiate favourable terms the shipping lines will divert their business to competing U.S. West Coast ports. This risk of diversion to Seattle or Tacoma negatively affects the VPA in two ways, namely: (1) diversions undermine the VPA's ability to meet its expansion mission and (2) diversions can result in significant loss in revenues.

Recently, inter-modal capacity constraints at all West Coast ports have caused the shipping lines to consider other route substitutes. Some shipping lines have diverted some of their Mid West business to East Coast ports via an all water Suez Canal or Panama Canal route.

Presently, the Suez Canal route is not considered a serious risk. World events make the Suez Canal a risky trading route. In addition, the depth of the Suez Canal limits the size of vessels that can navigate this route and transit times are longer than either the Panama Canal or the transpacific route.

Shipping lines are starting to use the Panama Canal on a more frequent basis. A driving force behind this development is that big retailers, like Wal-Mart, Kmart, Best Buy and others have opened trans-loading centres near east coast ports⁴⁶. At a trans-loading centre, marine containers are emptied and the goods are transferred to trailers or land containers. The shipping lines like the quick turnaround of marine containers, as there is a worldwide shortage of marine containers⁴⁷.

⁴⁶ "West Coast Ports versus East Coast Ports", CIFFA Newsletter, May 2004: 7.

⁴⁷ Paul Stastny, "A Made in China Problem", Canadian Transportation & Logistics, 1 June 2004: 10.

The risk of shipping lines diverting to the Panama Canal route is mitigated by the longer overall trip time (31 days via the Panama Canal vs. 23 days via the transpacific)⁴⁸. Via the PoV, shipping lines also have the benefit of a strong back all market.

Should the VPA decide to move forward with the supply chain system strategy, it is recommended that it be proactive and meet with key shipping lines and alliance representatives to discuss PoV information processing problems and solutions. In addition to being a good customer service and retention tactic, the major shipping lines have sophisticated logistics related information systems and have valuable insights that they would likely be willing to share.

4.2.3 Port Rivalry

The PoV must exploit its competitive advantages and mitigate its weaknesses if it is to best position itself to achieve the container targets covered in Chapter 3. The VPA considers its main competition to be the ports in Seattle and Tacoma not other B.C. container ports (i.e. Fraser River Port and Prince Rupert).

The B.C. Ports Strategy⁴⁹ embraces the concept of port collaboration. Given such issues as the cost of developing new terminals, balancing the rollout of new capacity between ports, land constraints and regional comparative advantages, B.C. container ports understand that synergies will be gained if the port authorities collaborate. For example, the PRPA and the VPA should coordinate the commissioning of new container terminals to avoid creating excess capacity and the related downstream problems (e.g., putting downward pressure on terminal lease rates and

⁴⁸ Jim Shaw, "Alameda Underway as Delays Hit Rail", CargoNewsAsia, 14 December 1998: 3.

<<http://www.cargonewsasia.com/timesnet/data/cna/docs/cna3977.html>>

(The waterborne portion of the Panama route takes approximately 26 days plus 3 – 5 days to a distribution hub vs. 18 days via the transpacific route including the rail haul plus 3 – 5 days to a distribution hub).

⁴⁹ Ministry of Transportation, B.C. Ports Strategy Final, March 18 2005: 9

<http://www.gov.bc.ca/ecdev/down/bc_ports_strategy_sbed_mar_18_05.pdf>

therefore compromising investment returns until the excess capacity is eliminated and leases can be renegotiated).

In addition, since the Port of Prince Rupert is the closest port to the huge liquefied natural gas (“LNG”) production projects in the Middle East, Indonesia and Australia, it may be more suited than the VPA to focus on developing LNG terminals⁵⁰.

A final example relates to the Fraser River Port. Since the FRPA has to dredge the Fraser River to allow for the larger ships, perhaps it would be more cost effective if the VPA and the FRPA rebalanced workloads such that the Fraser River Port served smaller vessels and the PoV served larger vessels⁵¹.

In agreeing to this approach, the port authorities will develop their respective ports in the best interests of Canada and more effectively compete with the ports of Seattle and Tacoma, as opposed to with each other.

Meanwhile, the Ports of Seattle and Tacoma are aggressively targeting the container industry with expansions to container terminals and upgrades to the inter-modal facilities at both ports. For example, a recent article indicates that the Port of Tacoma’s commission approved a series of planning studies that, once completed, will reveal options for how the port can expand and what infrastructure needs to be in place to meet port needs over the next 40 to 50 years into the future⁵². The Port of Seattle has indicated that factors such as the growing competition among West Coast ports, decreasing public funding and emerging new technologies create the need for effective and comprehensive long-range planning. Accordingly, Seattle has earmarked more than

⁵⁰ Lewis Ritchie, “New gas terminal investigated for Rupert”, Daily News, 2 July 2004: 1.

⁵¹ Bill DiBenedetto and Alan Daniels, “Western Canada ports: Commercial and trade engines”, Pacific Shipper, 2 July 2004: 10.

⁵² “Port plans for the long haul”, The Tribune News.com, 29 June 2005
<http://www.thenewstribune.com/business/story/4985314p-4554342c.html>

\$1 billion over 10 years in capital improvements aimed at upgrading and expanding its waterfront facilities⁵³.

Studies indicate that the shipping lines consider port productivity to be of prime importance in selecting a port of call followed by transportation charges and inter-modal capacity.⁵⁴ Other important factors include: geography, terminal capacity and back haul revenue opportunities. In sum, ports that gain competitive advantage will find ways of improving productivity and efficiency and enhancing customer services (i.e. faster vessel turnaround time; better document and information flow, etc.) all while maintaining competitive shipping rates.

The following analysis evaluates the competitive position of the ports of Vancouver versus Seattle and Tacoma. Based on the customer (i.e. shipping line) preferences mentioned above, key criteria that determine the PoV's competitive position are as follows:

- Terminal productivity
- Transportation charges
- Inter-modal capacity
- Geography
- Backhaul opportunities
- Terminal capacity

4.2.3.1 Terminal Productivity

Any given container terminal is capable of handling the same products as another container terminal. Thus, a key distinguishing factor between one terminal and another is the operational efficiency of the stevedoring company and terminal productivity.

⁵³ Port of Seattle, Seaport Business: Expansion, 15 July 2005
<http://www.portseattle.org/business/seaport/expansion.shtml>

⁵⁴ Dr. Jose Tongzon, Determinants of Competitiveness in Logistics: Implications for the Region, July 2004:
3 <<http://www.nesdb.go.th/national/competitiveness/attach/data21/08-JoseTongzon-A.pdf>>

Based on 2001 throughput, Table 11 provides typical terminal productivity measures based upon rated capacities for select terminals from around the world that are considered the most advanced and productive in their respective regions.

Table 11: Comparative Terminal Productivity Metrics

	TEUs Per Acre	TEUs Per Berth
Port of Seattle	3500	148,000
Port of Tacoma	4035	172,000
Maersk Pier 400, Los Angeles	4340	350,000
Deltaport, Vancouver	5000	400,000
Centerm, Vancouver	5075	170,000
Vanterm, Vancouver	6040	217,500
Hanjin Pier A, Long Beach	6470	550,000
APL Pier 300, Los Angeles	6490	425,000
Burcharkai, Hamburg	6580	325,000
Racine Terminal, Montreal	6855	212,500
Trinity Terminal, Felixstowe	8500	400,000
Altenwerder, Hamburg	8635	475,000
CT9, Hong Kong	17300	433,000

Source: Based on data from the VPA Container Handling Productivity Objectives. December 2001 (Table prepared by author)

In terms of land use, productivity at Vancouver is significantly higher than competing U.S. terminals. This advantage is due to the operational flexibility and greater willingness of labor to accept new technology. Restrictive U.S. labor practices are more fully discussed under the Transportation Charges section below.

Both Seattle and Tacoma are under pressure to increase utilisation rates and it will be essential for Vancouver to continue its process of productivity improvement to maintain this relative advantage.

4.2.3.2 Transportation Charges

There are three main transportation charges related to shipping a container from an Asian source port to Chicago via Vancouver, Seattle or Tacoma, namely: marine voyage charges,

terminal stevedoring charges and inland rail distribution charges. Table 12 offers representative charges from Kobe and Singapore as these ports constitute the geographical range of demand growth. Vancouver and Tacoma have the capability of berthing larger vessels than Seattle and this scale benefit is factored into the figures presented in Table 12.

Table 12: Representative Asia to Chicago Transportation Charges

	Marine Charges	Terminal Charges**	Rail Charges	Total
	US\$ / FEU ⁵⁵	US\$ / FEU	US\$ / FEU	US\$ / FEU
Kobe to Chicago				
via Vancouver	323.13	466.00	975.00	1764.13
via Tacoma	323.34	502.00	1085.00	1910.34
via Seattle	350.42	505.00	1050.00	1905.42
Singapore to Chicago				
via Vancouver	458.63	340.00	975.00	1773.63
via Tacoma	508.10	376.00	1085.00	1969.10
via Seattle	506.78	379.00	1050.00	1935.78

** - load and discharge costs

Source: Based on data from the VPA's Port of Vancouver Container Market Study, Final Report, April 2001. (Table prepared by author)

Historically, Vancouver has enjoyed a significant competitive advantage with regard to stevedoring and inland rail costs in contrast to both Seattle and Tacoma. This has been partially attributable to favourable exchange rates but underlying cost structures have also been generally lower.

A recent article states that the Canadian currency (at that time 63 cents U.S.) gave Canadian ports an advantage over American ports⁵⁶. To determine the exchange rate that would neutralize this advantage over American ports, the VPA attempted to normalize costs between the various ports. Once the costs had been normalized, VPA then applied different exchange rates to the costs to determine the exchange that would make the costs equivalent. The costs VPA took

⁵⁵ FEU stands for "forty foot equivalent unit" and is another standard container size. Unlike TEU, container statistics are not typically normalized using FEUs.

⁵⁶ "US Ports fear success of Canadian Waterfront", OnlineMariner.com, 13 October 2002, http://onlinemariner.yellowbrix.com/pages/onlinemariner/Story.nsp?story_id=33598106

into consideration were cargo charges, such as stevedoring and wharfage and ships' charges, such as pilotage, tugs, lines handling fees, harbour dues, customs fees and berthage. The analysis suggested that with the Canadian dollar at 80 cents U.S., the POV's advantage, as a result of the exchange rate, would be neutralized⁵⁷.

For 2004, the average exchange rate was approximately 75 cents U.S., still giving VPA an element of advantage over the Ports of Seattle and Tacoma⁵⁸.

With respect to underlying cost structures, restrictive labour practices have limited technology deployment and automation in most U.S. West Coast terminals. Without the historically rigid U.S. manning practices, the terminals could have been able to operate at lower costs and higher performance, resulting in higher asset utilization and higher overall capacity.

PoV terminal operators, such as TSI, have been working with the labour unions for several years to find appropriate solutions that integrate technology with labour to improve productivity as the terminals have expanded. The result has been increased labour efficiency, reduced operating costs and a sustained Vancouver cost advantage. An example at Deltaport is multi-trailer operations and computer systems that optimise the efficiency of moving containers to rail and also direct operators to different cranes instead of the operator being restricted to one crane.

The PoV will have to work hard to maintain this competitive advantage. The 2002 U.S. International Longshore and Warehouse Union (ILWU) labour agreement opened the door for the introduction of automation technologies. The U.S. West Coast terminal operators have been upgrading terminal technologies with the aim of reducing operating costs, increasing safety and

⁵⁷ Banjar Management Inc., Unit Cost Study: Analysis of the Competitive Position of West Coast Ports, (report prepared for the VPA) (Vancouver: October 2002): 24.

⁵⁸ "Exchange Rates", Bank of Canada, 15 July 2004 <http://www.bankofcanada.ca/en/can_us_close.htm>

security levels, improving service times for draymen and vessels, and increasing asset utilization. Some of the initiatives include: aggregating monitoring and clerical teams in central locations via closed circuit television, improving technology infrastructure, organizing command and control centres and developing modern customer-oriented web interfaces.

4.2.3.3 Inter-modal Capacity

Currently Vancouver, Tacoma and Seattle are hampered by a lack of available on-dock rail capacity and – more importantly – by congestion linking the ports with the transcontinental mainlines. Market share wins can lead to losses if parts of the logistics chain are capacity constrained. Hayuth’s container port development model refers to as this as the challenge of the periphery. “Diseconomies of scale result from constraints on inland distribution from increased traffic congestion.”⁵⁹ As a result, leading ports can lose some of their attractiveness while lesser ports can become primary ports.⁶⁰ Vancouver and Tacoma have experienced both ends of this rivalry.

Lower Mainland road network traffic problems have been documented in recent years in a number of studies⁶¹. The Major Commercial Transportation System as proposed by the Greater Vancouver Gateway Council⁶² addresses the most urgent transportation issues in the Lower Mainland (such as railway bottlenecks at the New Westminster Railway Bridge and the Colebrook siding in Surrey). Implementation of the improvements proposed by the Greater

⁵⁹ Gregory Case. Marine Exchanges: The Evolution of an American Port Institution, (Washington: University of Washington Graduate School, 10 March 1999): 43.

