Performance evaluation methods for urban freight distribution chains: a survey of the literature

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Extended abstract

Objectives and motivation

The concept of evaluating freight transport with performance measures has gained the attention of both transport and logistic operators and policy makers. This consideration is further increased in the last few years due to the need to decrease the transport external costs, to take into account new activities/patterns of consumption by citizens, to make the transport activities more sustainable etc.. All these aspects are are even more important if the urban context is considered, affected on turn by the increase of the demographic and urbanization process, the congestion of the main routes, the diffusion of pollutant emissions and related deterioration of air quality and human health.

There exist a vast international literature in measuring the transport performances aimed in designing systemic and balanced performance measurement systems or flexibility measurement approaches.

In this paper, the literature of approaches, techniques and indicators for chain performance evaluation of urban freight distribution activities are reviewed and described highlighting both advantages and disadvantages. To complement, for each performance evaluation method an application thorough a case study is illustrated. To do it, related studies appeared in the international literature are gathered and analyzed. The paper responses the following research questions:

1) Which performance evaluation indicators are mainly applied?
2) Which performance evaluation methods were prevalently applied?

The critical state-of-the-art of the literature allows to put some lights on the definition of a good practice framework to measure and evaluate the freight distribution chains’ performances with performance indicators.

General description

Urban cities strongly depend on freight transport networks that facilitate the massive flow of goods to, from, and within it. However, congestion, pollution and noise caused by the urban freight transport produce external costs and reduce the livability and accessibility of cities. Due to strong competition and increasing consumer demands, becoming over time also more demanding, transport companies try to reduce costs while simultaneously improving efficient consumer response. This leads to centralisation of warehouses and an increase in transport distances and frequency with an inevitable change in their performances. Every successful organisation needs to manage its assets effectively and benchmark its performance against that of its direct competitors. There are significant environmental pressures on operators in terms of engine emission limits, maximum noise levels and delivery restrictions placed on many retail sites.

The development of freight performance indicators is emerging at the local, urban, state, national and European level. Measuring the urban transport distribution system is needed in order to improve logistical performance and reduce external impacts at the same time. However, the government agencies, the private sector and the citizens have to work together to address problems as mobility, reliability, safety, security, infrastructure management, environmental impacts, sustainability and economic growth; many actors involved with different needs, activities and features. This is more complex if the whole supply chain is taken into account. Production or distribution firms do not operate in isolation but increasingly within logistics chains whose commercial success does not depend only on the decisions that they take on, but also by the decisions of other members of the chain. The transfer of information, sharing of issues, coordinated research decisions and the level of integration achieved are some of the elements that determine the success of a chain. This integration level is at times so high that one cannot talk of competition between individual firms but of competition among supply chains. For this reason it is is even more important, both for private operators and for public operators, understand how to operate a distribution chain, identify the role played in it by each actor and evaluate the overall performance of the chain in terms of profitability, risks, efficiency and effectiveness. This applies even if one wants to understand and improve the functioning of the urban distribution of freights.
Measuring the performance of an entire logistics chain (including supplying, procurement, production and distribution) or only a part of it, as in the case of the distribution chain confined to the urban environment, it is unfortunately not a simple operation which in the literature has been discussed for at least twenty years without coming to conclusions unanimously shared.

Various methods have been proposed to tackle the problem. A possible preliminary classification of evaluation models mainly used in the literature to analyze a logistics chain, is the following: the Balanced Scorecard, the Supply Chain Operations Reference model, the Logistics Scoreboard, the Activity-Based Costing, and the Analysis of the Economic Value.

**Results and conclusions**

The paper reports a critical analysis of the literature on performance evaluation methods for urban freight distribution chains. Results will be displayed taking into consideration that: *i)* the indicators are by nature complex and heterogeneous: some are quantitative (physical, financial or monetary), others are qualitative (timing and speed of processes, degrees of satisfaction, quality of processes). Their comparative evaluation is therefore difficult, operating on different dimensions; *ii)* the type of distribution, to be sustainable in the long term, should be satisfactory for the various actors involved, namely, the companies involved (manufacturer, wholesaler, retailer, transport operator), customers and local authorities. For each of these actors are identified specific metrics; *iii)* the decision-making process and the changes to be made must involve all stakeholders; and *iv)* any assessment model should be understood as a continuous process of refinement of distribution practices to which most actors are well possible that participate.

**References**


**Keywords**: performance evaluation; freight distribution; performance indicator.