A SURVEY OF AWARENESS AND IMPORTANCE OF INLAND PORT FEATURES

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CentrePort is an inland port initiative located in Winnipeg, and funded by the federal and provincial governments. This paper explores awareness and importance of CentrePort's features, in the minds of local logisticians, and its connection to lean logistics. CentrePort is roughly 2,300 km. from the nearest Canadian seaports (Montreal and Vancouver), and 100 km. from the U.S. border.

The paper is organized into four more sections. The first section is a literature review, covering inland ports and lean logistics. The second section outlines the research questions and methods used. Statistical results are presented in the third section. The fourth section draws conclusions, including implications for CentrePort, supply chain practitioners and public policy makers.

Literature Review

Cullinane, Bergqvist and Wilmsmeier (2012) observe that "no clear consensus has been produced as to an unequivocal definition of a *dry port.*" Dry ports are also referred to as freight hubs or inland ports. Ng et al. (2015) note the significant role of inland ports in complementing "market development, seamless transport and supply chain integration." Larson and Morris (2009) use Allen's attributes to describe an inland port: access to a major container seaport, intermodal transportation facilities served by a Class I railroad, 1,000 or more acres of land, foreign/free trade zone status, access to a local metropolitan market, access to major interstate highways and access to a strong local labor pool.

Walter and Poist (2004) proposed three critical attributes that affect success of an inland port: "major private investors, large populations nearby and air transportation facilities." While there is a cargo and passenger international airport at CentrePort's door-step, the entity lacks major private investors. As shown in its annual report, CentrePort is almost exclusively financed by the provincial and federal governments (see http://www.centreportcanada.ca/corporate/the-corporation/reports-and-policies).

An inland port can be used as a consolidation point, facilitating door-to-door delivery. Typically, inland ports offer more than one mode of transportation. Otherwise, they are simply warehousing/transshipment points, which can be done anywhere along the route. According to Roso and Lumsden (2010), dry ports facilitate increased use of rail, resulting in lower transportation costs, less environmental impact and less congestion at seaports. Dry ports also attract new business to the area, resulting in creation of new jobs.

Logistics is the management of inventory, in motion (transportation) and at rest (warehousing) to serve customers. Lean logistics (Jones et al. 1997) focuses on reducing waste in the following areas:

Over production – Building infrastructure not yet required; producing and deploying excess inventory

Waiting – at international borders (customs), intermodal terminals or warehouses

Rectification of mistakes – damaged goods; improper paperwork (e.g. bills of lading, customs documents)

Excess processing – over handling of products in warehouses; duplication of inspection; excessive documentation and administration

Excess movement – within warehouses, moving products unnecessarily; inefficient picking procedures

Excess transport – transporting goods unnecessarily; incorrect deliveries; lack of consolidated pickup points; empty backhauls and partially-filled trucks; using faster, more expensive transportation

Excess stock – idle trucks/containers waiting for use; inventory obsolescence; excessive safety stock

According to Matos (2014), "the implications of lean manufacturing extend beyond the production floor, directly affecting warehousing and fleet operations as well." Thus, logistics functions, e.g. transportation and warehousing, can also benefit from lean techniques. Matos (2014) recommends three ways to make warehouses leaner: develop better layouts for positioning of stock, track orders in more intuitive fashion, and create more effective communication among warehouse workers. There are also ample opportunities to make transportation leaner; including better fleet monitoring, improved routing and reduced congestion in the vicinity of the warehouse.

Lean logistics is a useful concept for balancing cost and service objectives. As noted by Mariotti (1997): "One answer to this dilemma (of balancing cost and service) is to quit thinking about a supply chain. Instead, think of a lean enterprise and a responsive partnership pipeline, through which all the partners benefit by moving material as fast as possible with the least amount of waste." Focusing on lean aspects of logistics will allow an organization to improve their cost/service performance.