⁶⁰ Yehuda Hayuth “Containerization and the Load Center Concept.” Economic Geography 57.2 (1981): 160-76.

⁶¹ A major commercial transportation system study was completed by Delcan Corporation in July 2003. Lower Mainland rail network problems are documented in the British Columbia Freight Transportation Study completed by the IBI Group on behalf of Transport Canada, January 2002.

⁶² “*Economic Impact Analysis of Investment in a Major Commercial Transportation System for the Greater Vancouver Region*” (prepared by Delcan and Economic Development Research Group, July 2003).

Vancouver Gateway Council is required to ensure efficient operation of the ports and improve customer services.

There are also serious capacity constraints beyond the Lower Mainland. For example, CPR has identified 20 separate problem areas on its Shuswap and Thompson subdivisions. The estimated capital investment to increase capacity by approximately 30% in this segment of the network is \$200 million⁶³.

Seattle and Tacoma are also experiencing inter-modal bottlenecks and are involved in planning inland access improvements. Washington's public ports and municipalities have identified major capacity constraints at port interfaces with the railroads. These constraints include: lack of adequate dock-side rail access, necessitating truck transfers from container yards to rail loading areas; inadequate track space to make up or terminate long trains; and trains blocking surface streets and access roads which not only results in inconvenience to the public, but also restricts truck movements in and out of terminal areas.

The Ports that address their respective inter-modal capacity issues the fastest will be in position to enhance their market share and competitive position. However, resolving capacity issues requires a positive investment climate and significant capital. Climate and capital can be significantly affected by governance structures and fiscal regimes. In this respect, U.S. ports have a distinct advantage.

The level of government support for port gateways and the related infrastructure evident in the U.S. is typical of those countries that see their ports as valuable assets in improving their role in international trade and as critical contributors to the growth of their local, regional and federal economies. The U.S. mindset reflects a willingness to invest public monies in port

⁶³ Colledge Transportation Consulting Inc., British Columbia Ports Competitive Profile (Vancouver, Colledge Transportation Consulting Inc., September 2004): 44.

infrastructure in return for the economic development, job creation and tax revenues that flow from these investments. In other words, ports are viewed as an economic generator, as opposed to a revenue generator for the government(s).

As a matter of policy, the U.S. federal government routinely provides significant funding towards transportation improvements through such programs as the Transportation Equity Act for the 21st Century (TEA-21) which can cover up to 80% of the capital costs of qualifying projects.

The Ports of Everett, Seattle and Tacoma, together with the U.S. Federal Government, the State of Washington and a number of cities and counties have funded the “FAST Corridor” project⁶⁴. The purpose of the project is to improve the efficiency, safety and reliability of Puget Sound’s area road and rail networks. The project plans on spending U.S.\$400 million from 2000 to 2006.

These grants make it easier and less costly for Seattle and Tacoma to expand inter-modal capacity. They create an artificially low cost base and provide competitive advantage by allowing them to respond to opportunities more rapidly and charge less for services rendered.⁶⁵ To date, Canadian ports have been regulated as revenue generators and consequently, stakeholders do not receive this level of support.

4.2.3.4 Geography

B.C.’s harbours are naturally deep and sheltered. The naturally deep harbours provide the PoV terminals (particularly Deltaport) with considerable advantages with regard to ship size accessibility. As more fully discussed above, the PoV will be able to leverage this capability as larger vessels are introduced to the transpacific route.

⁶⁴ “FAST Corridor”, Port of Tacoma, 15 July 2005 <http://www.portoftacoma.com/whatsnew.cfm?sub=105>

⁶⁵ While the rates of return built into U.S. port authority leases are typically in the 7.5% to 9% a year (nominal) range, Canadian port authorities require higher returns.

B.C. ports also have a modest geographic advantage compared to competing West Coast ports. Voyage distances between East Asia and the PoV are slightly shorter compared to U.S. West Coast ports and Canadian rail distances are comparable with U.S. routes to common hinterland markets.

4.2.3.5 Terminal Capacity

Seattle and Tacoma are outpacing PoV in terminal expansion investments. Excluding Prince Rupert, eight of the biggest ports in Canada, will only spend approximately \$701 million dollars during the period 2001 - 2005⁶⁶. In contrast, the Ports of Seattle and Tacoma anticipate capital expenditures of \$1.2 billion U.S. during the period 2001 - 2005⁶⁷.

As mentioned above, the accelerated spending by the ports of Seattle and Tacoma reflects the routine availability of government grants. By comparison, the VPA cannot access government grants. The present interpretation of the CMA is that the federal government cannot give funds to the VPA to allow it to discharge an obligation or a debt. This restriction effectively prevents the VPA from obtaining a federal government infrastructure funding to pay off an obligation or debt even though the infrastructure projects may be for the betterment of Canada.

The ports of Seattle and Tacoma have a variety of other financial advantages. For example, they are municipal agencies and as such, have access to municipal funding, including revenue bonds, some tax exempt and all relatively low cost. In addition, they do not pay property taxes or payments-in-lieu of taxes (PILT). In fact, some U.S. port authorities collect property tax,

⁶⁶ IBI Group Ltd., Association of Canadian Port Authorities Report on Competitiveness of Canadian Ports, (Vancouver, IBI Group, 23 September 2002): 17.

⁶⁷ IBI Group Ltd. 3.

(i.e., for 2003, Seattle recorded a net tax *income* of C\$26.6 million)⁶⁸. In contrast, the PoV pays some \$56 million in annual property taxes and PILT to eight municipalities⁶⁹.

Finally, American ports typically have no imposed debt limits. Canadian Port Authorities (CPAs) are restricted to debt financing up to the borrowing limits as set out in their respective letters patent. If the VPA elects to use all its borrowing capacity to help finance rail infrastructure improvements in the inner harbour or to acquire a strategically located section of rail line serving Deltaport, then the VPA cannot build or modify a container terminal other than through its cash flow.

4.2.3.6 Backhaul Opportunities

Vancouver enjoys a relative advantage over both Seattle and Tacoma in the balance between imports and exports generally easing the problems associated with repositioning empty containers. As noted above, low backhaul freight rates have promoted the containerisation of traditional, export break-bulk cargos (i.e., primarily break-bulk forest products and specialty grains). The PoV has a stronger hinterland supply of containerised export cargo and hence, more revenue generating backhaul opportunities for the shipping lines than Seattle or Tacoma.

4.2.3.7 Overall Assessment

Table 13 compares the competitive position of Vancouver, Seattle and Tacoma against the criterion discussed above. Of course, the relative importance of each criterion is not equal and definitive quantification of such issues is outside the scope of this paper. However, ranking the position of Vancouver for each criterion, and comparing these scores with the other ports can define a general view of the competitive position.

⁶⁸ Vancouver Port Authority, Submission to the *Canada Marine Act* Review Panel, September 2002: 16 <http://www.portvancouver.com/trade_shipping/docs/VPA%20Submission%20Final.pdf>

⁶⁹ Ibid: 16.

It is apparent that the overall competitive position of the PoV is positive and it is well positioned to achieve the target container growth volumes covered in Chapter 3. The PoV has natural deep berths capable of handling the next generation of vessels; it has competitive transport charges, more productive terminals and better backhaul opportunities. However, the PoV will not likely be able to keep pace with Seattle or Tacoma’s level of inter-modal investment due to the financial restrictions discussed above.

Table 13: Relative Competitive Positions of PNW Ports

	Vancouver	Seattle	Tacoma
Terminal Productivity	****	***	***
Transportation Charges	*****	****	****
Inter-modal Capacity	***	****	****
Geography	*****	***	****
Terminal Capacity	***	****	****
Backhaul Opportunities	*****	****	****
Total	25	22	23
<i>Source: (Table prepared by author)</i>			

5 INFORMATION PROCESSING PROBLEMS

5.1 Introduction

Improved global logistics information processing is primarily being driven by three factors, namely: (1) the rapid increase in container traffic and transactions discussed in Chapter 3, (2) government regulation/deregulation and (3) the demand for better customer service.

Government regulation drivers include the global customs modernization convention, the Container Security Initiative (CSI)⁷⁰ and the Ocean Shipping Reform Act (OSRA)⁷¹.

In 2000, the World Customs Organization adopted the International Convention on the Simplification and Harmonization of Customs Procedures. The convention calls for member countries, including Canada and the U.S., to maximize the use of automated systems for customs clearance.

In tandem with the global customs modernization convention, the U.S. government is aggressively pushing businesses to adopt Internet-based international logistics solutions. For example, the U.S. Census Bureau and the U.S. Customs Service stopped accepting Shipper's Export Declarations (SEDs) through fax on November 1, 2000. Exporters, freight forwarders and carriers are required to file SEDs through an Internet system called Automated Export System (AES) Direct.

⁷⁰ Jeffrey Holmes, "Coping with U.S. Customs' Container Security Initiative", World Trade Magazine (4 January 2004): 1.
<http://www.worldtrademag.com/CDA/ArticleInformation/features/BNP__Features__Item/0,3483,120688,00.html>

⁷¹ The Subcommittee on Coast Guard and Maritime Transportation, Hearing on Ocean Shipping Reform Act, May 2000 <<http://www.house.gov/transportation/cgmt/hearing/05-03-00/05-03-00memo.html>>

With the events of September 11, 2001, security has been increased at the Canadian/American borders and ports. In January 2002, the U.S. Customs and Border Protection Agency implemented the CSI and the Canadian Border Services Agency (CBSA) followed suit with its Advance Commercial Information (ACI)⁷² program.

The purpose of these programs is to increase the lead-time to screen import containers and to expand the sample size of containers being inspected. The U.S. and Canada are using common screening standards and sharing data in an effort to avoid undue delays in cross border traffic between the two countries. Both CSI and ACI programs require all shipping lines bringing cargo into the U.S. or Canada to electronically transmit a cargo report to the respective customs agencies at least 24 hours before the cargo is loaded at the point of origin⁷³. If the shipping lines do not provide the cargo report 24 hours in advance, they risk being fined and/or being barred from entry to the importing country⁷⁴.

Government deregulation has also increased the need for better information processing. Effective May 1999, OSRA allows shippers to enter into confidential contracts with the shipping lines. Before then all contracts were public records. Few shippers and shipping lines wanted to put customized clauses in the contracts for fear of exposing trade secrets. Thus old contracts were mostly “boiler plates” and did not sufficiently cater to the shippers’ needs and demands. Now that OSRA allows shippers and shipping lines to retain contract confidentiality, the number of customized contracts has drastically increased. However, neither shippers’ nor carriers’

⁷² Canada Border Services Agency, Fact Sheet Advanced Commercial Information, January 2005
<<http://www.cbsa-asfc.gc.ca/newsroom/factsheets/2005/0125aci-e.html>>

⁷³ Kevin Marron, “Tighter security pushes shipping into 21st century”, The Globe and Mail, 4 July 2004: B11.

⁷⁴ “Canada tightens security”, Times Shipping Journal, March 2004
<www.timesb2b.com/shipping/mar2004/glob.html>

existing information systems can efficiently facilitate the negotiation and administration of a large number of customized contracts.

For shippers and shipping lines, better customer service manifests itself in the form of on-time delivery, total visibility of the supply chain and ease of doing business. For cross-border trade, these service criterion have been difficult to achieve due to the sheer number of participants. Visibility often gets lost in the communications relay between participants.

In addition, global logistics processes are unduly complicated by a lack of integration between stakeholder systems. According to Stephens, it costs importers some \$3 billion per year in duty and tax overpayments due to a lack of system integration⁷⁵. For example, a lot of U.S. manufacturers import steel to produce appliances and industrial equipment. A large number of manufactured products are then exported to another country. If the manufacturer can present the U.S. Customs Service required documents to demonstrate the steel imported originally is later exported in the form of finished products, then the manufacturer can get a refund on the duties paid on the steel when it was first imported. The problem is, most of the manufacturers do not have integrated purchasing, manufacturing, sales and logistics systems to track the usage of the steel all the way through the product life cycle. Consequently, legitimate duty and tax refunds are foregone.

Table 14 summarizes the *steps and processes* related to international trade. Generally, the information flow related to the movement of containers and funds across borders can be categorized into three *steps*, namely: (1) global sourcing (2) transporting the goods internationally

⁷⁵ Stephens Inc. "eGlobal Logistics, The Engine Powering Globalization", Internet Research Industry Report, (Little Rock, Arkansas, November 2000): 73.

