STREET TURN STRATEGY: THE EFFECTIVENESS AS A GREEN LOGISTIC TOOL FOR THE MANAGEMENT OF EMPTY CONTAINERS FOR ROAD HAULAGE IN MALAYSIA

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ABSTRACT
Purpose: This author seeks to determine whether there is a cost saving and environmental benefits if there is implementation of a new strategy like 'Street Turn' in Malaysia for container haulage operations. Design/Methodology - The sample for this study consists of companies that are involved with the haulage of containers in Shah Alam and Klang, Selangor and questionnaires were distributed to 162 road haulage company.

Findings: The effectiveness of 'Street Turn' strategy will be measured systematically looking at the cost of operation gathering after implementation and simple estimation of percentage carbon emission reduction. In addition, Statistical Package for the Social Science (SPSS 19.0) software also had used to analyse the haulage perception.

Research Limitation: The study is still new, therefore is being a lack of information supported in Malaysia and people still lack of awareness and knowledge about green logistic.

Practical Implications: The results provide insights on how Malaysia government can reduce the carbon emission and support green logistics from the road haulage industry.

Keywords: Street Turn, Depot Direct, Green Logistic, Carbon dioxide (CO2), Prime mover, Containers

Paper type : Research Paper

Introduction

In recent years, the logistics industry in Malaysia has expanded very quickly in response to the pressures of globalization. As one of the biggest industries in Malaysia, the logistics and transportation sector has the sheer size of being large enough to have a significant impact on the environment. As such, reducing harm to nature can be done by implementing a logistics and transportation strategy that is friendlier to the environment. This is a point established in a study conducted by Rodrigue, J.P., (2011), the logistics and transport industry are a major contributor to environmental issues through its various modes and infrastructures. As a developing industry, logistics and transport were seen as a golden opportunity for the adoption of more environmentally friendly practices and present a more environmentally friendly face to the world at large.

At the forefront of this development in the logistics industry is the humble container. However, transporting a container is not an environmentally friendly process. For example, in Europe prime-movers contribute up to 10 percent (10%) of the carbon dioxide emissions (CESER, 2009). As similar vehicles are used here in Malaysia for the transportation of containers, emission figures should not be largely dissimilar. Hence, "green" practices such as minimizing the movement of empty containers should be practiced in Malaysia. The industry practice of container movement in Europe largely uses two strategies which called 'Depot Direct' and 'Street Turn', these strategies are looked upon as suitable tools for the management of containers that is hauled by the prime-movers. However in Malaysia, logistics practitioners still have not implemented a similar strategy that will be the foundation of green logistics thus helping in reducing carbon emissions in Malaysia. If Malaysia truly desires to implement similar strategies

like those found in European there is no need to implement a change in the logistics network structure-that may be costly. A mere change in management can generate efficiency and effectiveness gains over a longer period of time, (Association of Malaysia Haulier, 2011). Therefore, this study is a suggestion to the government and the logistics industry to clarify which is the best strategy for implementation in order to manage the movement of empty containers.

Problem Statement

Normal operations involving the movement of empty containers, is usually identified with inefficiency, as there is a failure to maximise utilisation of both fuel and the vehicle. A study by Dam Hanh, P.I.L (2003), had found that for inbound and outbound cargo, loaded containers are picked up by haulier companies from the carrier's terminal and are delivered to the consignee for unloading. The containers then return to the carrier's terminal, usually by the same haulier company. The same practices are in place for outbound cargo. Haulier companies pick up empty containers required by an exporter from a carrier's terminal and deliver these empty containers to the exporter for loading. After a container has been loaded, a haulier company will transport the loaded container to the carrier's terminal where it will be stacked at the pier prior to loading on to a container ship. It is clear that, in the case of both export and import cargo. At least two thirds of the require container haulage trips involve empty container movements, either for empty pickup or empty return.

McKinnon, A. & Edwards. J., (2010; p. 198), said that empty journeys are not only wasteful economically, but also carry an environmental problem. They also said that, nowadays this situation is not similar because over the last 30 years the proportion of empty running by haulage in the UK has steadily declined, yielding significant economic and environmental benefits. As a conclusion, in order to solve this empty container problem, most of marine terminal companies have come out with several strategies which have been put into practices. The main thrust of these management practices is not only to reduce the problem of empty containers but also to support the principles of green logistics in managing global warming issues. One of the most popular strategy that are implemented in the United Kingdom (UK) and marine terminals in the United States of America (USA) is a combination of the "Street Turn" strategy and "Depot Direct" strategy.

