Precision Logistics in Retailing

The elimination of wasteful efficiency

Ton van Asseldonk/November 2010

Introduction

At a speed of less than 5 km per day, goods travel nearly four times the net distance: millions and millions of excess truck kilometres are covered, producing close to 200,000 tons of potentially unnecessary CO_2 emissions.

This is the picture that emerges once we compare the performance of a particular food retail logistic system with the theoretical best practice. These are startling statistics for a 'fast moving consumer goods' business in a very cost sensitive environment. In this business, all players supposedly strive for better market- and cost performance in a consistent manner.

These findings are the result of an in-depth investigation into the retail goods flow of a sizable and representative grocery retail company in the Netherlands.

While the results are quite stunning, Ernst von Weizacker (Weizacker & Lovins, 1997) already revealed similar phenomena in 1997 pertaining to yoghurt products in Germany. Many other examples of similar apparent wastefulness of resources can be found in his book 'Factor 4'.

An interesting paradox arises: while everyone is trying to achieve ever more efficient and better performing processes, we seem to remain far away from the best imaginable result. Efficient? Perhaps within the current context of possibilities. Apparently much of this efficiency is wasted: not with intent, not by design, not by lack of information, but because of how contemporary logistical thinking has developed over time, bearing all the characteristics in mind of central planning and control that are so characteristic for a 20th century industrialized society.

It may yet be very worthwhile to question this system logic, not only from an economic performance point of view (as long as everyone is locked up in the same system this might not be a prime consideration), but especially and increasingly from a sustainability point of view. In addition, the shortage of road capacity might be another prime driver in countries like the Netherlands.

In this article we develop a new perspective on the system configuration to cope with this problem and make a substantial part of this 'wasteful efficiency' accessible; at least from a theoretical point of view.

We will first describe the basic characteristics of the current retail logistics system. We will explore the root causes underlying the apparent system lock-in in its current configuration. We will reason the core attributes of change towards new configurations and illustrate these principles with a conceptual model of a new world in retail logistics.

Is such a concept realistic? We think it is. A centuries old example, founded on the same principles, still exists today and is working fine: the supply of hot meals to hundreds of thousands of workers in the Mumbai area: the DabaWallahs.

But let us first explore the current state of the art in retail logistics.

State of the art

In a food retail chain two main streams of products are normally distinguished: fresh goods and dry groceries. Fresh goods are transported to shops as quickly as possible (in order to maximize the sales window), dry groceries are distributed by a sophisticated logistical process based on industrial principles (planning, batching, scheduling, etc). In this article we only examine the dry groceries flow.

Figure 1: Long route to nearby shop

Suppliers normally deliver their products to either regional distribution centres (RDC's) or to a national distribution centre (LDC). Most retail companies employ a small number of RDC's (the company we did our research on has three) and one LDC. Most 'fast movers' are delivered to the RDC's, 'slow movers' to the LDC, and then subsequently from the LDC to an RDC upon shop requirements.

This implies (see figure 1) that products (let us take slow movers) travel from the supplier to the LDC, from the LDC to the RDC, and from the RDC to a shop. Should such a shop be in the neighbourhood of the supplier dispatch location, the difference between the actual path the product travels and the shortest (road) connection between supplier and shop is obviously substantial. On top of that, the truck returns empty in most cases.

Yet, only **bringing** the products to the shop (in whatever way) is creating value for the client. All other costs (like the excess kilometres through the system and the return kilometres) are unnecessary costs, seen from the perspective of the client. Pending a cheaper alternative, this is the best practice in cost/performance terms. Industrial organizations presume that using the LDC/RDC system provides the best solution (cost wise) for this type of distribution.

'Factor 4' performance

Von Weizackers' 'Factor 4' relates to the ratio between the actual resources used (in this case for example the colli-kilometres travelled by goods) versus the minimum required to create the expected value and satisfy the client needs.

Period	April-september 2009
Articles	7822
Suppliers	354
Shops	268
DC's	4
Tracks	1770
Orders (inbound)	305.000
Orders (outbound)(Drops)	23.000.0000
Colli	32.410.405
TTL Colli Km	5.900.000.000

Figure 2: Scope and size of data-analysis

The first interesting result produced by our research into this dry groceries distribution system is that the 'F4 Factor' in this particular case proved to be '3.6', a figure quite close to Von Weizackers findings. But in this case not only for yoghurt, but for over 7800 products from over 350 suppliers, for close to 270 shops throughout the country, measured over a six months' period, totalling nearly 6 billion Colli-Kilometers (see figure 2).

This is not an exotic or isolated incident, but a key characteristic of the current system configuration.

In order to make this calculation we had to trace back every product movement to the level of the individual packing slip. An analysis of the data in the ERP system showed only aggregated data which is of no use for this kind of analysis. This method demonstrates why a normal financial analysis will not show this 'wasteful efficiency'.

Although other food retailers might have slightly different setups for their dry groceries logistics, the basic system configurations are rather similar. We therefore expect other retailers to have F4 Factors with similar values.

Value Potential

The current configuration of the goods distribution system does not only introduce a substantial excess mileage, it also slows down the goods flow. On average dry groceries remain in the chain for **over 20 days**, half of which in distribution centres, half of which on the shop shelves.

The shop acts to a large extent as an (expensive) storage space, wasting the opportunity value of that space. If unnecessary stocks (from product availability point of view) could be exchanged for more and diverse products, the shelves could be filled by a newer (and mostly higher-margin) product range. That in itself represents a significant value opportunity.