Table 14: Typical Global Logistics Functions

e-Global Logistics		
Steps	Processes	Description
Global Sourcing	Searching Trade Leads	Buyer (importer) looks for a Seller (exporter/manufacturer); Seller tries to sell to potential buyer.
	Initial Screening	Buyers/Sellers screen out counterparts that do not meet import/export trade compliance criteria or have bad credit history or are too small to meet the demand.
	Supplier/Buyer Qualification	Buyer visits Seller to determine the latter's capacity, quality control, and delivery capability. Seller visits Buyer to determine the latter's credit worthiness and to assess potential market demand.
	Contract Negotiation	Buyers and Sellers negotiate price, sales terms, payment terms, payment mechanism and level of service.
Global Logistics	Arrange International Shipping	Buyers and Sellers book domestic and int'l freight. Depending on the sales terms, the Buyer or Seller will coordinate the multi-modal transportation services.
	Arrange Trade Finance	Buyer/Seller make arrangements with banks for trade settlement.
	Prepare Trade Documents	Sellers, Buyers and Carriers prepare trade documents to clear customs, to get trade financing, and to settle the final payment. Required documents include commercial invoice, bill of lading, packing list, and certificate of origin, shippers export declaration, certificate of inspection and import/export license.
	Clearing the Exporting Country Customs (from the Canadian perspective)	Seller makes sure that all export products are classified correctly; all trade compliance documents are complete and correct. Depending on the sale terms, Sellers, Buyers, Freight Forwarders, or Customs Brokers clear export customs.
	Shipping the Products	Carriers move the products internationally and provide shippers with track and trace information.
	Clearing the importing Country Customs (from the Canadian perspective)	Depending on the sales terms, Buyer (most likely) or Seller makes sure that all import products are classified correctly, all trade compliance documents are complete and correct and then clears customs.
Global Settlement	Documentary Credit Management	In the case of wire transfer, Buyer wires the money to Seller. In the case of documentary settlement, Seller gathers all the required trade documents and sends to the negotiating bank to get paid.
	Financing and Settlement	Buyer instructs its bank to pay Seller. Seller can get advanced financing using letters of credit.

Source: Based on Stephens Inc. eGlobal Logistics, The Engine Powering Globalization, Internet Research Industry Report, November 2000. (Table prepared by author)

(i.e., global logistics) and (3) settling the transaction financially (i.e., global settlement)⁷⁶. Under each step, the shipper (i.e., the seller), the shipping line and/or the buyer have numerous global logistics *processes* to adhere to.

Processes related to, or that are carried out by, PoV stakeholders are highlighted in bold font and include arranging international shipping (particularly sourcing PoV suppliers), shipping the products (covers PoV inter-modal services and transactions) and clearing customs.

The balance of this Chapter focuses on these PoV related processes. Specifically, Subsections 5.2 through 5.6 explain PoV transaction processing problems in approximately the order that they are encountered as the vessel and cargo flow through the Port.

In some cases, (e.g., sourcing local services and track and trace), problems are from the customer's (shipper's or shipping line's) perspective. In other cases, (e.g., pre-arrival notices and empty repositioning), problems are mainly from the supplier's perspective.

While some of the problems relate to all cargo sectors, the focus is on container vessels due to the rapid growth and emerging information flow problems related to this sector. Approaches used to identify key processing problems include: (1) it was determined whether inadequate use of information systems was a root cause of existing operational problems or customer complaints and (2) individuals considered to be domain experts were consulted.

5.2 Sourcing

Sourcing a supplier is usually initiated through some sort of service directory. A service directory is like an online "yellow pages". Discussed more fully in Chapter 6, industry research indicates that basic directories include supplier service descriptions, coordinates and electronic

⁷⁶ Lara Sowinski, "Supply Chain Management and Logistics Software", World Trade Magazine, 2 January 2001
<http://www.worldtrademag.com/CDA/ArticleInformation/features/BNP__Features__Item/0,3483,18747,0.html>

links to suppliers. Advanced directory functions allow customers to sort and compare supplier data and to build and compare route itineraries based on customer-selected criteria (e.g., day of the week, time of day, etc.). In addition, advanced directories allow customers to “click thru” to products or services that complement the customer’s initial selection.

There are three PoV online directories that intend to offer comprehensive coverage of PoV services, namely: (1) the VPA’s portvancouver.com site (under the Shipping & Trade section) (2) ShipNet⁷⁷, and (3) the B.C. Chamber of Shipping’s⁷⁸ (CSBC) shipping directory.

Portvancouver.com provides descriptive information and electronic links to select PoV stakeholders including ShipNet. ShipNet lists (and/or provides links to) over 600 shipping related businesses in BC. However, some suppliers are not adequately covered (e.g., only 19 truck carriers are listed).

The CSBC’s online service directory allows customers to obtain supplier coordinates by searching on category (39 choices), city name (54 choices), and/or descriptive words. While the site allows suppliers to update their coordinates, service descriptions are incomplete.

Customers cannot obtain comprehensive supplier information from any of the above-mentioned sites. Customers have to navigate several sites and make several phone calls to cobble together pertinent information. This can be frustrating for the customer and suppliers may lose business simply because customers are unaware of their capabilities or comparative advantages. In addition, none of the sites offer the advanced sourcing functions mentioned above.

⁷⁷ ShipNet, 15 July 2005 <http://www.shipnet.com/links.html>

⁷⁸ Chamber of Shipping of British Columbia (CSBC) is a not-for-profit membership organization, representing the interests the deep sea, commercial shipping on the West Coast of Canada. Given that only a small number of deep sea commercial interests maintain head offices in Western Canada, the majority of these interests are represented in CSBC by their local agents. Their secretariat office, located in Vancouver, has a permanent staff of approximately 15. CSBC's main activities are those of providing a forum within which common interests and concerns can be discussed and, where necessary, resolved. In this capacity, CSBC represents the interests of its membership at all levels of government.

There has been no attempt to rationalize or integrate these directories or to provide customers with a single authoritative PoV Web site (or at least the appearance of single site) to facilitate “one window shopping.” In sum, customers cannot visit a central Web site to:

- Identify all PoV marine, landside and logistics service suppliers
- Obtain consistent, detailed service descriptions for each supplier
- Organize data online to facilitate supplier service comparisons. For example, for ocean carriers such information could include the foreign ports that are served by the carrier, transit times and frequency of service. For rail service the comparative report could indicate the direct and connecting rail carriers, the location of major interchange points, inland destinations for direct service and transit times.
- Be automatically prompted to view complementary services or to be provided with coordinates of services and suppliers that complement the user’s initial service selection. For example, when selecting a particular service, the directory might also show insurance companies that provide coverage for that category of service
- Get answers to frequently asked questions. For example: “Which local trucking companies are authorized to carry hazardous commodity X?”
- Build and compare route itineraries, including inter-modal options.
- Prepare and “push” an electronic message to one or more selected suppliers to contact them or to initiate the sales order.

Table 15 compares the sourcing functions covered by Vancouver, Seattle and Tacoma port Web sites. Web sites are ranked on the basis of *breadth, depth, and functionality*.⁷⁹

The port of Tacoma web site is rated higher as it contains more information on the landside services i.e. trucking companies, stevedoring, warehousing and broker/forwarders as well as rail schedules. Both Seattle and Tacoma have ship schedules published and Seattle provides a web cam view of the truck holding lanes.

⁷⁹ *Breadth* refers to the number and scope of logistics suppliers covered by the Web site (i.e. shipping lines, marine services, land side inter-modal services, and supporting logistics services). For each supplier, the *depth* of information can range from a simple listing to detailed service information and whether there is some form of electronic link to the supplier. The level of *functionality* reflects several factors including the accuracy and currency of data, access security features and how well the site allows customers to create custom reports (e.g. terminal information is detailed and can be organized to enable the client to quickly compare the operating capabilities of each terminal; information on land transportation suppliers can be organized to compare service characteristics such as destinations or transit times; etc.).

At the moment, none of the Web sites provide detailed service information to guide selection to any great degree or the ability to organize data in a comparative format. None of the Web sites allow customers to build inter-modal route itineraries although Seattle and Tacoma offers some tracking functionality.

Table 15: Comparative Port Sourcing Information & Functionality

Sourcing Functionality Comparison			
Information / Functionality	Numbers represent rank, lower numbers indicate superior functionality		
	portvancouver.com	portseattle.org	portoftacoma.com
Enable shippers to identify port services			
Marine	3	2	1
Terminal	2	1	2
Land transportation options	3	3	1
Complementary services	3	3	1
Score for Identification	11	9	5
Enable shippers to obtain relevant service information for selection			
Shipping lines	No information	List of lines, schedules, contact details & links	List of lines, schedules and links
Terminals	Basic information	Basic information	Basic information
Railways	On-dock yard information only	On-dock yard information only & links	Train schedule
Trucking companies	No information	No information	Searchable list
Supply Chain (door to door)	No information	No information	No information
Enable shippers to conduct online transactions with port suppliers			
Shipping lines	Not available	Via web links	Via web links
Terminals	Not available	Billing application	Not available
Land transport	Not available	Not available	Not available
Ability to assess current situation at the port (Container Status or Track and Trace)			
All (ship portion, terminal, rail, truck)	Not available	Tracking via web links to the shipping lines and gate cars links	Tracking via web links to the shipping lines. Planned and actual train arrival times

Source: Based on information obtained from respective port web sites. (Table prepared by author)

The Port of Seattle appears to have recognized the need for improved community based technology. It has licensed PortNet™ software from the Port of Singapore Authority (PSA) and is seeking to enhance its sourcing capabilities by providing shippers with the tools that allow

them to identify and contact suppliers, order services and track the status of cargo movements through the Seattle gateway.

Perhaps more relevant is the Port of Seattle's attempt to break down the longstanding silos in their port community. Powerful forces (e.g., competition, disparate objectives and priorities, etc.), reinforce existing community silos. The difficulty of breaking silos and implementing processes that reinforce business and systems integration across the community should not be trivialized.

Hence, Seattle appears to have has two challenges, namely: (1) successfully implement a complex systems project and (2) breakdown legacy silos. Both challenges will be tough to overcome. Information technology industry surveys indicate that systems initiatives fail 40% - 70% of the time⁸⁰. If the Port of Seattle succeeds they will gain community momentum⁸¹ and an advantage over the PoV.

This advantage reflects one of the premises stated in the Introduction to this paper. That is, it is proposed that the successful Port communities of this decade will be the ones that embrace the idea of an integrated supply chain and collaborate in the use of digital tools to reinvent the way they interrelate. The PoV has not initiated such a voluntary program and would be left in a position of catch-up if it chooses not to adopt a similar strategy.

5.3 Advance Notices

An advance notice refers to the systemic collection and electronic reporting of pertinent vessel and container information to relevant PoV suppliers prior to the ship's arrival. Advanced *vessel* information includes identification, agent coordinates, speed, location and expected time of

⁸⁰ IT Cortex, Failure Rate, Statistics over IT Projects Failure Rate, (1995 – 2001) <http://www.it-cortex.com/Stat_Failure_Rate.htm>

⁸¹ Jim Collins author of the book Good to Great refers to this as the “fly wheel” affect.

arrival (ETA) at specified intermediate points and the terminal berth. Advanced *container* information includes container identification, rail-handling instructions, stuffing/de-stuffing instructions and final destination coordinates.

Virtually every supply chain supplier depends on knowing the vessel ETA at various locations, primarily the pilot station and the berth, to plan resource assignments and thus expedite the ship's time in port. Suppliers extrapolate events based on that ETA taking into account many other factors including cargo readiness, berth and labour availability, etc.

The required advance notice period varies depending on the service provider. For example, railways need rail handling instructions some 96 hours in advance to effectively position equipment and to avoid costly switching costs. Daily equipment assignments and labour dispatch for other suppliers, (e.g., trucking companies), turn on a shorter, more flexible cycle. Consequently, the advance notice period for these suppliers is shorter than for the railways.

5.3.1 Vessel Notices

Historically, the Department of Fisheries and Ocean's⁸² (DFO) Vessel Traffic Operations Support System (VTOSS) has been the primary source of advance notice vessel data (up to 96 hours). VTOSS consists of field equipment and technologies for vessel detection, identification, data gathering, radar data processing and position location tracking. Vessel positions are acquired from mandatory vessel call-ins, radar plots (coverage includes the Straits of Juan de

⁸² The DFO owns the system and the Canada Coast Guard (CCG) operates the system. References to DFO or CCG are interchangeable in this paper.

Fuca and the waters immediately around Vancouver), automated identification system (AIS)⁸³ feeds and dead reckoning algorithms built into VTOSS.

VTOSS' backend software modules⁸⁴ provide the temporal and spatial vessel displays necessary to regulate marine traffic for various communities, harbours and inlets located along the B.C. coast.

It is important to note that the DFO (or CCG) has no obligation (nor the resources) to develop custom interfaces or applications for PoV vessel service suppliers. However, subject to appropriate security clearances, the VTOSS supports various file transfer protocols and shares source VTOSS data with gateway stakeholders involved with agency services or commercial dispatch, including the VPA, the Pacific Pilotage Authority (PPA)⁸⁵ and the CSBC. In turn, these stakeholders have developed backend systems to support their respective operations and service offerings.