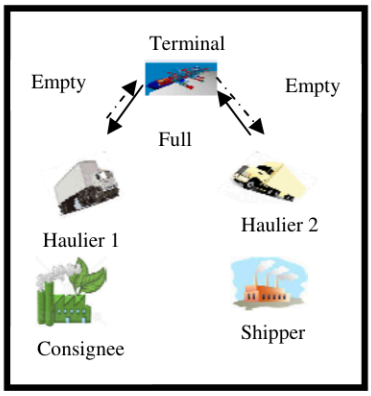


Figure 1: Depot Direct

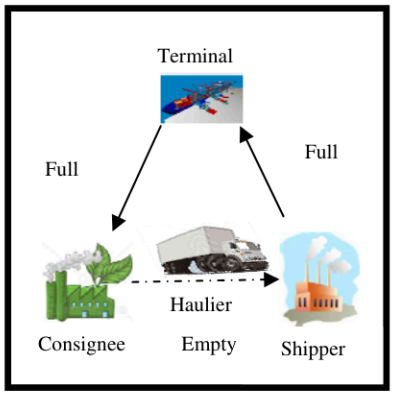


Figure 2: Street Turn

A study by Jula,H., et al., (2008), defined depot direct strategy as a normal operation of container haulage for import and export goods from the terminal, port or depot to their consumer and this strategy is suitable for the shorter distance travel. The 'Street turn strategy' defined as movement full load container haulage from the beginning and until the ending of operation and the rules for this strategy is consists of using an empty import container for export loads without first returning them to marine terminals. According to International Asset Systems (IAS), 2006, this "street turn" strategy can be made more effective by running it together with information systems that automatically updates the information about the availability and location of empty containers. Based on the street turn strategy, researchers have found that by implementing the idea of reusing empty containers, substantial reduction in related haulage trips from and to the container ports, reduction in costs can be obtained. Moreover, as a result of the study conducted by

Jula, H., et al., (2008) showed that by allowing substitution between different types of empty containers, we can further decrease the number of the haulage trips and also cost related to empty containers. In other that, by implementing the idea of reusing empty containers the traffic congestion around the container terminals can be improved and as a consequence emission can also be reduced significantly.

In Malaysia, the depot direct strategy is normally used by industry players and from the general observation this strategy is not an environmentally friendly strategy if we want to support the principles of green logistics, as it truly shows wastage in terms of fuel and carbon emissions, (Association of Malaysia Haulier, 2010). However, if there is implementation of a new strategy like 'street turn' in Malaysia for container haulage operation, the question which arises is how effective is a strategy like this to a haulier company and what is the impact to the environment? This effectiveness of this street turn strategy will be measured by looking at the cost operation after implementation (to measure the commercial impact) and simple estimation of percentage carbon emission reduction (to measure environment impact).

