

Evaluation of Logistics Centers Establishment: Financial and Non-financial Factors

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ABSTRACT

Purpose: The aim of this paper is to present all influential factors which should be considered regarding LC establishment evaluation. The second purpose is justification of why these factors should be taken as influential.

Methodology: this study followed a literature research approach in exploring LC establishment evaluation process. Even though, interviews with industry experts were done to navigate the study in right direction, they did not presented directly in this paper.

Result: Factors in evaluating a LC to be established or not include not only financial factors but also non-financial ones which are usually neglected in assessment process. Financial factors encompass establishment costs and revenue. The non-financial factors are identified as enhancing environmental friendliness and traffic congestion alleviation.

KEYWORDS: logistics center, establishment, evaluation, financial factors, non-financial factors, environment, traffic.

1. INTRODUCTION

About 30 years ago in response to globalization, elimination of border crossing and worldwide production the concept of logistics center (LC) appeared to develop efficiency in logistics and supply chain management. LCs absorb more attention as they gear with three important principal of logistics: infrastructural planning, quality of transport and inter-modality [9].

There are different definitions for a LC. Not surprisingly, definition of LC is under the influence of temporal and spatial context. As time went on the definitions are complemented. For example, some functions like vendor management which did not exist in the past added to the definition of LC currently. An example of spatial context is: the traditional Scandinavian definition of LC is different from its American definition [12].

What is meant in this paper as a LC is presented in the following sentence. A LC according to EUROPLATFORMS EEIG report in 2004 is defined as a hub of specific area where all activities relating to transport, logistics and goods distribution_ both for national and international transit are carried out on a commercial basis, by various operators [8].

There are other synonyms for logistics centers like freight Village and transport center. The rationale behind all of them is the same even though there are some minor differences in details. According to Meidute logistics center is the most appropriate word and a proper representative for what is meant by it [12]. Therefore, the authors will use the word logistics centers in this paper.

Establishing and operating a LC is associated with high costs. The most expensive part of logistical activity is cargo handling which took place inside of LC [4]. Amount of investment in LC is high in a way which is not usually affordable for private companies. Therefore, bank loans and public participation is used to compensate capital insufficiency. High amount of investment shows the criticality of establishment evaluation and this is a significant driver for a LC cost-benefit analyzes.

For a LC to be justifiable to establish, establishment costs should be compensated somehow in future by benefits otherwise, it is a lost. There are different opinions between researchers regarding what are LC benefits. There are some researchers who have a strict financial perspective and see LC benefit just as revenue [14, 20]. In contrast, there are others who have non-financial point of view. For say, Kia see the main benefit of LC as enhancing environmental friendliness [11]. In addition, Taniguchi see the main purpose of establishing a LC to alleviate traffic congestion [18].

However, the authors of this paper believe LC cost compensation should be seen from different angles including financial, social and environmental. All of these angles are important and have to be considered in

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analyzes. For example, a given LC which is not justifiable financially have not to be ignored. Because maybe it has environmental benefits as much that cover the whole financial lost. Therefore, it is rational to establish such a LC.

Authors believe traditional costs and revenue evaluation is not credible anymore, since the only benefit of a LC is not financial. Other benefits of LC along with revenue are identified as traffic congestion alleviation and increasing environmental friendliness. In the other words, in evaluations, costs of establishing a LC is placed versus not only the revenue but also benefits from traffic alleviation and environmental impacts. What is discussed here is summarized in the formula below.

LC benefit = financial benefit + non-financial benefit - costs [Formula 1. LC Profit formula]

Shortcoming which is sensible here is difficulties regarding quantifying environmental, traffic and material delivery effects. In case of quantifying aforesaid factors the abovementioned formula is presentable numerically. In the case that indirect benefits are not quantifiable for any reason, like lack of resource or lack of time, they should not be forgotten and qualitative methods have to be used to embed them in analysis.

2. LC establishment factors

In this section factors which are influencing establishment of LC _and showed in formula 1_ are categorized. Under each heading firstly a brief background is presented then it is explained why they are considered as establishment factors. In some cases explanations regarding how to determine and controversial perspectives associated with them are presented.

2.1. Costs

As it is discussed for establishing a LC a huge amount of capital should be spent. Providing this amount of investment is always a challenge. There are different ways to provide needed capital. The capital could come from a public or private entity or even as a result of a cooperation between both of them which is depend upon decision making criteria of each entity. The public entity makes its decision to invest in a new LC based on socio-economic evaluation. However, the private entity makes decision based on return on the investment. The return on the investment is dependent on fixed and variable costs also the revenue of the LC. The revenue is the fair-minded by location, markets relation with LC and the use of service offered [13].

