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SSS as an element of a Supply Chain for Melbourne's future East West Cargo flows.

Abstract

The benefits of using Short Sea Shipping (SSS) as an alternate or complement to, road and rail modes, for short haul freight of future cargo flows within Melbourne's east-west-east corridor, was canvassed in Hallock and Wilson [ATRF 2009]. The current paper explores two aspects of value capture and competitive advantage within the supply chain (SC) strengthening the case for integrating SSS into the SC.
Firstly, value capture in the SC relating to port/terminal situations is explored. The potential for value capture in the SC through incorporating SSS into the SC via the terminalisation model is specifically discussed in the paper. The potential to capture value by integrating SSS into the SC thereby leading to competitive advantage for users interested in sustainable supply chains is the second theme explored. Examples are provided of recent corporate interest in greening the SC and the author argues that this is not only important from the enterprise's viewpoint but also a path along which logistics should evolve to maintain its relevance in the future.

Key assumptions around the global occurrence of SSS and its viability are detailed in "Urban freight transport –the Short Sea Shipping (SSS) alternative for Melbourne" [ATRF 2009]. The idea of using SSS rather than road and rail for future East West freight flows was conceived in the context that in a 30 year time frame Hastings would become Melbourne's next port. Therefore Hallock & Wilson [2009] presented an unconventional approach to catering for cargo generated by Hastings/Melbourne/Geelong container cargo flows once Hastings was developed as a supplementary port to Melbourne. The 2009 paper also demonstrated the wide-spread acceptance of SSS internationally and gave the specific example of the EEC which had adopted the "motorways of the sea concept" as a policy.

Biography

Shanta Hallock has an MSc in transport economics from Cardiff University. He has worked in the maritime area offshore as a, manager of freight operations, large research programs, practitioner of project evaluation, expert in transport pricing methodologies and in shipping competition policy from 1974 to 1988. In Telstra he worked in the Systems Integration/Facilities management area of Major Project business on strategic pricing, complex bid evaluation and project evaluation. He is also a director of *drhLogistics* a 4PL based in South Asia. He now works for the Dept of Transport in Victoria specializing in the area of investment evaluation. He is an accredited and active Gateway reviewer for states and the commonwealth.

Introduction

This paper introduces concepts of the supply chain (SC) in section 1, value capture in section 2 and relates them to the port and Short Sea Shipping (SSS) environment, section 3. Value capture in SSS Section 4 presents three reasons for SSS contributing competitive advantage in the SC. In section 4 several examples of the adoption of SSS are given together with the presentation of the terminalisation model which can drive competitive advantage. The section concludes with a set of assumptions under which this may be applied to potential East West (E/W) cargo flows in Melbourne in the future. The paper extensively references a previous paper in ATRF 2009 by the author.

1) Supply Chain

It is important to be clear on a definition for Supply Chain Management (SCM). The most critical distinction needs to be between SCM and logistics. Logistics tends to be defined in operational terms, essentially "a planning concept that seeks a framework through which the needs of the marketplace can be translated into a manufacturing strategy and plan....." Christopher [1998, p14].
SCM definitions use the concepts of "upstream and downstream" management of relationships, the delivery of value and the integration of suppliers (upstream) with customers (downstream), Christopher [op.cit, p15, 16], Mentzer [2001, p4]. One definition of SCM is "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer" Mentzer [p 4]. A preferred definition, used in this paper, which incorporates the concepts of customer value and least cost, is SCM is the "management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole" Christopher [1998,p15].
However recent thinking proposes that the supply chain is only part of the overall value chain and in fact requires the introduction of a demand chain to be a meaningful concept [Walters and Rainbird 2007]. They go on to propose a model in which the cost efficiency and leanness of the SCM approach is supplemented by understanding customer and stakeholder expectations via demand chain processes. In their model of the value chain, supply chain decisions require the identification of a value proposition. This needs prior analysis of market attractivity, opportunity and organisational structure and resourcing. It is only then that the SCM decisions of value production and co-ordination can make sense. The advantage of approach of Walters et al[op cit] I s that it emphasises value capture and value creation. The application of the concept of value capture by integrating SSS into the SC is detailed in Section 4 below.