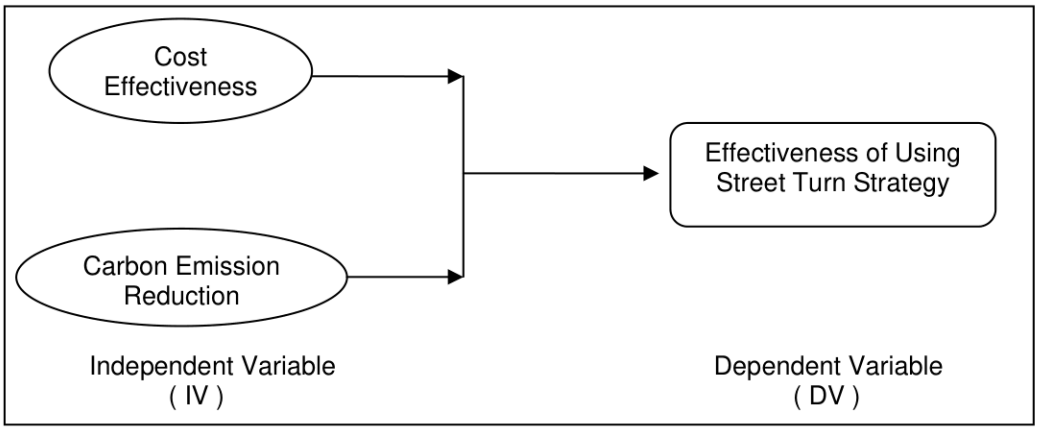
Research Framework

Measurement of the effectiveness of using the 'street turn strategy' in road haulage companies will be performed by focusing on two factors which are: Cost effectiveness and carbon emission factor. The identification of these factors has been made in previous international studies and show that these are major factors contributing to its effectiveness as tool for green logistics.

The important of cost to measure the effectiveness of Street turn strategy have been proven in studies conducted by both Dam Hanh, P.I.L (2003) and Wang, R. et al., (2008). Both conclude that, the cost control and reduction in managing empty containers have become the key aspects which influence a road haulage company's operation state. Under cost effectiveness dimension, there will be four (4) elements to support the measurement of the effectiveness of the Street turn strategy. These elements consist of vehicle impact, fuel utilization, waiting time as well as toll and road traffic.

In order to measure the effectiveness of implementing Street Turn strategy as a green logistic tool, and therefore its impact on the environment, there will be four (4) major elements that will be used in this study. The elements consist of vehicle utilisation, road traffic selection and survey, vehicle maintenance and estimation percentage carbon reduction. A selection of these elements has made by referring 'Vehicular exhaust emission modelling tree' that was included in the study conducted by Pandian et al., (2009). According to the study, Pandian and his fellow researchers noted that emission rates depend on the characteristic of traffic, vehicles and the type of road intersection. For example, engine characteristic, vehicle maintenance, condition and type of emission control equipment and age of vehicle. Based on these elements the measurement of the carbon reduction from practicing Street turn strategy is more accurate and therefore this yardstick will be used to show whether this strategy was effective as a tool to pursue the goals of green logistics in Malaysia.

Figure 3: Research Framework



Methodology

Sampling procedures
The sample for this study consists of companies that are involved with the haulage of containers in Shah Alam and Klang, Selangor. The reason for choosing this area, is because SMEs in Selangor are predominantly in the transport equipment and electrical sector (Saleh, A.L. & Ndubisi, N.O., 2006), and also there are 162 over 344 companies that involved with those activities operate here. This total number of haulage company in Klang Valley area had gathered by manually sorted after getting the list from Malaysia Logistics Directory, 2010/2011, SPAD and Association of Malaysia Haulier (AMH) for more detail, see table 3.3.

Regarding to the population, researcher will select a sample by using the stratified random sampling method, Sekaran (2003) considers this the most efficient sampling design when differentiated information is needed from the various strata within the population; purpose of using this technique is to avoid members of the population being significantly under or over represented (Hussey and Hussey, 1997). The optimum sample size was 63 determined based on the sampling table provided by Krejcie and Morgan (1970).

Table 3.3: Land Transport

Types of Company	Total Company in Klang	Total Company in Shah Alam	Total Company in Others area in Klang Valley
Container Haulier	104	21	37

Pilot testing
Once the instrument is ready pilot testing will be done to determine the appropriateness of the questionnaire. After respondents have validated the content of the questionnaire, minor changes will be incorporated into the final design of the questionnaire based upon the feedback received. To ensure consistency and reliability, a standard definition of the Street Turn system will be provided to the interviewees prior to being asked the questions in the questionnaire. Internal consistency and reliability measurement of the items will be verified by computing the Cronbach's coefficient alpha, and a minimum alpha of 0.60 will suffice in the pilot survey (Norzaidi & Intan Salwani, 2008). Around 10 samples to represent the study population will be selected for the pilot study and feedback from pilot respondents will be used to further improve and refine the survey instruments.