Categorizing costs to establish a LC there are two different classes of costs: fixed and variable costs. The fixed costs for establishing a LC include the cost for land acquisition, construction and equipment acquisition. Basically, fixed costs are dependent on the size of the LC.

Variable costs are related to operation of a LC and associated with the amount of service usage. This category of costs encompass staff salaries, technical infrastructure, energy bills and insurance. Usually, fixed costs are much more considerable in compare with variable costs [20]. What is discussed in this paragraph is summarized in the simple formulas below.

LC costs = fixed costs + variable costs [Formula 2. LC costs formula]

Fixed costs = land acquisition costs+ equipment acquisition costs+ construction costs [Formula 3. Fixed costs formula]

Variable costs = staff salaries + technical infrastructure costs + energy bills + insurance [Formula 4. Variable costs formula]

2.2. Revenue

The amount of revenue is a driver of selling services which LC provides customers with. To gain a proper revenue LC service assortment should fit logistical need of market. Also, it is important to sell services with the best possible price. The best possible price is not necessarily the cheapest price however it's the combination of cost and presented service [20].

To identify market needs and best price, the market should be analyzed. There are a lot of models to evaluate the market conditions like the one by Porter and the other one by Meidute [14, 16]. Regardless of minor contradictions these models overlap in the main points. Positive results of market analyzes shows possibility of gaining a reasonable revenue.

Between all models which categorized LC services the one by Meidute (2007) is the most appropriate for this study. She suggested that the revenue in a LC is generated by 5 situations: rental of warehouses, storage spaces and offices; rental of all outdoor spaces for cargo placing; concession of the hotel and restaurant exploitation; fee on the revenue of the gas station; charges for operation of the Intermodal transport terminal. The revenue from first three situations is matter of rent and all of them will be considered in a category of rental revenue. What is argued in this paragraph also is presented in the formula below.

LC revenue = rental revenue + gas station revenue + intermodal operation revenue [formula 5, LC revenue formula]

In addition to selling services there are other means which are promoting profitability in a LC as such, economy of scale which means cost effectiveness by handling high volume of cargo, for example transportation costs decreases per unit as volume increases and optimization of inventory costs [19].

The extent to which revenue in a LC is produced is associated with infrastructure inside of LC; the area of the port, capacity of terminal, number of cranes, number and length of docks, the cargo loading and discharging time [1]. As they increase firstly, the amount of cargo which is handled through LC increase. Secondly, the speed through which the cargo comes to LC and passed from LC to final destination will be increased. This way productivity of LC and consequently profitability of it will be increased.

2.3. LC location and size

The matter of location is expressed here because it to a great extent determines LC revenue, fixed and variable costs. Facility location determination especially LC location optimization and complexities in this vein were always a matter of interest and were explored by several researches. For example difficulties in this vein is studied by Drezner and Daganzo [6, 7]. It is tried to present an acceptable model for optimizing location of LC by Taniguchi and by Noritake and Kimura [15, 18]. Also, different mathematical methods like AHP and PROMETHEE are applied to solve LC location problem.

There is a consensus between researchers regarding the issue that, a LC should be located in a way that generates a rational trade-off between costs and revenue. This trade-off materialize through placement of LC in a way which capable it to attract more amount of cargo which generates more revenue and exceeds LC costs in the given place in a satisfactory manner [5, 11, 13]. Furthermore, LC location have to have needed infrastructure and the potential of inter-modality [1].

It is suggested that site location determination should be done with respect to two parameters: traffic attraction and type of cargo [13]. These parameters will be analyzed in two different levels: macro-level and micro-level. The purpose of the macro-level is the estimation of traffic attraction by LC and there is not any boundary limitation. The next step is micro-level which is engaged with determination of boundary limitation.

Boundary limitation or in the other word size of the project is determined by type of cargo which will be handled inside of LC. Type of cargo presents what LC needs to perform. The needs identify the services that LC should present to satisfy these needs. The services in logistics centers are related to warehousing, storage, banking, hotel, security and etc. given a specific service the corresponding size of the building, type of equipment and needed personnel is possible to be determined. Other researchers like Bowersox supported this perspective [4].

2.4. Environment and traffic

Two side-effects of transportation are traffic congestion as a result of vehicle movement and adverse effect on the environment as a result of vehicle emission. Two issues of traffic and environment are closely linked together considering that more traffic produces more emission. Traffic and emission cause congestion and pollution respectively. That's why these two issues will be discussed together.