2) Value Capture

In considering a possible future agenda for logistics Stock [2002] warned against the pitfall of falling into the trap described by Theodore Levitt [1960] in his classic article "Marketing Myopia". Levitt cautioned against viewing one's industry in too narrow a manner, e.g the demise of the railroad industry in the US was partly due to its key players disregarding the fact that their real business was transport – hence they lost out to the automobile which better met this need.
This in turn is true of the logistics industry today. Stock similarly advocates a broader horizon for logistics which will come from a SC orientation. Whilst a supply chain orientation of logistics is now more prevalent than when Stock wrote in 2001 several points he raises are important. Stock desires that the focus for the future in logistics should be to encompass general economic and social conditions of society at large. A similar view is

expressed by Flint [2004] who identifies the need to "understand changes in the environment and customers value perceptions of global SC" [op cit p 4] as one of the, top four challenges facing strategic marketing in global supply chains".
Current discussions on the future orientation of logistics have been partly caught up in a seemingly innocuous event in industry, the renaming of the Council of Logistics Management to the Council of Supply Chain Management Professionals. This spawned dialogue and debate on the relationship between SCM and logistics and perhaps indirectly had both academics and industry debating the very issue of what was/should be logistics' domain. Mentzer et al [2008] whilst noting the cross-disciplinary nature of SCM acknowledged the uniqueness of functional discipline such as logistics, marketing, or production. They argue that the current domain of logistics is ; Transportation network design and management; Warehousing techniques including location, design, and management; Materials handling management; System wide inventory management; Order management and fulfilment; Procurement; and Customer service[op cit p34]. SCM's domain on the other hand is "Applying analytical tools and frameworks to improve business processes that cross *organizational* boundaries" [op cit p38]. Frankel et al [2008] note that logistics has "impactfully redefined itself over time" [op cit p13] vis a vis SCM. The authors also note that researchers are expanding the use of methodologies and that the supply chain's value proposition is being extended to the end user.

Value capture in global and domestic supply chains has hitherto focussed on efficiency e.g. techniques to compress lead times, reduce costs and improve customer service and recently lean concepts Levy [1997], Womack and Jones [2005]. Value capture and value creation in a supply chain which relies on collaboration can be better understood from the point of view of Martinez[2003] who proposes two aspects of value viz internal focus on the creation of shareholder-wealth and the second external focus being from the customer's view and being satisfaction driven.
Value migration was identified by Slywotzky[1996] to be a phenomenon where value in an industry shifts over time and new business landscapes emerge; consequently outmoded business models give way to "new ones better able to satisfy customers" [op cit p4]. Robinson [2006] takes the view that "pervasive value migration has created new value pools in port –oriented handling systems" [op cit p3]. For an excellent recent discussion of the concept relating to the pharmaceutical industry see Walters and Rainbird [op.cit chap 7]. Value capture in these circumstances enables strategic positioning to ensure long term strategic advantage Porter [1996].

The evidence that short sea shipping has a role in value capture in strategic supply chain decisions because of environment and sustainability drivers and concerns is presented in detail in section 4. What needs to be noted here is that large retailers such as Wal-Mart have already required a demonstration of environmental stewardship on the part of their suppliers (including a base-lining of GHG emission per unit product).The implications for the SC in choosing low emission transport is immediately obvious.

3) Value Capture within Ports and the supply chain

Robinson [2006] cites the common experience globally in which terminal operation and trucking operations have evolved to an integrated operation involving third party or fourth party logistics providers. This is an example where value has migrated allowing integration of the activities of the terminal operators, the port and landside partners in the supply chain itself leading to value capture if opportunities are spotted and exploited.
Ports have been slow to respond to opportunities offered by integrated operations. Robinson [2002] observed that ports had continued to view themselves as places where cargo interchange took place rather than strategic locations in a supply chain. Consequently they have realised too late that they are in fact embedded in a supply chain.