In 2003, the VPA launched a web site, pacificgatewayportal.com (PGP), to publish vessel related arrival and departure times including near real time updates. The site also hosts numerous other applications including PoV related news (sponsored and vetted by the CSBC), near real time measurements of the water depth and current speed under the 2nd Narrows Bridge and near real time Web cam shots of port activity. There is also a secure section of the site, unavailable to

⁸³ Automated Identification System (AIS) is a shipboard broadcast system that acts like a transponder, operating in the VHF maritime band, that is capable of handling well over 4,500 reports per minute and updates as often as every two seconds. It uses Self-Organizing Time Division Multiple Access (SOTDMA) technology to meet this high broadcast rate and ensure reliable ship-to-ship operation. For further information see <<http://www.navcen.uscg.gov/enav/ais/default.htm>>

⁸⁴ The Marine Communication and Traffic System Centres (MCTS) use the "Plotter Module" and the Regional Marine Information Centres use a module of like name (i.e., RMIC module).

⁸⁵ The PPA is a crown corporation managing pilot dispatch on the BC west coast. Any ship over 300 tonnes travelling Canadian waters requires a pilot. PPA receive some 12,000 requests per year. There are about 108 entrepreneur pilots (represented by the BC Coast Pilots) that subcontract their services to the PPA and another 8 employee pilots serving the Fraser River area.

the general public, which hosts Dangerous Goods (DG)⁸⁶ applications/notifications, truck licensing, port security access pass and other specific use applications.

Site registration is free and customers can navigate several areas of the site without charge or special access privileges. Currently, the site has over 2500 unique registered users (this excludes the more than 22,000 security card pass holders) with vessel information a frequently visited part of the site (accounts for some 16% of site requests). The pacificgatewayportal.com site employs some of the latest systems security, development and communications standards and is a suitable platform to host the new applications proposed in Chapter 6.

As discussed in Chapter 1, given the VPA's guarded interest in operating front line services, the PGP site and related applications are hosted on dedicated hardware. PGP is not integrated with the VPA's production environment and, if necessary, can be outsourced.

Based on interviews conducted for this paper, advance vessel notice reporting problems are described as follows.

The PPA has requested that PGP's vessel estimated time of arrival (ETA) function be enhanced to report arrivals in a format that better suits the PPA's needs. Specifically the PPA would like the ability to sort and track vessel ETAs by the following time intervals: 96 hours or greater, 72 – 96 hours, 48 – 71 hours, 24 – 47 hours, etc. This would provide the PPA with more flexibility in organizing pilot assignments and calling pilots to duty. For example, this format will allow PPA dispatch to identify peak demand periods earlier thus providing dispatch with a greater window of opportunity to call pilots off their rest days or take other actions to avoid vessel delay.

⁸⁶ Definition and list of dangerous goods is available in the *Transportation of Dangerous Goods Act*.

Service providers, including the PPA and some shippers (i.e., the Bay and WalMart), have asked for custom alerts or triggers. These stakeholders would like to have an alert function that tracks customer specified vessels and that automatically generates and forwards an email or cell phone message advising that a specified event has occurred (e.g., when selected vessels are within a certain ETA interval or a specified vessel is within x hours of departure). Some stakeholders have suggested a fairly sophisticated alert function (i.e., one that changes the frequency of alerts the closer to the actual time of arrival or departure).

Alerts save suppliers time and money. For example, alerts would allow PPA dispatch to minimize pilot dwell time. Pilots can only be on duty for 8 hours after which time overtime penalties occur and another pilot must be called.

Finally, TSI has asked for the capability to sort vessel arrival/departure information by terminal. Understandably, TSI is only interested in vessel arrival/departure information for their terminals (i.e., Deltaport and Vanterm).

5.3.2 Container Notices

Providing relevant service suppliers (e.g. railways, labour, off dock terminals, etc.) with pre-arrival container data allows them to develop better demand forecasts and thus the opportunity to manage resources more effectively and to improve service quality. For example, CN advises that systemic, electronic reporting of pre-arrival container notices from all shipping lines, by terminal, would result in better rail car utilization.

Marco/Delco⁸⁷ would be able to better forecast the number of containers by customer that will be entering the PoV and therefore be able to better predict the number of containers that will be brought into their depots and to adjust resources accordingly.

⁸⁷ Marco/Delco provides off dock empty storage and specialty container services (e.g. cleaning and sterilization, repairing damaged containers, customizing containers for specialty loads, etc.).

Currently, there is no systemic, accurate, centralized Web based source for pre-arrival container data (by type, by terminal, by carrier, by final destination) including special handling requirements. Canada Customs could be considered a single source but historically, Customs has not collected all of the instructions and data required by PoV suppliers.

The on-dock terminals (Deltaport, Vanterm, Centerm) have longstanding electronic data interchange (EDI) relationships with the shipping lines and therefore, are the second most centralized data source. Assuming the terminals have all pertinent data, implementing a standardized file transfer protocol and leveraging the terminal's respective data parsing and cleansing efforts would be significantly less costly than entering into a separate agreement with each of the 20 container shipping lines calling the PoV.

Unfortunately, TSI representatives advise that timeliness, completeness, and accuracy problems undermine the effectiveness of this source. Data transmissions usually do not have the rail instructions. In fact, only two of the shipping lines calling TSI terminals send rail instructions with their original EDI transmissions. The terminal manually enters rail instructions for other shipping lines as well as downstream changes prior to and upon vessel arrival. Overall, TSI estimates that pre-arrival rail instructions are incomplete or erroneous approximately 50% of the time. Consequently, without significant improvements, pre-arrival container data sourced from the on-dock terminals is inadequate for CN and Marco/Delco requirements.

5.4 Vessel Related Transactions

5.4.1 Introduction

Historically, relevant PoV marine suppliers and service agencies have been relatively unsuccessful in pooling their requirements and resources to implement a centralized system that allows customers to pick the vessel services required, complete the necessary transactions and, as negotiated, settle their account.

One of the reasons for this slow adoption is that ship agents and their local association, the CSBC, closely guard control of the interaction between the shipping lines and marine service suppliers. Most agents appear to have a deep rooted fear that the introduction of Web based tools will allow the shipping lines to deal directly with suppliers. From some agent's perspective, there is no good outcome. Under the worst-case scenario, the agent will become an unnecessary middleman; under the best-case scenario, the agent will be faced with a more competitive environment.

Investigating this job security issue and proposing new value added agent services is out of scope for this paper. However, it is understood that this is a critical risk and it will have to be reckoned with prior to implementing such applications as online marine service ordering.

A container vessel cannot enter or leave the PoV without completing two mandatory, high volume transactions, namely: (1) completing DG applications⁸⁸ and (2) ordering pilot services⁸⁹. Hence, these are the transaction types covered by this paper. In addition, these are standardized, commodity type transactions and are therefore excellent candidates for systemization.

Another high frequency transaction relates to ordering tug services⁹⁰. However, tug ordering is not directly covered in this paper on the basis that the PPA has confirmed that the source data required for managing pilot and tug dispatch is virtually the same and that the ordering process is similar. Therefore, it is assumed that pilot and tug ordering problems and solutions will be similar.

⁸⁸ In 2004, container ships entering the PoV accounted for 93% (16,709 / 18,044) of the total DG applications. Vancouver Port Authority, "PortViewTM database", (Vancouver: Vancouver Port Authority 2005).

⁸⁹ According to Bruce Chadwick (PPA), in 2004, there were about 12,000 pilot dispatches.

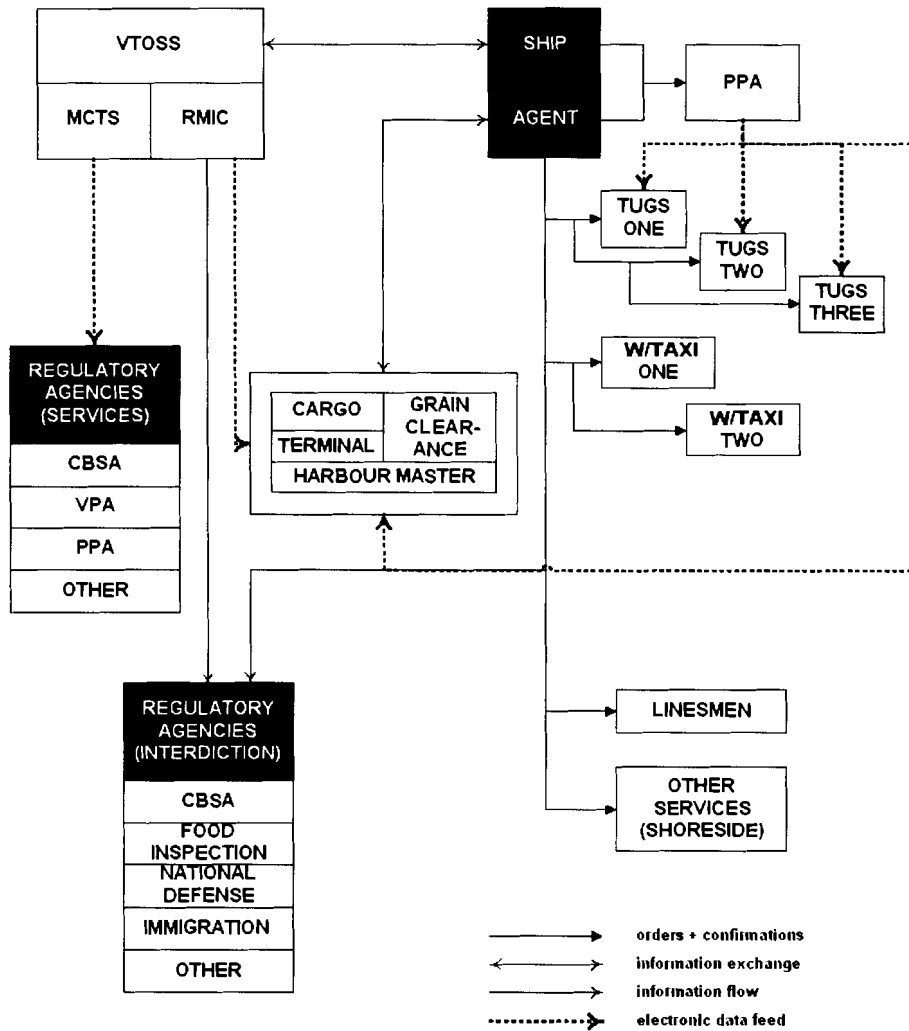
⁹⁰ There are three tug companies servicing the B.C. coast and Vancouver's inner harbour, namely: Cates, Seaspan and RivTow. In all cases, the tug companies rely on PPA for source tug dispatch data.

The similarity between pilot and tug order processes is not happen chance, it is a product of history. This legacy reflects Cates' historic monopoly in Vancouver harbour and the fact that Cates had a PPA data feed long before its monopoly was broken. Cates based its dispatch system on the PPA system and the PPA's electronic data feed is essential for it to function⁹¹. The introduction of Seaspan and Rivtow operations meant that the PPA had little option but to give the two new operators equivalent access.

Figure 7 illustrates the primary flow of data, orders and information with respect to a vessel call as it relates to maritime services and various government agencies.

⁹¹ Jonathon Seymour & Associates Inc., Port of Vancouver Centralized Dispatch Study, (report prepared for the VPA) (Vancouver: 31 December 1998): 8.

Figure 7: Vessel Related Information Flow



Source: Based on information contained in the VPA's Port of Vancouver Centralized Dispatch Study and Canada Coast Guard's VTOSS Technical Documentation. (Figure prepared by author)

The use and monitoring of VHF radio traffic is not included in the diagram, although it is the key to vessel movements on the coast including berthing and un-berthing. In effect, VHF traffic implements, and reports upon, the water side plans that were generated by the relevant information flows and exchanges and by the placement of orders by the ship's agent.

Other less frequent vessel transactions relate to anchoring⁹², fuelling, hot works (i.e., welding), water taxis, and various other marine services. Typically, container ships are piloted directly to a terminal berth and therefore do not need to order an anchorage or water taxi. Even under the current high volume period container ships seldom have to wait for an unoccupied terminal berth. From January to June 2005 of 327 total container vessel calls to the PoV, only 34, or approximately 10%, requested an anchorage⁹³.

Intuitively, it would be hard to justify the cost of developing and maintaining a system for low frequency transactions, especially if these transactions are not standardized. Hence, less frequent transactions are not discussed further in this paper. However, it is recognized that it may be cost effective to enhance or modify the software developed, (or licensed), for high frequency transactions to support low frequency transactions. Therefore, the online service specifications for high frequency transactions should be designed to be as flexible as possible to accommodate the future addition of low frequency transactions.

Also, it is logical that quasi-government agencies consolidate their respective billing functions and issue a single invoice for their respective fees to the shipping lines ((i.e., PPA (pilot fees), VPA (vessel tariff fees) and CSBC (CCG service recovery fee)). It would be fairly straightforward and cost effective to implement a secure eCommerce solution. However, due to the agent concerns mentioned above, eCommerce is likely to be highly sensitive. Promoting implementation at the outset of the supply chain program advocated in this paper, would likely slow, if not scuttle moving forward with the marine/vessel services portion of the program.

