8 Conclusions and Further Research

8.1 Conclusions

The objective of this work was to identify the relevant determinants of modern software markets and to incorporate these in a simulation model which provides the basis for an integrated theory of software markets and for managerial directions for software vendors to develop and implement strategies in a new economy.

In order to achieve this goal, a comprehensive empirical survey of the Fortune1000 companies was conducted in Germany and the US and complemented by case studies of individual enterprises. Besides giving an overview of corporate behavior concerning the choice, adoption and use of products in the markets for ERP systems, EDI solutions, and office communication software as well as a comparison of the three markets, typical determinants of adoption in software markets were identified. Besides price, heterogeneity of preferences, and compatibility (source of positive network effects), it was also found that structural characteristics of the individual communication network significantly influence diffusion processes in software markets.

Searching for appropriate instruments to model the relevant determinants, three research fields seemed to be promising. Standardization models model decisions on standards in communication networks and describe the influence of different coordination mechanisms on the degree of standardization. While the relevance of compatibility and the costs and benefits of standardization (the latter can be seen as the positive network effects) are considered, the focus is rather on modeling the individual’s decision-making and the efficiency of centralized and decentralized coordination mechanisms than on dynamic processes in markets.
Network effect theory focuses on the installed base of a given product rather than on the structural properties of the individual communication network, implying fully connected networks. This highly unrealistic assumption leads to the fact that the models are insufficient to explain important phenomena of the software market like the coexistence of different software products despite strong network effects, small but stable clusters of users of a certain solution, although a competing product is dominating the rest of the market, or the phenomenon that strong players in communication networks force other participants to use a certain software.

In contrast, models of network diffusion cover many structural properties, but do not adequately consider the dynamics of the diffusion process itself when strong externalities exist.

Taking the empirical findings into account, useful concepts from the three research areas were integrated into a network simulation model for software markets. The simulations came to the following conclusions. While heterogeneity of preferences, high product prices and a decentralized, regional or sparse structure of the network prevent concentration, homogeneous preferences, low prices, high connectivity, a random "global" topology or a centralized structure of the network promote concentration towards a single software product. Additionally, taking the market stability into account, the relevant markets were classified and typical vendor roles identified. The markets for EDI solutions in Germany and in the US are stable oligopolies as is the market for ERP solutions in the US. A typical vendor role in these markets is the King of the Castle, who specializes on one segment, competing by better product functionality and not by price. The market of ERP systems in Germany is a stable monopoly with the Imperator as a typical vendor role. An Imperator has succeeded in taking over many of the heterogeneous user clusters which also characterized the stable oligopoly. Here, it is very difficult for competitors to gain market share and push the dominant vendor out of its monopolistic position, since every segment has to be taken over independently. The market for office communication software and the emerging market for WebEDI belong to the unstable monopolies, with the Revolutionary as the typical vendor role. These are "winner-takes-all loser-gets-nothing" markets with a high level of competition and sometimes very rapid changes in market shares.

To illustrate how the simulation model might be used to derive appropriate pricing strategies, additional simulations were conducted. The influence of network structure on the optimum pricing strategies of competing vendors could be proven. As expected, in markets with independent user clusters, one finds a tendency to higher prices. However, the profit in such markets is smaller for the vendors, because the clusters limit the potential number of buyers and because switching between different solutions is more unlikely. If one is losing market share in unstable monopolies, it might be sensible to switch to a skimming strategy, since one is likely to be totally driven off the market anyway.