Ports have missed the opportunities provided by value migration and value capture (Sec 2 above) and to thereby strategically influence the supply chain.
Value capture is required if a port is to survive under the scenario of the future proposed by Robinson [2006] because it enables a port to identify and maintain competitive advantage. It means the exploitation of strategies that will result in higher levels of productivity and efficiency.
Value capture in ports is discussed by Bichou and Gray [2004] citing Paixao and Marlow [2005] who suggest that the concept of agility should be applied to ports who would then be "proactive rather than reactive along supply chains in a modernised global economy" [Bichou and Gray op.cit p51]. The need to be proactive enables the port to play a coordinating role in capturing and releasing value. It could be the location where potential channel interactions take place as well as having the capability of creating "patterns and processes of its own," Bichou and Gray op cit [p 53].
Value capture in ports is also determined by the significant partnerships and alliances that exist in international transport. The emergence of port operating transnational corporations (TNC) such as Dubai Ports World, Hutchinson-Whampoa Terminals, APM Terminals (Maersk/Sealand controlled), is well documented in the trade journals [Containerisation International, Fairplay, International Transport Journal, Lloyds Daily Commercial News etc]. These TNC's own a global portfolio of terminals and operate them under a global corporate strategy which is based on alliances with shipping lines that operate globally too. The widely known example of how the alliances impacted a port occurred in 2001/2002 when Maersk/Sealand (a large global shipping line)followed shortly by Evergreen line moved patronage out of Singapore to Tanjung Palapas(PTP) in Malaysia, simultaneously taking out a terminal management equity stake in PTP through APM Terminals. The move affected about 20% of the port of Singapore's volumes.

The ports of Melbourne and Hastings were recently merged into a single entity [TIA 2010]. Terminal operators who control land-side operations as tenants can integrate SSS into the supply chain as shown in the case of barge operators in Rotterdam referenced below. This would be possible if there was perceived benefits to terminal operators in the use of sustainable transport such as SSS at an enterprise level for reasons of cost and strategic competitive advantage.

4) Value capture in the supply chain through SSS

A detailed discussion on the variants of a definition for SSS is provided in Hallock [2009] and Medda and Trujillo [2010]. In this paper we adopt Stopford's [1997] definition of short sea shipping (SSS) as "maritime transport within a region serving port to port feeder traffic in competition with land transport" cited by Musso and Marchese [2002,p 281] in their discussion on a definition for SSS. Medda and Trujillo [2010] contribute something new to the discussion on definitions for SSS when they identify the intermodal importance of SSS, as both a complement to road or rail as well as being a competitor when the potential exists to provide a point to point alternative to land transport.

SSS offers a competitive advantage within the SC because it:

1. Enables sustainability objectives to be met by users [CI 2008d]
2. Minimises economic and environmental disbenefits, EEC [2006], REALISE [2006].
3. Allows unlocking of value by using a different operational paradigm Rodrigue & Notteboom, [2009].

Examining each of these:

1) There is evidence that concern with future impacts of present actions in environmental and sustainability areas is now informing the strategic SC and logistics choices made by commercial operators and policy choices of governments.
The forwarder CONTARGO in the European North Continental Port range offers barges on both short routes of 50 km and longer routes with a matched value proposition to cargo needs. Three scenarios are offered: barge combination, truck only, rail combination, with CO2 emissions offsets provided for each scenario [CI, 2008 a & b].
An examples of government policy is the; European Commission's Motorways of the Sea concept which stems from the Trans European Transport Networks and Marco Polo program. Marco Polo is the European Union's funding programme for projects which shift freight transport from the road to sea, rail and inland waterways. This means fewer trucks on the road and thus less congestion, less pollution, and more reliable and efficient transport of goods. For instance, "a motorway of the sea route could be developed along the Atlantic coast to provide a sea-lane running parallel to motorways" (ECT 2006, p2).