Quantitative
Quantitative study is more appropriate for this research because the main research problem of this thesis involves a lot of information from the road Haulage Company that cannot be qualified such as measurement of their cost operation. Besides that, researcher will use estimation calculation to calculate percentage of carbon emission before and after implementing this strategy. This calculation will base on actual data gathering from the study that has been conducted by Hasmawati, H. (2011) about the movement of heavy vehicle in Klang Valley. In addition, researcher also will use estimation formula to measure the cost of fuel for one container haulage trips per day to compare with the profit gathering from the similar haulage on that day to identify fuel utilization result. A formula that will use will be like this:

Estimation of Carbon Emission Calculation:

Component	Emission Rate and Fuel Consumption Per Mile (Mi) 1	Calculation	Total Annual Pollution Emitted and Fuel Consumed
Carbon Monoxide	27.7 grams	(27.7 g/mi) x (? mi) x (1 lb/454g)	Pounds of carbon monoxide
Carbon Dioxide 2	1.15 pounds (lb)	(1.15 lb/mi) x (? mi)	Pounds of carbon dioxide

(Sources: United States Environmental Protection Agency – EPA, 2005)

Estimation of Cost Effectiveness Calculation:

Cost Effectiveness = toll cost + maintenance cost + fuel cost (Zoetermeer, 2010).

Results

The findings indicate that the majority haulier perception in Malaysia agreed that Street Turn strategy can reduce cost operation. However they do not agree that carbon emission can reduce from this strategy based on several factors such as driver behavior. Therefore, estimation calculation had done to confirm this result. Based on the results gathered in the final stage estimation calculation analysis, it was truly showed that Street Turn strategy is more effective because the total amount of cost faced is lower (RM 35,700) compared to depot direct system RM 40,987.50. The difference for this amount is quite higher by RM 5,287.50 (12.9%) and based on this amount it was proved that by implement and practices this strategy road haulage company can reduce their operating cost and will generate more revenue for their company.

This result had supported by the previous study that's shown the effectiveness and efficiency implementation of this strategy can reduce the cost. Such as the study that had conducted by Chang et. al., (2006), the authors conclude that a cost reduction in the range of 5% to 46% is attainable, if a combination of the container types in the supply and demand nodes is found by dealing with the empty container reuse strategy. Even though, for the medium company the cost under street turn is a little bit higher than depot direct but the different amount is just RM 425 and this amount is still under consideration and can be covered by the profit gathering based on the number of trips can be run.

Besides that, the measurement of reduction carbon emission had used the formula from (EPA, 2005), the range of the total carbon monoxide and carbon dioxide for these three categories (small, medium and big company) under the street turn strategy and depot direct strategy is too small which are 0.45kg of carbon monoxide and 8.41kg of carbon dioxide. Based on literature result in carbon emission reduction by practicing the Street Turn strategy, the Tioga Group Study, (2002), provides an excellent source of reference on the logistics of empty marine container. The study covers issues such as empty container logistics and flows, the potential for empty container reuse, off-dock empty return depots and depot-direct-off-hires had shown the result of carbon emission reduction 1.04 tons per annually (12.26%) for the potential empty container reuse strategy implementation. In addition, Jula et. al., (2006) study had shown an empty container reuse will have significant environmental effects. It will reduce the traffic and congestion around the ports, which in turn reduce noise and emission.

As a conclusion, from this result it had shown that percentage of cost had reduce is quite high. In addition, there is also having a carbon emission reduction even though the percentage is too small but it still can be improved in the future. The comparison between haulier perception and simple estimation calculation indicates that the proposed tool represents a promising instrument to improve its current decision making process, yielding significant savings in cost operation by trucks. Human skills alone are not sufficient to manage such a multitude of information efficiently and, therefore, cannot ensure a rapid and effective solution for such a complex issue. Moreover, the effectiveness of this strategy will also yield benefits of the final cost of goods, while reducing traffic problems and related environmental impacts

Conclusion and Future Research

Previous studies show that the implementation of "Street Turn" system for ocean carriers, shippers, and trucking companies result in greater equipment utilization, improve operating efficiencies, and reduce empty container mileage. Other than that, terminals can alleviate congestion and its associated problems. Considerable environmental benefits are also attainable, in the form of reduced truck traffic and diesel emission. Besides that, it had significant potential to reduce congestion in port terminals, rail ramps and inland container depots, to lower ocean carriers' and tracking companies' costs of dispatching empty containers, and to create greater efficiency for shippers.