Organizations are finding ways to save through implementation of lean in the logistics field. Saxena (2009) outlines how using lean process improvement tools saved APL Logistics over $8 million in its warehousing operation. At APL, the lean initiative included bringing warehouse personnel together to generate ideas about waste reduction and continuous improvement. Jacobs (2011) describes cases where lean thinking: inspired a modal shift to reduce freight transit time; led to re-design of warehouse layout, increasing utilization and flow of items; enabled reduction of the number of truck trailers needed, by utilizing more cubic capacity per trailer; and improved warehouse picking productivity by modifying procedures. These are all examples of the benefits of lean logistics.

Research Methods

Reviewing the literature and discussions with experts has inspired the following research hypotheses:

H1: Winnipeg-area supply chain managers are aware of the features CentrePort offers/advertises.

H2: The features that CentrePort offers/advertises are important to these supply chain managers.

H3: Lean thinking influences the importance of CentrePort's features to supply chain managers.

A survey was designed and targeted at Winnipeg-area supply chain managers. The population consists of members of the Supply Chain Management Association (SCMA)—Manitoba Institute and the Canadian Institute of Traffic and Transportation (CITT)—Manitoba Area Council. Both organizations have active groups in Winnipeg. Design of the survey was guided by lean logistics and inland ports literature, inland port promotional pieces, and discussions with academics and industry professionals.

Supply chain manager's perceptions about CentrePort were assessed by awareness and importance of features promoted by the inland port. The following features were developed into questionnaire items:

1. Single-window foreign trade zone (FTZ) access – a single point of contact to gain FTZ benefits and status, as opposed to dealing with multiple agencies and organizations.

2. FTZ benefits – e.g. duty avoidance or deferral, secure storage facilities, etc.

3. Three Class 1 railroads – Canadian National (CN), Canadian Pacific (CP) and Burlington Northern/Santa Fe (BNSF).

4. Low corporate income tax – Manitoba has no corporate tax on income below the "business limit" and a 12 percent tax rate on income above the limit. No other province offers tax free income below the limit; however, three provinces/territories (NWT, Ontario and BC) have lower rates (11.5%, 11.0% and 11.5%, respectively) above the limit.

5. "5 minutes to 55 mph" – an American trucking term, meaning vehicles reach a speed of at least 55 miles per hour within 5 minutes of departure from the terminal (Cash 2014a).

6. Common use rail facility – to be connected to the three Class 1 carriers and short haul carriers.

7. Location in the northwest Winnipeg area.

8. CentrePort Canada Way (CCW) – the $212 million road cutting through CentrePort (Cash 2013a; Anonymous 2013).

The survey includes several false features, used to learn more about the logisticians surveyed and their perceptions. One false feature (location in east Winnipeg) is in direct conflict with another (location in northwest Winnipeg). The additional features are: dedicated rail line from CentrePort to a major seaport and light rail transit (LRT) along CentrePort Canada Way.

Other items were developed to determine whether organizations are inclined toward lean logistics. These items are used to create high and low groups within the population, in terms of adopting lean practices. Lean logistics indicators focus on waste reduction, continuous improvement, failure prevention and root cause analysis. The survey was sent via the trade organizations to approximately 300 SCMA members and 300 CITT members. There were 62 respondents, yielding a response rate of around 10 percent.

Statistical Results

Respondents were asked to consider the following question: "Where have I mostly learned about CentrePort?" The leading source of knowledge about CentrePort, selected by 42% of respondents, is newspaper articles, e.g. Cash (2013a; b), Cash (2014a; b) and Kives (2011). The next most popular sources are seminars (21%) and meetings (19%). In the last few years, CentrePort personnel have made presentations at several seminars and meetings sponsored by SCMA and CITT.

Table 1 presents one-sample binomial tests for awareness of the eleven features. H1 is tested using the binomial test, since the awareness data is categorical, with only two categories (aware and unaware). For each of the eleven features of CentrePort, the respondents are asked if they are aware or unaware of it. The hypothesized proportion is 0.5, i.e. the test is whether greater or less than 50 percent of supply chain managers in Winnipeg are aware of CentrePort's various features. The null hypothesis is based on equal probabilities, i.e. aware and unaware both occur with a probability of 0.5. Thus, the question is whether or not a significant majority of respondents are aware of the various features.