Golicic, Boerstler and Elram [2010] observe that there are benefits to companies that integrate sustainability into their SC. They also note that freight transportation has moved from being of negligible consideration in company strategy to something monitored as a key part of SC sustainability practices, by both investors and customers. Golicic et.al surveyed 44 Fortune 500 companies and identified 22 that were trying to significantly address greenhouse gas emissions from freight transport in the supply chain .The 22 used a mixture of technological and operational tactics to achieve their goals. Eleven companies including Dell, HP, Estee Lauder making strategic choices on mode shift; thirteen companies including WalMart and FedEx used tactics which required a change to their fleet practices, e.g. through using alternate vehicle types and fuels, wider truck tyres etc.

2) The certainty that mode shift to SSS will result in economic and an environmental benefit has been extensively discussed in Hallock [2009] and elsewhere. The pollution mitigation potential of SSS is recognised by numerous authorities – Perakis [2009] Marlow [1997] and the ECT via its Marco Polo Program [ECT 2005]. In BTRE [2007] and EEC [2006] data is provided showing the relative greenhouse gas (GHG) emissions by pollutant by mode. BTRE (2007) notes the social costs of congestion $6.1bn for Melbourne by 2020 refers to estimated aggregate costs of delay, trip variability, vehicle operating expenses and motor vehicle emissions—associated with traffic congestion—being above the economic optimum level for the relevant network. These costs are not "internalised" or paid for. SSS is comparatively less polluting than road or rail. Australia has a national target of cutting greenhouse gas (GHG) emissions to 108 per cent of the levels they were in 1990[NTC Annual report 2009]. Evidence from the EEC (Table 1) and Australia (Tables 2 and 3) follows. Greenhouse gas emissions in the EEC (2006) are given below and data on all emissions is also shown.

A summary of truck and rail movements per day by cargo type from Hastings projected for 2035, based on a train of 1200 metres carrying 180 TEU, is shown in Table 5. The truck movements (Tables 4 and 5) to cover future (2035) container volumes (2.5 M TEU) will have a significant environmental impact. These movements place the GHG task in context.

Table 1 – Greenhouse Gas emissions from transport in the European Union (27 states)

Source		***CO_2-e emissions (million tonnes)***
Road		902.0
Rail		7.8
Shipping		
	Coastal	23.4
	International	171.3
	Total Shipping	194.6
Air		
	Domestic	25.6
	International	129.8
	Total Air	155.4
Other Transport		10.1
Total Transport		1269.9
Total Emissions		4558.7

Source: EEC (2006)

Table 2 – CO_2-e emissions by transport mode, 2000 – 2020

	Emissions of CO_2-e by transport mode (gigagrams)						
Year	*Car*	*Road Freight*	*Air*	*Rail*	*Coastal Shipping*	*Other*	*Total*
2000	40,696	20,762	4,996	3,518	1,505	1,980	73,456
2020	50,110	31,874	11,922	4,848	1,359	2,292	102,406

Source: BTRE (2007)

Table 3 – Non CO_2 emission projections to 2020

	Emissions (gigagrams)				
Source	*NO_x*	*CH_4*	*NMVOC*	*CO*	*N_2O*
Rail (non-electric)	2623.0	64.40	0.23	21.80	0.08
Coastal shipping	28.6	0.07	1.16	2.94	0.04

Source: BTRE (2007, pp. 213 and 231)

Table 4 – Truck movements to / from Hastings (truck trips per day)

	Scenario	
Road mode share	*Low (1million TEU / year)*	*High (2.5million TEU / year)*
25%	300	740
50%	600	1490
75%	890	2230
100%	1190	2980

Source: POHC (2006, p 46)

Table 5 – Truck and rail movements per day by cargo type ex Hastings projections for 2035

	International containers	*Bass Strait*	*Motor Vehicles*	*Break bulk*	*Dry bulk*	*Liquid bulk*	*Total*
Truck moves	1500	700	200	500	350	160	3410
Rail moves	24	12	0	4	0	0	40

