

# Foreword

Industrialized societies cannot exist without powerful transport networks. The quality of such networks can be measured along many dimensions: time and cost efficiency, flexibility, and reliability, to name a few. However, in the scientific literature the design of networks is primarily discussed under the objective of cost minimization. Furthermore, it is regularly assumed that all necessary information for the optimization is available, while in real life strategic network design decisions this is hardly the case. Thus, the usual assumptions of strategic network design models do reflect real life conditions only to a limited extent.

To overcome this discrepancy, strategic information about the relation between the structural and procedural shape of transport networks and their performance is essential. In this context the centrality of a network should play an important role as key element of network design. Based on these thoughts, Anne Paul formulates two objectives for her dissertation: “firstly, to conceptually devise the relationship between centrality and network performance in order to emphasize the outstanding importance of network centrality for network design, secondly, to suggest quantitative measures for transportation network centrality”.

These objectives are fully achieved. Based on the precise definition of network centrality, Anne Paul links convincingly and for the first time the previously separate ways of thinking of network topology and network concentration. The centrality of transport networks is identified as overarching factor for network design. Established concepts as the exploitation of consolidation potentials or the minimization of distance- or volume-related costs can be linked by the concept of network centrality, integrating service aspects. Hereby the concept takes on an extended perspective, complementing classical, cost-oriented network design in an innovative way.

Furthermore, it is shown that network centrality has two dimensions. The qualitative dimension of network centrality and its relation to performance indicators of transport networks can be used to structure the search for superior network alternatives in the design process efficiently. This concept is of a conceptual nature and of highest relevance for practical strategic network planning. The quantitative dimension of network centrality is structured by the development of indices of centrality for the general cargo market. This must be understood as a fundamental methodological contribution in the area of network analysis.

All together the present thesis provides a remarkable scientific contribution and is pointing a new way for the strategic design of transport networks. By linking the concept of network centrality with classical criteria of OR for network optimization

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Anne Paul builds a bridge between previously separate research concepts. With a wide range of applied analyses in her thesis she proves in a convincing way the fruitfulness and sustainability of her innovative approach and opens up a new, scientifically ambitious and intriguing field of research with immediate utility potential for the practical design of transport networks and far beyond.

I wish this thesis a very positive reception in academia and practice and hope it will trigger an intensive discussion and further research.

*Werner Delfmann*