Note that significant majorities of respondents are aware of CentrePort Canada Way and the location of CentrePort in northwest Winnipeg. These results support H1. Thus, supply chain managers in Winnipeg are generally aware of where CentrePort is and that a new road (CCW) runs through it. There have been several news articles written about CentrePort's location (Kives 2011) and specifically CentrePort Canada Way (e.g. Cash 2013a). This may explain why many respondents were aware of CentrePort's location and CCW. Few of the other features were so prominently reported in news articles. Also, recall that newspaper articles are the leading source of information about CentrePort, according to the respondents.

Significant majorities of respondents were unaware of four other features of CentrePort. Two of these features – east Winnipeg location and light-rail transit (LRT) along CCW – are fictitious. There is no LRT along CCW and CentrePort is not located in east Winnipeg.

Table 1. Awareness of CentrePort's Features

Feature	Aware (%)	Unaware (%)	P-value
CentrePort Canada Way (CCW)	81.3	18.8	.000
NW Winnipeg/Rosser location	77.1	22.9	.000
Dedicated rail line to seaport*	46.9	53.1	.775
3 Class I railroads	42.9	57.1	.391
Foreign trade zone (FTZ) benefits	42.9	57.1	.391
Common use rail facility	40.4	59.6	.243
Single window FTZ access	37.5	62.5	.112
Low corporate income tax	30.6	69.4	.010
"5 minutes to 55 mph"	27.1	72.9	.002
LRT along CCW*	25.5	74.5	.001
East Winnipeg location*	25.5	74.5	.001

*These are false features.

Significant majorities of respondents were also unaware of the "5 minutes to 55 mph" and low corporate income tax features. CCW and another proposed highway project, the Headingley bypass, are promoted as enablers of 5 minutes to 55 mph (Cash 2014a). Winnipeg is not known for heavy traffic congestion, compared to cities like Toronto or Chicago. Still, 5 to 55 could be important to "lean" firms, as it could help save time and fuel costs. Low corporate income tax rates are hardly unique to CentrePort; they are available throughout Manitoba. Thus, it is not surprising that supply chain managers in Winnipeg are "unaware" of this feature. Tax rates would likely be more important for firms not already in Winnipeg.

Finally, for the five other features (including another false one), the majority were neither aware nor unaware. Indeed, less than half of the respondents were aware of the following features: three Class I railroads providing service, plans for a common use rail facility, single-window FTZ access and other FTZ benefits. Slightly less than half were also unaware of the other false feature – a dedicated rail line to a seaport.

Table 2 is a cross-tabulation of the two items on awareness of CentrePort's location. Recall that one item gives CentrePort's true location (NW Winnipeg) and the other suggests a false location (east Winnipeg).

Table 2. Awareness of CentrePort's Location

Location		East Winnipeg*		Total
		Aware	Unaware	
NW Winnipeg/ Rosser	Aware	9	27	36
	Unaware	3	8	11
Total		12	35	47

*This is a false feature.

A majority of respondents (n = 27) appear to know where CentrePort is (aware of NW Winnipeg) and isn't (unaware of East Winnipeg). The second largest location awareness group (n = 9) seems to believe it spans both NW and East Winnipeg. Perhaps some supply chain managers believe CentrePort covers all of Winnipeg. It could also be that some respondents believe CentrePort encompasses the CN rail yard in east Winnipeg, as well as the area in NW Winnipeg, due to the advertised *3 Class I railways* feature.

Respondents who are unaware of either location (n = 8) may be wondering: where is CentrePort? A final, small group seems totally confused about where CentrePort is (n = 3). They are "aware" of the (false) location in East Winnipeg but "unaware" of the actual location in NW Winnipeg. Maybe these folks believe it is located at the CN rail yards, in East Winnipeg.

H2 is tested using both the one-sample t-test and its nonparametric alternative, the one-sample Wilcoxon signed rank test. The Wilcoxon test determines whether the sample median equals some specified value. Non-parametric testing is warranted by the small sample size plus possible departures from the normality assumption, though the t-test is robust to such departures. The respondents are asked how important they perceive each of the eleven features of CentrePort to be for their organization.