Source: POHC (2006, p 52)

3) At present SSS is not part of any mainland Australian supply chain. However in the future, should Hastings be developed as a port in Melbourne's east an opportunity may exist as shown in Hallock [2009] to handle East–West (Hasting-Melbourne/Geelong) cargo flows by SSS rather than yet to be built rail. Whether or not rail is automatically the alternate to road should be viewed in the context of Robinson's [2006] observations. In discussing strategies in Australia to move "more to rail" to ameliorate congestion, he argues that such strategies are merely "coping rather than long term development" [op cit, page 41].
Embedding SSS into the supply chain would be a paradigm shift from land based heavy rail or high productivity B-double solutions, to genuinely sustainable alternative SSS with the potential to unlock strategic value.
The offering of CONTARGO discussed previously is one example of how SSS provides a strategic alternative to customers who want a green supply chain. Another is that of JVC Belgium, which has its Euro distribution centre set up in Boom halfway between Antwerp and Brussels on the Antwerp-Brussels Charleroi canal. Arrangements with shipping lines results in all European containers being discharged at Rotterdam and on-carried to Boom on three services a day and then to Antwerp [Rodrigue & Notteboom, 2009].
These examples also validate the observation of Christopher 1998 [p16] that "supply chains compete against supply chains, rather than company against company to deliver customer value".

Unlocking value in a supply chain, of which SSS is an element also requires a change in the operational paradigm, in this case via the terminalisation model proposed by Rodrigue and Notteboom [2009] being extended to cover supply chains. Rodrigue and Notteboom [2009] have analysed the growing importance of two phenomena, gateway constraints and dwell times within the supply chain. The phenomena have been known to shipping practitioners but have only recently been considered by academics. The terminalisation model advocates the use of dwell times and a strategically widened role for terminal operators as a way value can be captured primarily by providing benefits in time and cost. The authors introduce the concept of modal separation of space and time, i.e. an opportunity for trading off time utility vs. space utility, as a means of unlocking value.

The present paper focuses on buffer derived terminalisation (bottleneck-derived terminalisation impacting vessel calling frequency, and port space is not considered). This is where there is an expectation that the warehouse becomes the buffer rather than more traditionally the distribution centre (DC). In essence it is an inventory in transit strategy which uses "inventory at terminal" to reduce warehousing cost and thereby total distribution cost. It can succeed where DC / warehousing is costly and where shipping lines are chasing cargo. "Inventory in transit" was encountered by the author, when managing break bulk shipping (which did not always possess the clock work efficiency of container schedules) in trades having global supply chains. US and European consignees of some primary commodities and semi-processed agricultural produce preferred the slower transit time because it enabled them to use the vessel as a floating warehouse which phenomenon was recorded in Hallock [1983]. Since SSS is an activity potentially replacing landside transfers the terminalisation of the supply chain can be extended to incorporate SSS. By doing so it facilitates value capture as described by Martinez [2003] cost efficiency leading to creation of shareholder wealth on the one hand and customer satisfaction to those who want a green supply chain.

A diagrammatic representation of Hastings in relation to Melbourne and Geelong and key freight terminals – Dandenong, Somerton and Altona is shown fig 1 below. The SSS alternative is based on the following economic assumptions:

- Hastings will be an overflow port for Melbourne.

- Terminal operators will assume responsibility for two-way E/W cargo flows and there will be no state intervention in determining cargo flows,
- Cargo with origin/destination from the industrial areas of Melbourne's west and north using Hastings as a gateway
- Cargo with origin/destination from the industrial areas of Melbourne's east and the south needing Melbourne as a gateway
- Cargo with origin/destination interstate using Hastings as a gateway and access to the interstate or intrastate rail network is possible from interchange at Dynon or Geelong.
- Due consideration would be given to SSS as an alternative to building new heavy rail infrastructure at a conservative cost in today's dollars of $ 4-6Bn.
- Travel time from Westernport (Hastings) to Melbourne by SSS is between 5.5 and 7 hours for speeds of 18 knots and 13 knots respectively) by water. This compares to about 3-4 hrs by direct rail (yet to be built) and less by road. Travel times to Geelong from Westernport by water will be slightly longer than those to Melbourne–requiring an additional 40 minutes. On the other hand transit from Westernport-Geelong by road or rail will be significantly longer than by water requiring an additional 1.5 to 2 hours compared to the all water route.
- Cargo handling will be either Load on/ Load off, Roll on/Roll off (Ro/Ro), and either motorised barges or vessels between 200 TEU to 600 TEU with Ro/Ro capability deployed.
- Arbitrage on dwell times enabling inventory in transit strategies to benefit the SC will occur.