⁹² For completeness, the VPA has a Web based anchorage system but to date this system has not been made available to external customers (mainly used by bulk, break bulk and liquid bulk sectors). Shipping lines (or agents) phone their requests to the VPA Harbour Master who manually enters pertinent data. Downstream confirmations and notifications (i.e. assignments and reassignments) to agents, the DFO (MTCS) and the PPA require more phone calls and manual intervention. Consequently, requests and notices are not handled as efficiently as possible. Pursuant to VPA system security standards, it would not be difficult to expose the VPA's system to external customers.

⁹³ Vancouver Port Authority, "PortView™ database", (Vancouver: Vancouver Port Authority 2005).

Hence, for this paper, it is assumed that if the community agrees to centralize online vessel service orders, relevant billing data will be transferred to the respective party's backend invoicing system. The core system should be designed to minimize the cost of adding eCommerce functionality at a future date.

5.4.2 Dangerous Goods

Circa 2000, in collaboration with the CCG and the Marine Chemical Emergency Response Steering Committee (MCER)⁹⁴, the VPA developed a Web based system that allows container vessels using the PoV to declare the dangerous goods that they intend on unloading (in the case of imports) or loading (in the case of exports). The system is equipped with drop down tables and other functions to simplify data entry and eliminate errors.

Once mandatory fields are complete, the system automatically performs a number of verifications and either approves the request, asks the shipping line for more information or forwards the request to the VPA's Harbour Master department for manual review and approval.

Over 90% of the requests are automatically approved with electronic notifications issued to relevant downstream stakeholders (i.e., the on-dock terminals and incident response and interdiction agencies). Applications forwarded to the Harbour Master primarily relate to extremely dangerous products (e.g., dynamite or products containing radioactive material).

The main problem with the DG application is that it is incomplete; the system's incident response functions were never implemented. If implemented, incident response functions would provide the relevant agencies with real time online access to critical incident details including

⁹⁴ In the mid '90s, based on the "Brander – Smith" report, national consultations resulted in the formation of regional groups to develop a system for response to marine incidents involving chemical materials. On Canada's West Coast, with the support of CCG, a work group was formed to develop a system that could be applied in all of Canada's marine areas. This group, made up of representatives of government agencies, associations, shippers and marine carriers became known as the "Marine Chemical Emergency Response Steering Committee". For more see <<http://www.pacific.ccg-gcc.gc.ca/er/hazmat/pdf>>

vessel location and orientation, all onboard dangerous goods, dangerous goods location (i.e. stowage plans), water depth at the incident site and handling instructions.

5.4.3 Online Service Ordering

There does not appear to be a single PoV vessel service supplier that provides a shipping line or its agent with the tools to order services online. This is not particularly surprising in that online ordering logically follows the sourcing activities covered in Section 5.2. Since sourcing is not particularly well supported by information technology, it is not surprising that online service ordering does not exist.

The shipping lines (or agents) do not have the benefit of a central Web site with tools to order required vessel services, to receive supplier confirmation, to manage change orders and to confirm service dispatch status. Consequently, service ordering is labour intensive, requiring several phone calls, faxes, and follow-ups as customer requirements or supplier availability changes.

As mentioned above, PPA pilot ordering is used as a benchmark. There are nine PPA dispatchers taking orders from agents and calling the pilots. In accepting an order, the dispatcher must authenticate the agent/shipping line relationship and confirm credit worthiness and payment details.

In addition, dispatchers take note of special requests and instructions. The current process for scribing instructions is unstructured; there is no systemic, electronic capture of special requests or instructions. Hence, similar downstream instructions and requests have to be entered from scratch.

Dispatchers enter pertinent order and invoicing information into the PPA's AS400 backend invoicing system. The dispatcher will be provided with a confirmation number or error message and will notify the shipping line's agent accordingly.

Downstream change orders require dispatcher/agent manual intervention with the dispatcher having to key change order data into the AS400 system.

Currently, AS400 reporting capability is deficient. The PPA have indicated that they require two types of reporting, namely: (1) a near real time log that indicates the number of orders submitted, number approved, by time period (i.e. 00:01 to 06:00, 06:01 to 12:00, 12:01 – 18:00, and 18:01 – 24:00) and (2) historic reports (e.g. number of requests by agent and number of change orders by agent).

5.4.4 Tombstone Data

Centralized information processing would have other information processing benefits. For example, each community stakeholder involved with vessel tracking, dangerous goods, service ordering and/or anchorages requires a significant amount of vessel related tombstone data.⁹⁵ Currently each stakeholder sources tombstone data and maintains separate databases or worksheets resulting in a duplicate efforts and wasted resources. These redundant efforts would be avoided under a centralized approach.

⁹⁵ Data related to vessel specifications includes vessel name, call sign, IMO number, vessel type, flag, ex-name, length, breadth, max. draft, arrival draft, summer draft, GRT, NRT, deadweight tonnage, crew/passenger information, year built, certificate & date of registry, # of holds, engine characteristics, bow thruster info. and gear); vessel contact information includes owner, operator, name of vessel master, vessel telex, vessel inmarsat, agent details, lead insurer, and spill response contact); and vessel certificate expiry dates for safety equipment, radio inspection, etc.

5.5 Landside Transactions

Key stakeholders handling the container from the terminal to final destination include the stevedoring companies, the railways and the trucking companies. In 2004, 69% of import containers and 37% of those for export were moved by rail; the balance by truck. In total, the balance of containers handled by inter-modal rail vs. truck is about 60% / 40%.⁹⁶

While stevedoring companies, railways and trucking companies are the most common landside suppliers it is worth mentioning that there are over 20 off-dock facilities located within a 20 minute drive of any of the PoV's on-dock container terminals⁹⁷ Off-dock facilities relate to empty storage, freight forwarder operations, cold storage and repair services.

Movement coordination is complex and an enormous amount of information is exchanged between stakeholders. Salient problems related to landside container logistics are as follows.

5.5.1 Container Status Information

Typical status information includes a bill of lading release⁹⁸ and an import container release.⁹⁹ For the shipping line, status information is important for managing customer delivery commitments and their container inventory. For local suppliers, accurate, near real time container status is important for expediting releases and scheduling pickup and/or delivery (i.e., one supply

⁹⁶ Vancouver Port Authority, Port CEO Calls for Facilitator to be Appointed in Truck Dispute, Press Release, 27 June 2005.

⁹⁷ NovaCorp International and JWD Group, Greater Vancouver Short Sea Container Shipping Study, (report prepared for the VPA) (Vancouver: 31 January 2005): 31.

⁹⁸ The bill of lading release includes advance notice #, bill #, container #, shipping line name and release date, carrier(s) release to, demurrage charges covered, customs clearance status (Y/N), hold conditions and release party code and name.

⁹⁹ The import release includes similar information to the B/L release as well as special instructions and container specifications.

chain participant will not release the container to the next participant until the shipping line has issued a release).

Some terminals (e.g., Deltaport, Vanterm, Centerm, Fraser Surrey Docks and Marco/Delco) and government agents (e.g., Customs) provide online container status information to customers with the appropriate access privilege. Data availability and formats for each supplier are different. None of these sites are integrated. There is no electronic file exchange between suppliers or customers and hence, as necessary, stakeholders re-key data into their respective backend systems, which is inefficient and prone to data entry errors. None of the sites offer trigger or alert functionality.

In addition, online status information is often incomplete. For example, a CN assigned container may be cleared by Customs but instructions concerning the need for container repairs are missing¹⁰⁰. It is very costly and therefore unacceptable for CN to load the container requiring repairs onto a railcar and then receive a downstream instruction to switch off the railcar carrying the rogue container. At other times, Custom's or other interdiction agency notices are incomplete or not timely (e.g., expected release dates from inspection are not provided and, once inspected and cleared, notices are not promptly made available).

Furthermore, some suppliers do not have the technologies or resources to provide online status service. A centralized, standardized system for capturing and displaying status information would provide these suppliers with a convenient means to enter relevant data while eliminating the need to respond to telephone inquiries.

Stakeholders requiring status information typically log onto several Web sites and navigate various display formats and/or they call the terminal. There has been no attempt to inventory and rationalize container status data and exchange requirements for PoV stakeholders.

¹⁰⁰ Conversation with Marie Therese Houde, CN (Vancouver: 6 June 2005)

5.5.2 Electronic Delivery Orders (EDO)

As mentioned above, trucking companies currently pickup and deliver some 40% of the total container traffic passing through the PoV. Typically, the truck order process consists of four steps:

- Customers (i.e. shipping lines, agents and freight forwarders) shop the market and nominate a trucking company.
- The trucking company accepts or rejects the nomination depending on such factors as price and equipment/driver availability and advises the customer.
- The customer acknowledges acceptance and advises the terminal of the nomination.
- For imports, the trucking company queries the terminal to confirm the status of the container(s) scheduled for pick up. For empty returns, the trucking company queries the terminal to determine how many containers are still needed.

Local trucking companies primarily serve the PoV. Unlike the long haul carriers, most local companies are relatively small and have not invested in information systems. Consequently, communications and information exchange between most trucking companies and their customers is labour intensive. Some pickup/delivery orders are transmitted online as email attachments but most bookings are sent by fax. Trucking company acceptances and downstream agent notices to the terminal are done by phone or fax.

There is no centralized Web based system to support the one to many and many to one transactions related to the EDO process. The predominantly manual information exchange and re-keying of data is inefficient and prone to data entry errors.

U.S. West Coast ports report that trucking companies presenting incorrect information on their respective booking documents (such as wrong bill of lading number or container number)

cause approximately 30% of the congestion at terminal entry gates¹⁰¹. Hence, a systemic online approach would improve transaction velocity, reduce booking errors and reduce gate congestion.

5.5.3 Empty Repositioning

Another problem undermining the efficiency and effectiveness of the EDO process relates to communications of the shipping line's empty repositioning instructions.

U.S. and Canadian demand for Asian imports coupled with strong Asian demand for local resources has caused shipping lines to become more diligent and rigorous in managing empty return container movements. Examples of the types of situations that increase the frequency of shipping line empty reposition requests are as follows.

- Shipping lines (i.e., NYK, P&O, Hapag Lloyd) that call both Vanterm and Deltaport must insure that they have the right amount of empty containers in close proximity to both terminals to best serve their customers. Reposition instructions to shuttle empties between the two terminals change frequently to meet customer demands.
- On the other hand, the on-dock terminals have limited empty container storage capacity and at times have no choice but to restrict the number of empties brought onsite until some are removed. This has been a particular issue with Evergreen who frequently changes its reposition instructions in response to a terminal directive.
- Some lines (e.g., Hyundai) have a requirement for a certain number of empty containers to be available at container stuffing/de-stuffing facilities (e.g., Coast Terminals or Westnav).
- Finally, when lines find that they need more empties in Asia, they will redirect empties from the off dock terminals to the on dock terminals until the Asia demand is satisfied at which time they will change their reposition list instructions.

The problem is that there is no centralized system for the shipping lines to post and maintain their respective reposition instructions. Frequent instruction changes and miscommunication between trucking companies, on-dock and off-dock terminals causes

¹⁰¹ John Cushing, Using Information Technology To Reduce Congestion And Optimize Operations, (presentation and discussion at the AAPA Port Operations and Information Technology Seminar, Chicago Illinois: 28 April 2005)
< http://www.aapa-ports.org/programs/seminar_presentations/05_OpsIT/Cushing_John.pdf>

unnecessary truck movements, arguments over who has the right instructions and unnecessary effort reconfirming instructions with the shipping lines.

5.5.4 Gate Reservations

Once the truck orders and container releases have been dealt with, the trucking company coordinates pickup or delivery times with the relevant terminals. Each on-dock terminal operator has implemented an online reservation system to better distribute truck arrivals throughout the day, to enhance terminal staging operations and to reduce gate congestion.

Trucking companies are required to learn several different systems (screen formats and appointment steps). Each day, *new* reservations can only be made at a specific time. Typically, the trucking company will have one or more employees log into each system at the specified time and reserve time slots to their assigned limit as fast as possible. Regardless of equipment or driver availability, there is a tendency to overbook and then release reservations if they cannot be met. Released reservations are open for other trucking companies nominated by the shipping line and can be rebooked any time during the day.

Each terminal did not coordinate or integrate their respective reservation programs with downstream suppliers. Consequently, this disparate approach has partially resolved one supply chain problem (i.e., gate congestion) but has created new problems. For example, shifting terminal pickups to late in the working day is of nominal overall supply chain value unless downstream suppliers agree to extend their working hours.

A supply chain system approach may have prevented this sub-optimisation in that the supply chain planning process requires suppliers to share their respective plans with a view to enhancing the operating integrity of the overall supply chain not diminishing it.