Traffic problem in urban areas is attributed mainly to increasing unnecessary vehicle usage. Part of these unnecessary vehicle usage is attributed to movement of half empty trucks inside the city areas to frequently satisfy customers' needs. Traffic congestion not only cause wasting time and anxiety of city population but also it cause wasting energy.

Transportation affects environment by taking lands which are needed for developing the infrastructure and cause air and noise pollution. Transportation, also, have controversial economic and social effects [3]. The environmental impact of the transportation differentiated into three different sectors: air and noise pollution and other environmental pollutions for local people; collateral externalities like acid rain; effect on global complexities like global warming.

Using transportation systems results in greenhouse gases emission. Among these greenhouse gases are O₃, SO₂, CH₄ and CFCs which affect ozone layer and increase global warming [2]. The matter of global warming is recognized as the most unprecedented and challenging issue of earth inhabitants. Since it cause a broad range of issues like increasing the intensity of storms, increasing sea levels, increasing air and ocean temperatures and etc [2].

Reviewing the literature it is concluded that using LC can decrease truck transportation and consequently emission which leads to traffic alleviation and less pollution, respectively. This way establishing a LC is in accordance with sustainable development which is defined as developing economic opportunities according to environmental and social concerns [17]. These concerns are achievable through three methods which are: inter-modality, increasing vehicle efficiency and locating LC close to express ways.

Vehicle efficiency

Efficiency here means using less number of trucks to do same amount of distribution work. Environmental concerns and traffic issues could be improved by LC as maximizing the efficiency of distribution vehicle number.

It is argued using LC provides possibility to implementation of advanced information systems that in turn helps to implement algorithms and heuristics which improve scheduling system and makes the distribution of truck delivery more efficient. Also, Given a LC which serves a number of projects, aggregated demands of some projects could full a truck in each delivery and consequently develop efficiency [18].

Locating LC close to express ways

Also, it is argued that if a LC is located outside city area and close to expressways, it can shift traffic from crowded inner city areas to expressways which usually have a fluent traffic [18]. Using this technique not only decrease city overcrowding but also transfer emission to countryside making cleaner inner city environment.

Increasing inter-modality

Reducing energy usage in transportation sector is usually concentrated around mode-based approaches [11]. It means, avoiding energy intensive modes like truck and shifting toward energy efficient modes like train and sea transportation. Considering LC as a mean of developing inter-modality, it cause more degree of environmental friendliness as a result of shifting toward cleaner transportations.

Categorizing different transportation modes from the amount of pollution perspective sea transportation is the lowest polluter. The most pollution comes from truck transportation and rail transportation stands between road and sea transport [10]. In this perspective it looks wise to shift transportation from road transport toward rail and sea transportation to be more environmental friendly.

Of course inter-modality not only boost being environmental friendly, but also, it transfers a significant amount of traffic from roads toward sea and rail mode. However, there are barriers for this shifting method. Double handling of cargo and stevedoring are two hinders of sea transportation which are undermining benefits of this type of transport. Lack of infrastructure is the main barrier for rail transport.

3. Conclusion

The unique features and characteristics of the LC as a transport infrastructure, make its planning and evaluation process significantly different from road and rail infrastructure evaluations. As a result, a specific and unique method should be taken to satisfy LC specific demands.

The methodology developed here was a new method for evaluating LCs establishment. This methodology can help peoples in industry to make a proper decision about LC establishment. Also, presents a proper fundament for academy to thrive regarding what is presented in "Future studies" section.

This study identified four factors which should be taken into account in establishment assessment: costs, revenue, traffic congestion alleviation and enhancing environmental friendliness. Consideration of all factors allows gaining maximum benefit financially and non-financially.

Unique with this study is consideration of non-financial factors equal with financial ones in evaluation equation. This consideration could be both quantitative and qualitative. The significant point is that non-financial factors could also have positive financial outcomes which are sometimes far from the mind. For say, inter-modal transport is both cleaner (non-financial) and cheaper (financial) than truck.

The identification of LC location is recognized as a matter of importance in this paper since it influence all financial factors. LC location contributes to cargo attraction which enhance revenue and affect variable cost. The extent of cargo attraction, also, influence size of LC which in turn affect fixed costs of LC. This way LC location manipulates all the monetary factors.

3.1. Future studies

In this study in addition to revenue, non-financial benefits of LC: increasing environmental friendliness, traffic congestion alleviation and efficient material delivery, should be compared with LC costs. However, at the moment there is not any model which quantify these non-financial benefits precisely and ideally in monetary manner which could be summed to revenue and compared with costs. Future studies can concentrate in this shortcoming. Also, studies can concentrate on uncertainties regarding supply and demand fluctuation in short and long-run which affect all aforesaid factors.

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