Table 3. Importance of CentrePort's features (One-sample t-test)

Feature	Mean	t	P-value
Dedicated rail line to seaport*	3.91	4.910	.000
Foreign Trade Zone (FTZ) benefits	3.90	4.376	.000
CentrePort Canada Way (CCW)	3.88	5.149	.000
Common use rail facility	3.78	4.425	.000
Low corporate income tax	3.74	3.767	.001
3 Class I railroads	3.71	3.387	.002
NW Winnipeg/Rosser location	3.64	3.576	.001
Single window FTZ access	3.62	3.029	.004
"5 minutes to 55 mph"	3.29	1.524	.135
LRT along CCW*	3.29	1.454	.154
East Winnipeg location*	3.07	.363	.719

*These are false features.
Test value (mean) = 3.0

Table 3 shows the t-test results. All "true" features of CentrePort are important, i.e. significantly above the mid-range mean value of 3.0, except for "5 minutes to 55 mph." The following CentrePort features are important to supply chain managers in Winnipeg: FTZ benefits, CentrePort Canada Way, a common use rail facility, low corporate income tax, 3 Class I railroads, NW Winnipeg location and single-window FTZ access.

The lack of importance of 5 to 55 coincides with the lack of awareness of this feature (see Table 1). Perhaps people are unaware of this feature because it is not important to them. The city does not suffer from terrible traffic congestion, so this may not be an issue for organizations already located here. It is also possible most shippers are already located within 5 minutes of the perimeter, i.e. they already have *5 to 55*.

Two of the three false features – LRT along CentrePort Canada Way and east Winnipeg location – are not important, i.e. not significantly above the mid-range rating. However, the "dedicated rail line to seaport" feature is the most important feature. This may reflect a misunderstanding of the term "dedicated," since the CN line stretches from Winnipeg to the relatively new Port of Prince Rupert. This finding should be interesting to CentrePort staff, as it implies a desire for direct rail freight service to the seaports.

Results of non-parametric one-sample Wilcoxon signed rank tests are in concurrence with results from the one-sample t-tests.

H3 is tested for each of the eleven features of CentrePort, using independent samples t-tests and Mann-Whitney U tests, a nonparametric alternative to the two-sample t-test. Since Mann-Whitney is nearly as powerful as the t-test, it is useful in a small sample scenario. For each of the features of CentrePort, it is hypothesized that lean organizations will rate them more important.

The questionnaire includes four items on lean logistics, each measured on a five-point scale. Principal components analysis was used to assess the dimensionality of these items. A single factor emerged with eigenvalue > 1, explaining 72.5 percent of the variance. The factor loadings are all high: continuous improvement (.88), waste elimination (.86), failure prevention (.86) and root cause analysis (.82). Thus, the four lean items form a unidimensional scale. They were summed to form an index for testing H3.

The sample was split at the median (14.0) to form high and low lean groups. Table 4 shows independent samples t-tests for all eleven CentrePort features. While none of the mean differences between the groups are significant at the .05 level of alpha, the 3 Class I railroads feature is strikingly close (p-value = .051). Perhaps having three competing railroads is thought to yield better service, e.g. greater on-time delivery. On-time delivery permits a shipper to operate at lower inventory levels, an important objective of lean logistics. The high lean group rated several other features (FTZ benefits, single-window FTZ access and common use rail facility) more important on average, but these differences are not statistically significant.

Table 4. Importance of features and lean logistics (Independent samples t-test)

Feature	Mean: high lean	Mean: low lean	t	P-value
Foreign Trade Zone (FTZ) benefits	4.16	3.58	1.287	.103
3 Class I railroads	4.06	3.30	1.678	.051
Dedicated rail line to seaport*	4.05	3.70	0.886	.191
Low corporate income tax	3.89	3.53	0.848	.201
Single window FTZ access	3.84	3.37	1.055	.149
Common use rail facility	3.84	3.61	0.595	.278
CentrePort Canada Way (CCW)	3.84	3.95	-0.277	.392
NW Winnipeg/Rosser location	3.53	3.68	-0.394	.348
LRT along CCW*	3.32	3.28	0.088	.465
"5 minutes to 55 mph"	3.22	3.32	-0.219	.414
East Winnipeg location*	3.00	3.00	.000	.500

*These are false features.