Generally, off dock terminals and service providers do not have reservation systems and hence can experience lengthy gate wait times, congestion and increased delivery time for customers. For example, CN have indicated that in addition to local traffic they can experience significant arrivals at their Vancouver Inter-modal Terminal (VIT) from the U.S. Some days 30 to 40 trucks from the same company arrive resulting in unacceptably long queues¹⁰². During seasonal periods (e.g. Christmas) demand peaks are even more extreme.

CN's goal is to provide a consistent one-hour turn around service by reducing the queuing time outside of the check-in gate and increasing the number of containers loaded directly from the truck to train and vice versa. A reservation system would help to accomplish this goal.

5.5.5 Track and Trace

Shippers and PoV stakeholders are increasingly concerned with container visibility as it moves through the PoV supply chain. End-to-end track and trace has three key benefits, namely: (1) it enhances customer service by allowing them to monitor delivery progress without having to make numerous, sometimes conflicting, phone calls, (2) it allows logistic partners to better plan their respective resource assignments and (3) it generates data that is valuable for measuring supply chain performance.

Most of the larger stakeholders (e.g., shipping lines and the railways) have some sort of track and trace system. In some cases, this information is available through the respective company's Web site or through some other form of dial-in service. Information detail and timeliness varies between companies. These systems are not integrated. It is understood that none of the sites have the capability of pushing an alert to a customer or downstream supplier when a specified event has occurred. Typically, smaller PoV suppliers do not have an online track and trace system.

¹⁰² Conversation with Glen Randall, CN (Vancouver)

Obtaining accurate, decisive track and trace information for a container within the PoV is difficult. Stakeholders have to visit several sites and make numerous phone calls to confirm the location of a container and its expected time of release, departure and arrival at pertinent downstream milestones. Consequently, shippers and suppliers view the PoV track and trace experience as fragmented, incomplete and frustrating.

5.6 Supply Chain Performance Measurement

A fundamental governance and audit requirement¹⁰³ is identifying, monitoring and reporting key performance indicators (KPIs) of supply chain operating performance. Given the critical importance of supply chain velocity, it is quite astonishing that there has been no attempt to define relevant KPIs and to systemically measure near real time performance against acceptable operating benchmarks.

Lack of supply chain measurement undermines the VPA's ability to achieve one of its objectives, operational excellence. The cliché "you can't manage what you are not measuring" applies. Lack of performance data makes it more difficult and time consuming to diagnose root problems and the stakeholder(s) primarily responsible for fixing the problem. Transparency and accountability is compromised. Customer service excellence is compromised.

Without KPI tracking, relevant parties have no way of systemically identifying when performance is being "threatened". Consequently, the VPA and relevant stakeholders often react to problems as opposed to identifying a deteriorating situation and taking preventative action.

¹⁰³ For example, the IT Governance Institute & the IS Audit & Control Association standards, Control Objectives for Information & Related Technology (CobIT), provides monitoring and reporting standards and guidelines.

Typically, once a problem has reached a serious state, a domain expert is contracted to gather pertinent data, identify solutions and provide recommendations¹⁰⁴. In addition to being reactive, recommendations based on this approach could be based on a small sample size. The sample may not be statistically significant; the sample may not identify seasonality or other longer-term patterns in the data. Hence, solutions recommended on the basis of this data may be incomplete.

Finally, lack of KPI tracking prevents 360-degree performance measurement. That is, while historic data improves the assessment and enhancement of operating practices, downstream measurement and trend analysis verifies whether enhancements actually delivered the intended result(s).

¹⁰⁴ For example, on July 1, 2005 the federal government announced that it would launch an inquiry into traffic issues at the PoV and recommend ways to solve longstanding problems facing drivers. For more see “Mediator in Vancouver port truckers strike”, Yahoo Canada News, 1 July 2005: 1
<http://news.yahoo.com/s/nm/20050701/wl_canada_nm/canada_transport_vancouver_strike_col>

5.7 Problems Summary

Table 16: Problems Summary

Increasing Supply Chain Transaction Velocity		
Functions	Processes	Industry Defined Problems
Sourcing	Services Directory	Incomplete coverage, fragmented sources, inconsistent descriptions, no online tools for comparing services, prompts, FAQs, alerts, etc.
	Route Finder	No online tools to develop routing itineraries, prompt suppliers or initiate order process.
Vessel Transactions	Advance Vessel Notices	System enhancements required: e.g. add customer-controlled sort function, add alerts, etc.
	DG Declarations	No incident response functions.
	Online Service Ordering	Labour intensive, no centralized platform to order marine services, receive confirmations and manage change orders.
Landside Logistics	Advance Container Notices	Required data incomplete.
	Terminal Container Status	Fragmented systems, limited online collaboration.
	Empty Repositioning	No central change management system.
	Truck Delivery Orders	Labour intensive, fragmented with fax, phone and radio inputs.
	Gate Reservations	Fragmented systems or no system; downstream commercial problems.
	Track & Trace	Fragmented and incomplete (unknown ETAs) with frequent phone follow-ups.
Reporting	Supply Chain Operating Performance	No systemic end-to-end measurement of PoV operating performance.
<i>Source: (Table prepared by author)</i>		

6 RECOMMENDED SYSTEM SOLUTIONS

6.1 Introduction

It is important that the search for software solutions for the problems raised in Chapter 5 be driven by the overarching objective to implement an integrated suite of applications. Meeting this objective requires an in-depth understanding of supply chain business processes, information flows and corresponding data requirements. The ideal architecture will be one of a centralized data base supporting front end customer service and reporting applications and backend transaction processing applications. This objective and architecture intentionally mirrors that of Enterprise Resource Planning (ERP) suites.

ERP suites have evolved specifically to support an increasingly complex business environment with functional departments requiring more and more inter-department data flow for decision making, timely and efficient procurement of products and services, management of inventory and distribution of goods and services. This increasingly complex inter-department data flow mirrors the increasingly complex flow of information between PoV stakeholders.

ERP software design facilitates transparent module integration, providing flow of information between all departments (or in the case of the PoV, between stakeholders) in a consistent, standardized manner. Computing with an ERP allows companies to implement a single integrated system by replacing or re-engineering mostly incompatible legacy information systems. This ERP approach should guide the PoV in architecting its supply chain system solutions.

However, this integrated ERP approach must be tempered by the realization that supply chain systems have not reached a high level of commercialisation or commoditisation, particularly on the landside. Typically, licensed products only cover specific functions and choices are limited.

In addition, PoV suppliers are not likely to abandon their legacy systems and investments (e.g., terminal reservation systems) for the greater good of the community. Consequently, the PoV will likely be faced with a solution that combines licensed and developed software. Under this scenario, it is critical that technical standards be established upfront and that the PoV adopt a “best of breed” approach.

6.2 Sourcing

A single Web site with normalized service descriptions and advanced directory functions would simplify the multi step sourcing process, show case PoV suppliers and mitigate the risk of the PoV falling further behind Seattle and Tacoma. This service is particularly important as the PoV, Seattle and Tacoma compete for business destined for the U.S. Mid West.

There is no “standard” best in class application for port directories; different ports have taken different approaches with varying degrees of breadth, depth and functionality. However, it is worthwhile to follow up with ports that have implemented more advanced directories to learn from their mistakes and to obtain advice on directory structure and content management (CM)¹⁰⁵.

Web sites that are worth further investigation and perhaps emulating are as follows: Port of Tacoma supports key word searches (i.e., “heavy haul”) to locate categories of service providers; the Port of Rotterdam has extensive electronic links with stakeholders, consistent service descriptions, and extensive coverage of land transport and supporting logistics suppliers;

¹⁰⁵ Content management is particularly important. Stale dated information is perceived to be, and often is, inaccurate and can be very damaging to the site owner’s image and credibility. Arguably, it may be better to have no site than to have one that is out of date.

and Port of Singapore's PortNet™ offers advanced features i.e. online maps and online service ordering.

Several ports have enriched their directories and reduced or eliminated their CM effort by entering into partnerships with independent firms with complementary directory information. For example, the Port of Seattle reduces its CM workload by collaborating with the Puget Sound Marine Exchange, while the Port of Rotterdam collaborates with Holland Transport for extensive, current trucking company coverage. The Port of Rotterdam's Port Index portal piggybacks on the efforts of the publisher of the Port of Rotterdam yearbook.

The PoV supply chain site should be designed to integrate service directory and route itinerary functions. That is, as a customer uses the service directory to search and select suppliers, the system should be designed such that relevant information for selected suppliers does not have to be re-keyed to run the route itinerary application.

Some third party logistics providers¹⁰⁶ (3PLs) offer online route itinerary type applications. For example, SchedNet¹⁰⁷ consolidates shipping schedules and provides a search format to identify scheduled service by origin and destination ports. This site is complete with respect to Asian - North American trade lanes. As another example, The Journal of Commerce (JOC)¹⁰⁸ offers a Web-based service (Cargo Search) that indicates the ETA for various shipping

¹⁰⁶ Third party logistics providers (3PLs) have emerged from traditional logistics intermediaries such as the freight forwarders. A standard definition of just what a third-party logistics provider is can vary from contract to contract. Generally, a 3PL can be defined as a company that sells multiple supply chain services that previously had been done within an organization on a contract basis. Activities that may be taken over include warehousing and inventory management.

¹⁰⁷ Launched in 1997, SchedNet is a vertical portal providing the most up-to-date shipping schedules and shipping information to shippers and forwarders worldwide. SchedNet is operated by the HKSG Group, the publisher of the Hong Kong Shipping Gazette for Hong Kong SAR and Mainland China, and Asian Shipper for Singapore, Malaysia and Indonesia. <<http://www.schednet.com/home/index.asp>>

¹⁰⁸ The Journal of Commerce Online is a valuable, interactive business tool providing site users with breaking news, analysis, sailing schedules, logistics tools, market data and links. <<http://www.joc.com/jocinformation/aboutthejoc.shtml>>

lines by market sector (i.e., container, bulk, and break bulk) to many ports around the world including B.C. ports. However, Cargo Search does not specify B.C. port destinations. All B.C. ports are simply referred to as “Vancouver”. Neither SchedNet nor Cargo Search allows customers to build door-to-door inter-modal itineraries, trip times or cost estimates.

The Port of Rotterdam also offers route itinerary type functions through its PortSailingList, PortTransport, and PortRail portals. PortSailingList is linked to a database of transport alternatives between Rotterdam and several trading partner locations in Europe and around the world. The searchable file offers the user service options based on a selected origin and destination (by continent, then country, then port), modality, equipment, ETA and estimated time of departure (ETD).

PortTransport provides inland transport alternatives, connections and trip time information. Inland modes include inland shipping, pipelines, rail, road and short-sea feeder connections.

PortRail offers in-depth information for rail transport options including an overview of the connections to destinations throughout Europe, timetables, scheduled works and recent developments.

6.3 Vessel Notices and Transactions

6.3.1 Introduction

Typically, vessel notice and vessel transaction applications (e.g., online service ordering) are modules of a much larger suite referred to as a Vessel Traffic Management Information System (VTMIS). Lockheed Martin defines a VTMIS as a system that provides a comprehensive solution for the marine transportation situation including resource planning, traffic safety,

environment protection and that improves the efficiency of port operations¹⁰⁹. The common goal of a VTMS is to enhance the safety of vessel movements and decrease vessel turnaround time.

Based on a review of the port of Rotterdam and Felixstowe VTMS suites, U.S. Marine Exchanges and studies prepared by the U.S. Coast Guard and the U.S. Coast Pilot it was determined that the most common VTMS functions are as follows: (1) Vessel Notices (2) Dangerous Goods, Hazmat and Marine Pollutants Management (3) Online Service Ordering (4) Reporting Services (includes stowage plans, marine publications, tides and currents charts) and (5) eCommerce.

The Los Angeles/Long Beach (LA/LB) Marine Exchange site provides a good VTMS benchmark. The LA/LB Marine Exchange continues to enhance their site, PortSource™, with the goal of providing port users and stakeholders with a single information source to enhance their operating efficiencies as well as providing advanced forecasting and planning tools to meet the demands of the double-digit growth being experienced in the LA/LB harbour complex.

When fully developed, it is anticipated that PortSource™ will include traffic information (ship, rail, truck); berth descriptions and availability; links to all major shipping lines, port authorities, service providers, and ground transportation; and interactive connectivity to pilots, tugs, line handlers, U.S. Coast Guard and others. PortSource™ will eventually include a worldwide ship tracking capability, environmental sensing through link-up with the Physical Oceanographic Real Time System (PORTS) and an advanced berthing information and management system.

As explained in Section 5.3.1, the core of the PoV's VTMS is DFO's VTOSS. Relevant service suppliers and agencies are provided with a data feed and have developed backend systems

¹⁰⁹ Stephen Ladd, *Advanced Technology in Vessel Traffic Management Information Systems*, Port Technology International, Edition 12: Section 3, Vessel Traffic Services, <<http://www.porttechnology.org/journals/ed12/pdfs/pt12-69.pdf>>

to support their respective operations. While the PoV's approach is not well integrated, relative to most other ports, the PoV has a good set of VTMS applications. It is important that PoV stakeholders continue to investigate and, where justified, implement enhancements to existing and new VTMS applications to maintain parity with competing U.S. ports. The Port of Seattle's PortNet™ pilot project includes advanced VTMS functions.