Translated to a national (Dutch) scale, this represents an opportunity in the order of:

- € 300 million in transportation cost savings
- 180,000 tons of 'avoidable' CO_2 emissions
- € 600 million in opportunity value

So the incentives are very high, both for the sector (in economic terms) as well and for the country from the perspectives of sustainability and road capacity.

A metro for goods

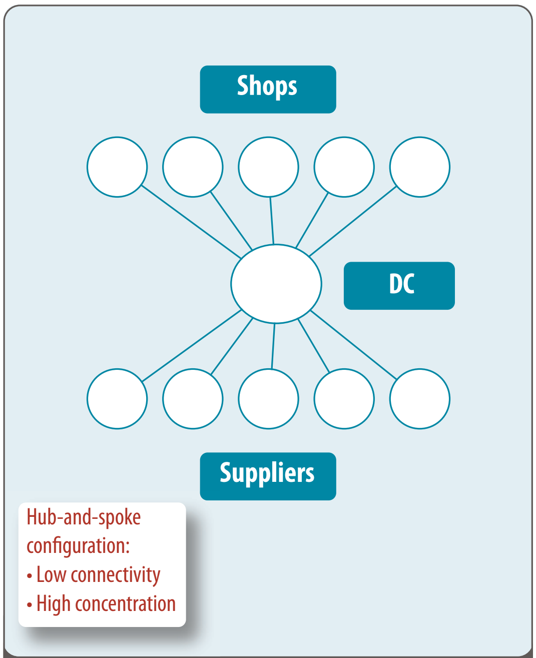

Figure 3: Schematic drawing of 'Industrial' (hub-and-spoke) goods flow

To develop an alternative perspective let us consider the London Underground as a logistics system. Morphologically the system is not very different from a food distribution system in the sense that from many different places of origin 'units' (in this case people) need to be transported to a wide variety of different destinations.

In principle every person could use his own means of transport (e.g. car, taxi, etc) but this rather simplistic logistical setup would be very wasteful indeed in terms of resources used.

If however, we were to treat this as an 'industrial' logistical problem, we would try to group and move people in a batched mode from one location to another. As these people have no intention to be grouped nor batched, this is unlikely to ever be possible, even if our system intelligence would be large enough to organize the problem in the first place.

So in reality the problem is solved in a completely different way. We have created a system with a very high connectivity (both in terms of physical points to be connected as well as in terms of the connection frequencies). This connectivity is not channelled through a small set of concentration points.

On the contrary: the pathways intersect and connect in a large number of places allowing ample interconnectivity between various lines. And last but not least the intellectual ability of passengers to navigate themselves through the system is part of the design.

Metaphorically it is the difference between a roundabout solution in car traffic in comparison with traffic lights: on the roundabout intelligent people are interacting with the system and each other, rather than be told what to do by traffic lights.

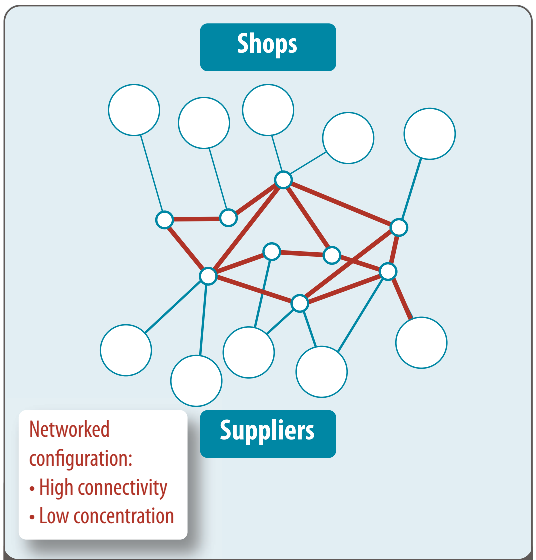

Figure 4: 'Metro' type goods flow

This high-connectivity and high-intelligence-actor configuration is almost the exact opposite of the characteristic of an industrial setup, which is a low-connectivity and low-intelligence system.

In order to estimate the potential impact of such a conceptual revolution on the F4 factor, we have used the Dutch railway grid as a 'Metro for Goods'. In fact any grid could be used (including the motorway grid), but the railroad grid nicely reflects the differences in demographics and economic activity on one hand, and has distinct (inter) connection points (stations) to allow for interconnectivity.

Figure 5: 'Metro for Goods'

If we were to assume the products to be sufficiently 'intelligent' to navigate themselves through the system (e.g. by using RFID technology which allows for routing at the crossconnection points), these products could use ad hoc transportation to the nearest station, route themselves through a grid, and again use ad hoc transportation to arrive at the specific shop.
When we make the F4 calculations for this configuration (obviously including the kilometres for the local loops and return/netting transportation) the F4 factor proves to be 1.73! This is less than half the existing situation, which proves the superiority of a high-connectivity and high-intelligence actor configuration.

DabaWallah

Figure 6: DabbaWallah food distribution in Mombai

Before anyone claims that 'it is theory which cannot be done in practice'; living proof has existed for ages: the DabbaWallahs in Mumbai. For the past 112 years every day millions of meals are distributed by a not dissimilar system. Using a largely illiterate (but a relatively well paid workforce), achieving almost 100% accuracy, for $5/month! No planning, no scheduling, no computers. Just a few simple rules and a code on the boxes to route the meals through the system (and return the empty boxes).

For today's heterogeneous and unpredictable markets the industrial system is just not good enough anymore. It appears to be efficient but it is not: it is wastefully efficient. It suggests speed but it is slow. On top of that it wastes resources and prevents us from exploiting the full value potential. The concept described in this white paper revolutionizes food products distribution from 'average logistics' to 'precision logistics', as a tool towards 'precision retailing'.

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