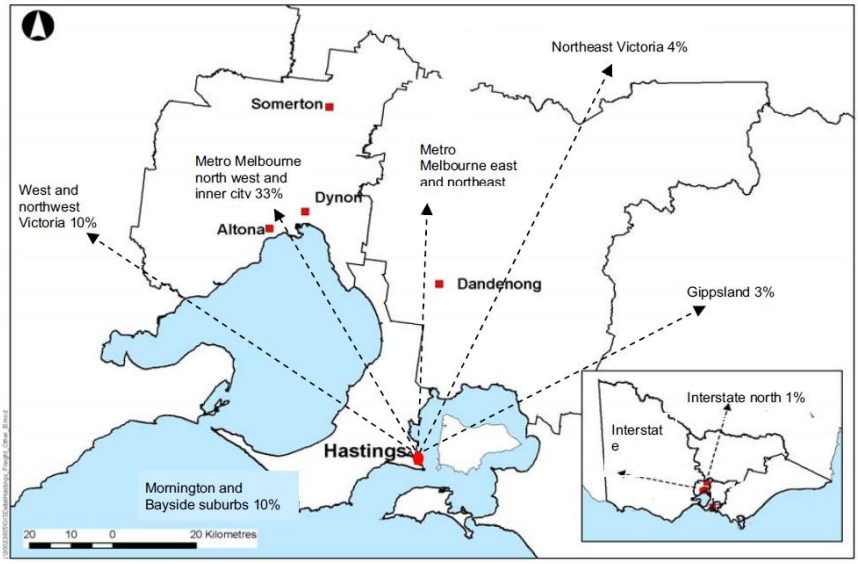

FIG 1

Use of the SSS transport mode that may offer both a time differential and cost differential to road and rail as well as greater temporary storage depending on how the supply chain/transport partnership interface is set up. SSS based arrangements may therefore be more attractive to some supply chains and cargo types for operational reasons as well. Porter [1996] advocates a long term view in both creating and sustaining a strategic capability and strategic position. The positioning we are suggesting here is a similar long term strategy in bringing SSS into the decision framework of supply chains.

Conclusions

It is plausible that in the future, value can be unlocked in a supply chain using SSS for cargo transit between Hastings and Melbourne/Geelong and return.

Should a SC adapt and include SSS then creation of competitive advantage is possible for firms who are conscious and focussed on greening the supply chain. Such firms would present favourably in the eyes of their stakeholders who would also value practical environmentally sustainable strategies such as using a mode that uses less GHG. Firms may also benefit from efficiencies arising out of the adoption of the terminalisation model by terminal operators and shipping lines. A value capture benefit via cost efficiencies is more likely to accrue to the early movers.

The reduction in potential congestion of roads(refer tables 4 & 5 above) will benefit not only supply chains using the ports as a gateway but also residents who can avoid congestion on local and arterial roads leading into the ports as well as all motorway users who will have less freight on the roads.
The avoidance of capital investment in heavy rail infrastructure will be an economic benefit to the Victorian community as it would allow the use of funds probably around $4bn elsewhere. The amenity benefit to residents along any possible rail easement who would now avoid rail freight moving would be significant.

Therefore SSS should be integrated into the supply chains of the future because value creation can occur because there will be an opportunity for the SC to be both customer responsive as well cost efficient.

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