As discussed in Chapter 5, three areas requiring improvement are vessel notices, dangerous goods and online service ordering.

6.3.2 Vessel Notices

The vessel notice problems raised in Chapter 5 are not inherently difficult to resolve. The VPA has built sort and alert functions into many of its systems. For example, the technicians responsible for the operating integrity of the VPA's servers and network infrastructure already use monitoring and alert functionality. This knowledge and capability should make it relatively easy to add these functions to the PGP vessel notice system.

6.3.3 Dangerous Goods

To maximize system value, it is important that the existing DG system be enhanced to include incident response functions. However, previous VPA efforts to expand system coverage to other B.C. ports and to implement incident response functions have been hampered by the CCG's inability to obtain stakeholder buy-in. In addition, the CCG's has been reluctant to accept responsibility for downstream application support.

The CCG have been slow to accept these responsibilities due to changes taking place within the CCG¹¹⁰. Specifically, the CCG's role within the marine community and regulatory environment has been in a state of uncertainty and flux since 911. These reorganization issues

¹¹⁰ Conversation with CCG's Don Rodden.

have questioned the CCG's continued role in DG and consequently, have drained CCG resources away from the DG program. A new champion does not appear to be imminent.

Naturally, the VPA is reluctant to make additional DG commitments until the CCG enters into an agreement to takeover hosting and system support responsibilities including downstream warrants for system integrity and performance.

6.3.4 Online Service Ordering

The PPA has indicated a willingness to collaborate with the VPA to implement a "proof of concept" project. While application design will be based on a generic service order model, it must meet PPA requirements as follows.

Following user (i.e., customer) authentication¹¹¹, agents will be provided with Web based screens to enter pertinent data (i.e., some fourteen fields or types of information¹¹²) related to ordering pilots. The system will be designed to make the data entry task as easy as possible (e.g., data entry will be supported by tombstone data search utilities, drop down tables, etc.). As appropriate, the system will include rules to enforce data accuracy (e.g., the agent will get an error message if an essential field is incomplete or the data entered in a field does not meet PPA's data input standards).

The system will include a "special requests / instructions" message area. As appropriate, this messaging feature will be structured e.g. the agent will be prompted as to the type of message (e.g., vessel mechanical, operating rule, human resources, other). Structured messages will improve customer service planning and daily operations.

¹¹¹ In addition to password protection, authentication will include agent name, contact number, CSBC membership and confirmation of credit worthiness.

¹¹² Primarily relates to vessel location, ETA, tombstone vessel data and special instructions.

Once the agent completes and submits the request, two things will happen, namely: (1) accounting data will be transmitted to the PPA's backend AS 400 based invoicing system and (2) PPA dispatch will receive an alert that a request is pending. PPA dispatch will review the request and will have the ability to over-ride defined fields. Once approved, a confirmation number (or job number) generated by the AS 400 will be tagged to the order and the agent will be notified electronically.

In addition, the system must have a change order function. A change includes everything from cancellation to changing one input data field. Agents are allowed to make one change without charge. Subsequent changes are subject to a change management fee. The backend accounting system administers fees. Hence, the change order function must track the number of changes for a particular order and, in the case of two or more changes, transmit relevant data to the AS 400.

Finally, the system will have two types of reporting capability, namely (1) a near real time log that indicates the # of orders submitted, # approved, by time period (i.e. 00:01 to 06:00, 06:01 to 12:00, 12:01 – 18:00, and 18:01 – 24:00) and (2) historic reports. There will be two types of historic reports, namely: (1) number of requests by agent and (2) number of change orders by agent.

6.4 Landside Transactions

6.4.1 Advance Container Notices

The landside information flow starts with pre-arrival container notices. Stakeholders should have relevant container details electronically pushed to them in standardized format early enough to enhance their respective staging activities and resource assignments.

Before requesting the shipping lines to enhance the pre-arrival data provided to the terminals, relevant PoV stakeholders need to inventory and rationalize their requirements. Thereafter, it would be prudent to determine whether the Canadian Border Services Agency (CBSA) is a better data source than the terminals. It is understood that the CBSA collects pre-arrival data of value to PoV stakeholders including shipper/forwarder declarations of commodities for consolidated cargo, the ultimate origin/destination and contracted carriers beyond the ocean bill of lading. In addition, sourcing data from the CBSA, will allow the PoV to take advantage of the CBSA's data quality control and standards enforcement.

Sourcing data from the CBSA is only cost effective if it eliminates the need to source data from the 3 on dock terminals and/or the 20 container shipping lines visiting the PoV. The point is, it would be cost effective to establish an accurate, single source of advance notice data.

6.4.2 Container Status – EDO – Gate Reservations

Once the container has been unloaded from the vessel, stakeholders should be able to go to a centralized Web site and quickly search for containers of interest across all terminals and obtain or enter status details. As clearances are updated, they should be automatically disseminated to relevant stakeholders. An enhancement would be to allow customers to set alerts or triggers that automatically notify the customer when specified containers achieve a defined status.

The one to many and many to one relationships related to ordering a trucking company's pickup or drop off services, checking driver availability, verifying driver access privileges, validating the trucking company's port license and processing the trucking company's order acceptance (or rejection) should be managed through a standardized set of Web based tools/screens backed with pertinent business rules and electronic dissemination capability.

Flowing from the container status and electronic delivery order functions, trucking companies and high volume terminals would be well served by a standard, centralized Web based application that allows trucking companies to manage (reserve, release, change) reservations across relevant high volume terminals in a single session.

Standardization and centralized control of the trucking company order – acceptance - reservation processes ensures a match between the truck company’s acceptance of the delivery order, the shipping line or forwarder’s confirmation and the terminal’s expectation of who is to pickup or drop off which containers and when. The risk of miscommunication is mitigated.

In addition, the system can be set to automatically download relevant data to the trucking company’s backend dispatch system and/or the terminal’s backend yard control system.

eModal is a U.S. based software vendor that licenses an integrated application suite primarily targeted at terminals and trucking companies. eModal’s port community system allows members to query container and booking status at participating terminals, pay outstanding demurrage fees, register truck drivers, schedule gate appointments and create personalized views. It appears to be the only North American vendor offering this level of integrated module coverage and is a good benchmark.

The basic building block of eModal’s system is its “Activity Folder”. The folder shows container status across multiple terminals. Each participating terminal provides specified container data in a set format, every hour. Container status has 23 fields of information and booking status has 7 fields of information. Each user (i.e., trucking company, broker, shipping line or freight forwarder) is allowed up to 3 free Activity Folders to manage up to 30 containers and/or booking numbers per folder.

The system user can customize the display and sort the order in which containers are displayed, for example by last pick up date or by customer (e.g., shipper, shipping line, agent). There is also a search function to assist zeroing in on a specific container.

The truck order process requires the requestor (usually a shipping line or its agent) to fill in a delivery order screen. The “EDO Folder” of a trucking company is completed. The nominated trucking company reviews and accepts or rejects orders. Comments can be added. For security and/or liability purposes, it may be necessary to have the requestor confirm the order before it is released to the appropriate terminal(s).

After the trucking company checks container status and “last free day”¹¹³ through the Activity Folder, the trucker opens the “Scheduler” function. The trucker selects the containers to schedule and makes appointments based on terminal yard or “zone”¹¹⁴ and time slot rules.

Zones, the operating time window for each zone (e.g., 24 hrs, 6 hrs, 2 hrs, 1 hr) and the capacity in each zone per time window (e.g., 500 transactions per hour for import containers in the north section of the terminal) define each terminal’s yard configuration. There may be more rules specific to a zone including how far in advance appointments can be made or when they must be cancelled. The Scheduler function manages terminal zones and appointments.

6.4.3 Empty Repositioning

The recommended empty repositioning solution is to create a standardized, centralized Web based tool that allows the shipping lines or their agents to enter and update empty reposition instructions. Benefits realized by the shipping lines and suppliers would be as follows:

- Shipping lines would be able to better manage and control their empty contain inventory

¹¹³ Last free day before demurrage charges apply.

¹¹⁴ A zone can be the whole terminal, a lane, a row, an area in the yard or a type of container movement.

- On dock and off dock terminals would require less manpower to manage and follow up on miscommunications
- Trucking companies would reduce the number of unnecessary movements
- Reservation system errors would be reduced (i.e., trucking companies would not make a reservation to drop a container at the terminal if they knew that the reposition instruction had changed).
- Trucking companies may be able to start charging a change management fee

6.4.4 Track and Trace

Customers and stakeholders should be able to log into a single authoritative site to obtain end-to-end track and trace information.

In its simplest form, track and trace may be nothing more than relevant PoV stakeholders identifying three or four key events, capturing time stamps when these events occur and displaying the information online. For example, the first event and time stamp may be when the container is unloaded from the vessel. The next event and time stamp may be when the container clears customs or is returned from inspection; followed by the time the container exited the terminal, etc.

Advanced track and trace functions include: (1) calculating and disseminating the ETA for a downstream event(s) and (2) notifying relevant downstream parties of the “threat of delay”. The threat of delay notice is determined by comparing the actual time of a specified event (e.g. gate clearance) to the scheduled time for the same event. If the resulting variance exceeds an identified threshold, a threat of delay notice is issued. With sufficient advance notice, this threat of delay feature would be useful for downstream suppliers by allowing them to adjust their resource deployment plans.

6.5 Supply Chain Performance Measurement

One of the PoV's critical success factors (CSF) is to increase cargo throughput speed or velocity. One of the ways to achieve this is by simplifying business processes and implementing the solutions recommended in this Chapter. It follows that PoV stakeholders need to have some way of monitoring improvements in operating velocity.

Key performance indicators (KPI) need to be defined, monitored and reported in such a way as to allow stakeholders to gain a good overall impression of how well the PoV is achieving this CSF. Each KPI should be reported against target thresholds as defined by an industry heuristic or a domain expert. KPIs should be made available to all relevant stakeholders. Visibility enhances understanding of supply chain relationships and dynamics, identifies problems as they arise and fosters a higher level of accountability.

Based on input from domain operators, Table 17 indicates possible supply chain KPIs, performance thresholds and data sources. RAG¹¹⁵ symbols will indicate the "health" of current operations. Colour code status will be determined by comparing a near real time measurement of performance against RAG thresholds.

The "red" thresholds provided in Table 17 indicate unacceptable times or variances. "Amber" and "green" thresholds are natural progressions from the red thresholds and have not yet been defined.

KPIs are fairly intuitive, with possible exceptions explained as follows. The "container dwell time" at the terminal is the total time a container (laden or empty) sits on the terminal, from the time it is unloaded from the vessel (in the case of imports or from the truck or rail in the case of exports) to the time that it exits the terminal.

¹¹⁵ RAG stands for "red", "amber" and "green". Red indicates operating problems; amber indicates deteriorating operations and green indicates satisfactory operations.

Table 17: PoV Supply Chain KPIs

KPIs	Thresholds - Red	Data Sources
Vessel Operations		
Schedule adherence	Less than 95%	VTOSS, AIS
Dwell time at anchorage	Greater than 8 hrs.	VTOSS, AIS
Dwell time at terminals	Greater than 12 hrs.	VTOSS, AIS
Overall ship turn time	Greater than 22 hrs.	VTOSS, AIS
Terminal Operations		
Container Dwell Time	Greater than 12 hrs.	Terminals
Truck Operations		
Dwell time in gate lanes	Greater than 45 min.	RFID
Turn time in terminal	Greater than 45 min.	Terminals
Turn time on port property	Greater than 2 hrs.	RFID
Rail Operations		
Schedule adherence	Less than 95%	Railways or Terminals
Variance (cars delivered vs. scheduled)	Greater than +/- 5%	Terminals or Railways
Variance (cars delivered vs. demand)	Greater than +/- 5%	Lines

Source: (Table prepared by author)

Currently, the PoV does not have the necessary data to calculate how long a truck is on Port property (“turn time on port property”) or how long it sits outside a terminal gate (“dwell time in gate lanes”). To collect relevant data, it will be necessary to equip trucks with radio frequency identification (RFID) technology and implement readers at appropriate locations.

Rail cars scheduled vs. delivered vs. demanded are key parameters that have emerged from recent difficulties at Deltaport. The KPIs measure railway schedule adherence and whether there is an imbalance between the number of containers arriving at the Port for railway pickup (demand) and the number of rail cars being delivered (supply). An imbalance will undermine terminal productivity and throughput speed.

KPIs will be presented in an easy to understand format with top tier presentation being either an overall summary for the Port or by terminal. Users will be able to click on a RAG icon to drill down and obtain more detailed information (e.g., to see historical and trend data by terminal or by KPI). The site should also be equipped with features to allow users to select logical subsets of the data (e.g., for specified time periods, for a specific railway, for a specific trucking company, etc.).

