

## QUANTITATIVE ANALYSIS OF PHYSICAL DISTRIBUTION NETWORKS WITH APPLICATIONS

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There is a growing interest in improving the efficiency and effectiveness of international distribution networks. This is in particular true in those situations where one is considering the outsourcing of (parts of) the distribution function to service providers in the areas of warehousing and transportation. But the interest is also caused by the recent and upcoming simplifications in border-crossing traffic within the European Community which make it attractive to reconsider the country-for-country approach, followed by many multinational companies, by concentrating stocks in supra-national distribution centres. This implies that in most situations strategic and tactical decisions have to be made with respect to changing the set up and operation of the distribution function.

On the basis of earlier research done by members of our consultancy group and recent experiences in a number of consultancy projects, we are developing a quantitative analysis framework to support this decision process. In this paper we describe the framework and highlight some aspects by examples from practical situations within a multinational electronics company.

The objective of the quantitative analysis framework is to support the evaluation of quantitative performance measures in the areas of customer service levels, goods flow volumes and transportation, warehousing and stock holding costs for different distribution network scenario's. Important scenario characteristics are e.g.

- (1) market demand,
- (2) location of production centres and stock points,
- (3) stock replenishment policies,
- (4) transportation modes and associated costs and lead times,
- (5) product portfolio,
- (6) interest, obsolescence and price erosion factors,
- (7) warehousing and stock holding costs,
- (8) and product flows defined by distribution channels and customer service offers.

The analysis will yield insight in how the distribution network should look like and how it should be managed. This insight will lead to recommendations on where to locate stock points, how to replenish stocks, and how to distribute products from production centres through stock points to customers.