This current study of the "Street Turn" strategy determined how much less impact a truck operating in the Shah Alam – Port Klang area of the Klang Valley will have on the environment if the container was managed by the 'street turn' strategy. If the data supports what many already believe to be the case, 'street turn' will be a revolutionary new way to manage the transportation of empty containers in Malaysia and will have a big role to play in traffic reduction, fuel saving, expanding the life span of vehicles due to less wear and tear as well as increasing the revenue of stakeholders in the road haulage industry.

In future research, it is the suggestion of the researcher that more studies be done on an experimental design and detail calculation to determine which problem characteristics lead to the largest cost and carbon emission saving . Next, future research will focus on solution methods for larger problems and on the extension of the models presented in this study.

Since this study focuses only on one industry, future research would be useful to test this strategy to others sector of logistics and transportation such as public transport sector focuses on buses.

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References

Aronsson, H. & Huge Brodin, M. (2006). The environmental impact of changing logistics structures, *International Journal of Logistics Management*, vol.17, no.3, p.394.

Belmecheri, F., Cagniart, T., Amodeo, Lionel, Yalaoui, F. & Prins, C. (2009). Modelling and optimization of empty container reuse: a real case study.

Bleijenberg A. (1998). Freight Transport in Europe: in search of sustainability, Delft: Centre for Energy Conservation and Environmental Technology.

Byrne P. & Deeb A. (1993) "Logistics must meet the 'green' challenge", Transportation and Distribution. Feb. 33-35.

Caplice, C. & Sheffi, Y. (1994) 'A review and evaluation of logistics metrics' *International Journal of Logistics Management,* 5 (2).

Cox, J. A. & Hickman, A. J. (1998). Aggregated emission factors for road and rail transport. Vol. 23.

Crainic, T. G., Gendreau, M., & Dehjax, P., (2003). Dynamic and stochastic models for the allocation of empty containers. Operation Research 41: 102-26.

Hanh, L. D., (2003). The Logistics of empty cargo containers in the Suthern California region. Techinical report, Metrans Report.

Jula, H., Chang, H, Chassiakos, A. & Loannou, P., (2008). Empty Container Reuse. *Intelligent Freight Transportation,* 211-227.

Larsson, F. E. & Bernal, D.V. (2010). Green logistic in temporary organizations: A paradox? Learning from the humanitarian context.

Li, J. A., Liu, K., Leung, S. C. H., and Lai, K. K. 2004. Empty container management in a port with long-run average criterion. *Mathematical and Computer Modeling* 40:85–100.

McKinnon,A. C. (2007). A Review of the British Government's Transport KPI Programme. Synchronised *Auditing of Truck Utilisation and Energy Efficiency*, 5.

Muller E.W. (1990) "The Greening of Logistics" Distribution, January, 27-34.

Murphy, P., Poist, R.F. & Braunschweig C.D. (1994) "Management of Environmental Issues in Logistics: current status and future potential". *Transportation Journal*, 48-56.

Nash, C., Mathhews, B., Menaz, B. & Niskanen, E. (2003). Charges for heavy goods vehicles: EU policy and key national development. *Institute for Transport Studies*, 1-17.

Pandian, S., Gokhale, S. & Ghoshal, A. K. (2008). Evaluating effects of traffic and vehicle characteristics on vehicular emissions near traffic intersections. *Transportation Research Part D*.

Pisinger, D. (2009). Special Theme: Toward Green ICT. ERCIM NEWS 79.

Rodrigue, J.P., (2011). The Geography of Transport Systems. Dept. of Global Studies & Geography, Hofstra University.

Sandrio, S. (2008). Carbon conversion calculator methods report. *Intelligentsia International*.

Shen, W.S. & Khoong, C.M. "A DSS for empty container distribution planning", *Decision Support Systems,*Vol. 15, No.1, pp75-82, 1995.

Temmermans, J. M., Matheys, J., Mierlo, V. J. & Lataire, P. (2006). Environmental rating of vehicles with different fuels and drive trains: a univocal and applicable methodology. *European Journal of Transport and Infrastructure Research,* 6, 313-334.

The Tioga Group, (2002). Empty Ocean Logistics Study. *Technical report, submitted to the Gateway Cities Council of Governments. California, United States*.

Wang, R., Zhao, X., Yu, W. & Zou, W. (2008). The study on empty container allocation in the container transportation.

Sekaran, U. & Bougie, R. (2010). Research methods for business: A skill building approach. 5th ed.