6.6 Solutions Summary

Table 18 summarizes software solutions. Discussion with the VPA Executive indicates acceptance in principle for the transaction and reporting improvements covered by this paper. However, improving business processes and transaction speed requires stakeholder collaboration. Accordingly the next logical question is how should the program be organized to secure stakeholder buy-in and to sustain their commitment? This issue is addressed in Chapter 7.

Table 18: Supply Chain Transaction Solutions

Increasing Supply Chain Transaction Velocity		
Functions	Process Title	Solutions
Sourcing	Services Directory	Emulate or license LA/LB PortSource™ or Port of Rotterdam, InfoLink or PSA, PortNet™ products.
	Route Finder	License Rotterdam's PortSailing & PortTransport or emulate JOC "Cargo Search"
Vessel Transactions	Advance Vessel Notices	Enhance existing PGP system.
	DG Declarations	Enhance existing DG system following DFO or CCG commitment and protocol agreement.
	Online Service Ordering	Design & implement centralized Web based solution (PPA pilot). Investigate PSA Portent tools.
Landside Logistics	Advance Container Notices	Crystallize supplier requirements. Investigate single data sources.
	Terminal Container Status	License or emulate product like eModal.
	Empty Repositioning	Develop centralized change management system.
	Truck Delivery Orders	License or emulate product like eModal.
	Gate Reservations	License or emulate product like eModal.
	Track & Trace	License or emulate product that best integrates with existing supplier track and trace services.
Reporting	Supply Chain Operating Performance	Design & implement centralized Web based solution.
<i>Source: (Table prepared by author)</i>		

7 CONCLUSIONS

7.1 Introduction

The preceding Chapters have discussed the growth in container traffic, the resultant transaction and reporting problems and possible system solutions. Beyond understanding the problems and solutions, critical success factors include stakeholder buy in, sustained collaboration and dedicated resources. It is proposed that the successful Port communities of this decade will be the ones that embrace the idea of an integrated supply chain and collaborate in the use of digital tools to reinvent the way they interrelate.

The Bitpipe dictionary's definition of value chain integration may focus stakeholder attention but will not, in itself, finalize user requirements, prepare system specifications or develop/license software. Planning, developing and supporting a supply chain system will require organized, dedicated resources and the governances that enforce integrity, fairness and accountability necessary to sustain stakeholder trust and commitment. Hence, this Chapter concludes by proposing an organization structure and offers high-level guidelines for key governance issues.

7.2 Organization Structure

Initially, it is proposed that the organization structure consist of a Steering Committee comprised of senior Executives of PoV companies that are willing to commit domain expertise, valuable data and other systems resources necessary to launch the supply chain program. Additional selection criterion include: willingness to provide seed capital, decision making authority within their respective company and ability to balance PoV and their company's

interests. The VPA should demonstrate leadership and Chair the Steering Committee as it gets off the ground.

A Working Group, delegated by the Steering Committee, should be comprised of individuals employed within the PoV with the necessary blend of business expertise and technology skills to handle supply chain implementation tasks. The VPA should demonstrate leadership by taking on the project manager role and by providing information technology and, as necessary, administration support services (e.g., legal, public relations and procurement).

At the end of 2006, the Steering Committee can review progress and reassess its organization options including outsourcing or creating a standalone entity. For comparison, it is worth noting that established supply chain systems endure under various structures and governances.

Many systems operate almost on a voluntary basis (e.g., Finland) under a committee structure with issues such as management, finance and system development decided by community members and users. Elsewhere, the system provider has a shareholder structure that includes users or user associations and is operated by a private company (e.g., Felixstowe). Another option has supply chain system resources become part of the Port Authority (i.e., Rotterdam and Seattle).

Under the Felixstowe model, Maritime Cargo Processing (MCP) handles strategic planning, marketing & sales, administration and some system product development. MCP has about 20 employees with half involved in business analysis and product development and the other half performing administrative functions. Network services are outsourced to the Felixstowe Port Authority. MCP has a variety of service and transaction fees, is profitable, has repaid initial loans and pays dividends to its shareholders.

While government agencies are usually not direct members, most supply chain systems cooperate with and benefit from close ties to government agencies. These relationships can involve sharing data, manpower, reporting stations and communications network infrastructure. Partnering combines the expertise, resources and finances of public and private organizations to accomplish goals that would not be possible without a coordinated effort. Having said that, the systems viability should not be dependent on government will, interest and/or funding.

At the end of the day, the supply chain system's success will depend on the coverage and effectiveness of its services and equal treatment of all users, be they large or small. The program must be seen as having a neutral position within the community, while serving the needs of all users. This impartiality starts at the top and flows through the organization.

7.3 Policy Guidelines

During preparation of this paper some stakeholders requested guidelines in the following areas: planning, accepting new initiatives, service level agreements and funding. This section offers guidelines for each of these areas. As necessary, the Steering Committee can obtain additional information from member policy documents and/or industry governance manuals.

7.3.1 Planning

Each year a three-year system plan including objectives, strategies, action plans and resources/budgets should be reviewed and updated. Naturally, planning should continue to focus on processes that cross PoV businesses and on information flow "choke" points.

More importantly, in preparing the supply chain system plan, key stakeholders should resolve to compare relevant portions of their respective information systems plans with a view to identifying initiatives that are best handled centrally by the supply chain system and those that are best handled by supplier backend systems. This approach will help mitigate the sub-optimisation

of the type referred to in Chapter 5. In addition, coordinated plans should drive cost savings by eliminating unnecessary duplication and fragmentation.

7.3.2 New Initiatives

Stakeholders that want to invest in a supply chain initiative should not be unduly restricted in proceeding by those that do not have a direct interest in the initiative. After all, it is important to resolve gateway logistics problems and act on opportunities that increase valuable services to its membership.

However, when considering a new project or service, three important questions must be answered, as follows: (1) Is this new project or service in the best interests of the membership? (2) Is this something that PGP can do well? (3) Will this project or service at least pay for itself considering all costs? Only when all three questions receive a positive answer should the Committee take on the new initiative.

7.3.3 Service Level Agreements (SLA)

The system itself must be secure in all respects, in particular providing confidence to competing organizations sharing a common system. Because of the nature of the industry being served, issues such as reliability, resilience, 24 X 7 availability and support are also essential. Rules governing data sharing and security need to be spelled out in a SLA or protocol agreement and signed by relevant parties.

7.3.4 Funding

One of the underlying premises is that the supply chain system be operated as a financially viable business – operated by the PoV (or its assigned outsourcer) for the PoV. The program must generate enough annual income to repay initial member investment, to cover

ongoing support costs, to replace assets as they become obsolete and to acquire new system assets.

It is anticipated that the program will benefit from the tremendous value of upfront contributions and in-kind support provided by PoV stakeholders. For example, valuable support includes access to and/or usage of relevant system assets that Committee members own (e.g. intellectual property and domain expertise, source code, data, etc.) at no cost to the program. To be clear, this list of system assets should be inventoried and signed off by the parties. While providing the program with significant cost savings, if adopted, this approach indicates that stakeholders understand that they have more to gain by collaborating than building overlapping and redundant systems.

By 2007, it is anticipated that revenues generated from various sources will be sufficient to cover annual project and support costs including seed capital repayment costs. As more fully explained below, there are four potential sources of revenue, namely: (1) VT MIS fees (2) Landside fees (3) License Royalties and (4) Advertising fees.

7.3.4.1 VT MIS Fees

The LA/LB Marine Exchange has a comprehensive fee structure for a variety of vessel related services. Under the LA/LB Marine Exchange model, fees are service specific and, where practical, are derived from the specific costs of the under-lying service. For example, in 1994, Vessel Traffic Information Service (VTIS) came on line. The overall operating and enhancement costs for VTIS are primarily funded by the maritime community through collection of “VTIS user fees” which are mandated by state law and required by port tariff.

Circa 1998, these fees ranged from U.S.\$180 for the smallest freighter (or tug and tow), up to U.S.\$340 for the largest tanker or container ship (per port call). There are also fees applied to “local vessels” (e.g., tugs/tows and passenger ferry service to Santa Catalina Island; vessels

engaged in port construction projects; vessels certified to carry 50 or more passengers and engaged in “whale–watching”, sport fishing, coastal sight-seeing tours, etc.).

In addition, the Exchange offers a wide range of online vessel reporting services as well as hard copy reports to over 300 subscribers. Fees range from U.S.\$30 / month, “Vessel Advance Sail / Shift Report” to U.S.\$300 / month, “Tug Operator’ Service Package. Fees for daily reports for newspapers, “Special Reports” and “Monthly Database Access Report fees are negotiated. There are also additional fees for initial account set up (U.S.\$100) and electronic or hand delivery options.

The above-mentioned fees cover the Exchange’s annual budget (some U.S.\$1.7 million).

7.3.4.2 Landside Container Logistics Fees

eModal is a good benchmark for landside fees. eModal has three types of charges as follows: (1) annual terminal fees (U.S.\$60,000 / year / terminal)), (2) demurrage service charges (1.9% of the claim), and (3) a transaction fee for activity folders and container status reports beyond the free threshold.

As PoV landside applications are specified and cost estimates are prepared, the Steering Committee will be able to determine an appropriate fee structure.

7.3.4.3 License Royalties

The supply chain program should investigate innovative ways to partner with service providers to minimize development (or license) costs and to market its solutions. For example, PSA have indicated that they will consider a wide variety of joint partnerships in lieu of the traditional “software licensing and professional integration service arrangements” if the partnership helps the PSA achieve its goal of being a market leading global logistic service provider.

In addition, the supply chain program may be able to generate royalties by providing licensing distribution rights to logistics solution providers such as IBM Global Services, Lockheed Martin or non-competing community system owners/operators (e.g. MCP). Naturally, PoV solutions should only be licensed to non-competing ports.

7.3.4.4 Advertising Fees

Eventually, the supply chain site may have the number of subscribers and transaction volumes to generate some advertising revenue. Examples of advertising fees are drawn from Maritime Global Net.com (MGN), and Amazon.com's "click thru" model.

MGN offers banner ads, email ads and an email list rental. They boast that there are some 150,000 user visits per month and that an email newsletter is issued to over 75,000 individuals each week. Advertising rates vary from U.S.\$225 / month for a footer ad to U.S. \$1200 / month for an email newsletter ad.

The click-thru model charges vendors a modest fee for each potential sales prospect that reaches a vendor's site directly from the supply chain site. For example, as you book into the Paris Hilton, a link to "French Travel Books at Amazon" appears. Clicking this link opens the Amazon site with a relevant list of Paris travel books already displayed. This is a high quality sales lead, since the Hilton site visitor has just demonstrated that they will be staying at an up-market Paris hotel. "The Gourmet's Guide to Paris" will be at the top of the Amazon book list and "The Backpackers Guide to Paris" will be at the bottom. Site audit software will accumulate counts of generated click-thru activity to be charged against each supplier.

7.4 Next Steps

On June 30, 2005 the VPA Executive assigned top priority to designing and implementing a supply chain performance measurement system as discussed in Section 6.5.

Additional recommended next steps are:

- Target Steering Committee members and solicit their participation
- Appoint a full time Working Group manager and team members (initially, team members may be part time)
- Enter into protocol agreements including in kind support and data sharing
- Refine & detail user requirements and specifications for each new application
- Continue the research and analysis initiated for this paper. Table 19 summarizes the immediate next steps in defining user requirements and system specifications.
- Complete search for integrated solutions and finalize license vs. build decisions.
- Estimate costs and benefits and prioritise each application.
- Estimate seed capital requirements, budget for the next year and obtain financing.
- Prepare and issue a request for proposal (RFP) or request for quote (RFQ) to qualified solution providers.
- Prepare an overall GANTT and a detailed GANTT for each new application.
- Define and implement program KPIs.
- Refine and detail the fee strategy

Table 19: Next Software Design Steps

Increasing Supply Chain Transaction Velocity		
Functions	Process Title	Immediate Next SW Design Steps
Sourcing Transactions	Services Directory	Rationalize existing PoV sites, design normalized descriptions.
	Route Finder	Crystallize customer requirements.
Vessel Transactions	Advance Vessel Notices	Prioritise on VPA programmer task list.
	Dangerous Goods	Wait for CCG commitments to host system
	Online Service Ordering	Obtain PPA signoff on user requirements.
Landside Logistics Transactions	Advance Container Notices	Crystallize supplier requirements. Investigate single data sources.
	Terminal Container Status	Crystallize supplier requirements; rationalize existing PoV sites.
	Empty Repositioning	Crystallize supplier requirements.
	Truck Delivery Orders	Complete SW solution search.
	Gate Reservations	Design centralized front end for existing systems.
	Track & Trace	Complete SW solution search that best integrates with existing supplier services.
Reporting	Supply Chain Operating Performance	Complete solution design, cost estimate and obtain Executive approval.

Source: (Table prepared by author)

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