The common use rail facility and single-window FTZ have a logical link to lean logistics. These features have the potential to increase efficiency (and reduce waste) in transportation and warehousing. However, these are relatively new opportunities for supply chain managers in Winnipeg, since no other common use rail facilities or single-window FTZ access programs exist today. This may explain the lack of significant relationships between these features and lean logistics.

The lack of significance between high and low lean groups on average importance ratings may be partly explained by the rather small sample size. The general lack of awareness about many of the features might also be to blame. It is also possible that supply chain professionals do not see a role for CentrePort in their lean logistics strategies. An organization could be relatively keen on lean and find certain features of CentrePort important, without connecting the two.

The lack of a significant link to lean logistics is most notable in the case of CentrePort Canada Way. Although supply chain professionals in Winnipeg are generally aware of this feature, and find it to be important, they do not associate it with lean logistics. Since the road is promoted as an enabler of more efficient transportation, it has a most logical connection to lean thinking. Further study should be done to determine why people are so aware of this $212-million-dollar road and consider it so important. Perhaps the price-tag alone leads folks to assume it is important—without knowing why.

Results of the corresponding Mann-Whitney U tests are very similar to the independent samples t-tests.

Conclusions

The study shows that the supply chain community believes CentrePort is important, but doesn't really understand what it is. People know where it is and that a new road runs through it. But beyond that, CentrePort seems to be a mystery to supply chain professionals in Winnipeg. Features of CentrePort are considered important, but people don't seem to understand these features. Thus, CentrePort management should clarify its advertising and ensure its features align with goals of the project and needs of the supply chain community.

CentrePort is advised to clarify its promotional objectives, and differentiate the message to local versus non-local customers. While affordable, secure space for lease in a public warehouse might entice local firms to move to CentrePort; municipal or provincial tax breaks could help sell firms from afar to come to Winnipeg and set up shop in CentrePort.

As an aside, the "better, faster, cheaper" (formerly) prominently displayed on its website contributes to the ambiguity of CentrePort's marketing and business development focus. The question remains: better, faster, and cheaper compared to what? CentrePort is advised to identify its competitors and answer that question. For instance, is CentrePort a better, faster and cheaper alternative to the Global Transportation Hub in Regina (see http://www.thegth.com/), for consolidating eastbound freight destined for the Greater Toronto Area (GTA) or Chicago?

Supply chain managers should study the benefits of a CentrePort location. Traditional logistics objectives focus on cost and service, i.e. minimize total cost while meeting customer service goals or maximize customer service while adhering to a logistics budget limit. Nowadays, a growing number of supply chain managers seek to maximize sustainability while considering customer service goals and budget constraints. Practitioners need to understand how CentrePort impacts cost, service and sustainability.

Lean logistics is a growing phenomenon in many organizations. While many organizations represented by survey respondents engage in some form of lean logistics, there was not much of a connection between leanness of these organizations and importance of features offered by CentrePort.

There is a critical need for better understanding of CentrePort. Including construction of CentrePort Canada Way, over $250 million of tax-payer funds have been invested in this venture in the past several years. Unfortunately, it is still unclear what the tangible benefits are, or what they are going to be, and when they will accrue. As frequently noted in the literature, private investment and direction are required for the success of inland ports. Government is advised to find a way to reduce the funding it provides to CentrePort—and to get out of the inland port "business." Policy makers should also estimate the return Manitoba and Canadian tax-payers have received for this investment.

The common use rail facility and the "5 to 55" concept are additional areas that merit further study. What types of businesses might find the common use rail facility attractive? What types of businesses are keen on the opportunity to get trucks moving at 55 miles per hour within 5 minutes of departing the terminal? What is the role of CentrePort Canada Way in achieving 5 to 55? How will it impact cost, service and sustainability of supply chains?

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