

6 Conclusion and Outlook

6.1 Synopsis

The thesis “Leveraging Knowledge Communication for Innovation” focuses on knowledge communication and social networks in research and development (R & D) environments. While social network analysis has become more widely recognized as a potential method to analyze, evaluate, and influence processes of knowledge generation and communication, and various papers promote its potential usefulness as a knowledge management tool, this thesis presents a comprehensive conceptual framework from a theoretical perspective as well as suitable analytical methods for organizational practice.

In this study, the context of innovative knowledge generation in organizational R & D environments is introduced very broadly with reference to the existing literature. In addition to other findings of academic research and publications, relevance of the subject is empirically explored through data from an expert survey and three case studies that were undertaken by the author.

Knowledge, communication and their social organization constitute the central points of reference to this work. Knowledge is perceived from a social constructivist perspective. As understood here, knowledge is a human act and it is socially constructed. This conception of knowledge is the common link between the various existing approaches and it serves the goal of this study best from analytical and conceptual perspectives with regard to its subject of research.

From a social constructivist perspective, managing knowledge is not literally possible. We have to focus on conditions and influence factors of knowledge generation, sharing, use, conservation, and forgetting on individual, organizational, and societal levels. Then, we aim at the creation and facilitation of knowledge flows within R & D environments rather than at managing knowledge.

Results of the expert survey give empirical insights into today’s knowledge management practices and challenges, strengthening the primary role of knowledge communication and knowledge transfer as the focal point of organizational and inter-organizational knowledge processes. Corresponding with the emphasis on informal knowledge communication, the focus is put on communities and social networks. Their detailed outline from a wide background of knowledge communication and the generation of innovations provides the conceptual framework for the study of organizational knowledge communication in R & D.

The role of communities for knowledge communication in organization and business practice is accentuated by the empirical findings of the expert survey. Then, the discussion of the sociological perspectives and limits of the community concepts provides the background for a fundamental critique of the prominent concepts of community in recent knowledge management debates and the proposal for a more fruitful social network perspective on knowledge communication processes within and between organizations. The network paradigm can be considered as being a much more pragmatic approach than the conceptualizations of community or system theory.

Since knowledge communication within and between organizations is a broad field of study, here the focus is primarily put on social networks and the generation of innovations. The generation of innovations in the knowledge society is explored within the theoretically and practically highly relevant field of organizational R & D and with regard to the role of entrepreneurs as the drivers of innovation. Results of the expert survey illustrate role and impact of knowledge management in R & D processes. The shift of focus toward social processes of knowledge communication is reflected in the recent perspectives of R & D management approaches as well. The primary concern of today's R & D management is about managing knowledge rather than simply managing its generation. And again, we have to put it even more clearly that managing knowledge in R & D environments means to facilitate and foster processes and structures of flourishing knowledge flows in social networks. From a broad background of research, the role of networks in R & D environments as intermediaries for the institutionalization of knowledge transfer is outlined. In addition, focusing on the role of social networks in R & D environments, the networking activities of individual network members play a central role. From this perspective, we include the role of entrepreneurs as those people who can be characterized as maintaining excessive networking activities.

Method conceptualization and adaptation of social network analysis as a knowledge management tool focuses on roles, positions, and structures of knowledge communication in R & D environments:

- Simple whole-network properties play a central role to describe knowledge flows according to size, centralization and decentralization, and density of networks.
- Basic types of network structures have a primary influence on knowledge communication and include concepts like sub-groups and cliques for the development of sub-cultures and clusters of expertise, cut-points as bottlenecks and knowledge gaps, and hubs as enablers of effective knowledge transfer
- Roles and positional models within knowledge communication networks put their focus on measures of degree centrality for prominence, expertise and

power, closeness centrality for integration or isolation of network members, betweenness centrality for members who play roles as knowledge brokers or gatekeepers, and strength and multiplexity of ties as indicators for the sharing of more intimate, voluntary, supportive, and durable relationships that are a prerequisite for shared identity, trust, and mutual understanding.

Moreover, results of the case studies lead to the modeling of four different roles that are considered as important for knowledge communication: experts, knowledge brokers, contact persons (“agents”), and knowledge consumers. Measuring the boundary-spanning character of inter-organizational networks is very simple by use of the E-I index that measures the ratios between external and internal ties and normalizes them.

A guideline for the use of social network analysis is developed that aims at leveraging communication within and between organizations. It provides detailed steps for practical application in organizations: from clarifying objectives and defining the scope of analysis (knowledge domain) to designing interventions and taking actions.

The practical value of social network analysis is demonstrated by three empirical case studies. The first case study shows that social network analysis provides a method to trace knowledge flows, analyze network structures and personal expertise with additional value to a simple knowledge map or yellow pages. Here, social network analysis is used as a tool to foster organizational expertise and transfer of knowledge.

The second case study illustrates the evolution of entrepreneurial networks and knowledge communication. Although subjective relevance of networking and knowledge exchange is rated on a medium level by the network members, results of social network analysis clearly indicate significant correlations between subjective assessment of networking issues and knowledge exchange, network positions, and status of the individual entrepreneurial activity. Especially the core network of central actors rates relevance of networking for knowledge exchange as very important and shows a high level of entrepreneurial activity status.

The third case study analyzes the integration of inter-organizational knowledge sharing within innovation processes into organizational practice. Using methods of social network analysis, it explores inter-organizational formation and utilization of expert knowledge, their social relationships and corresponding knowledge flows. Results presented here especially concentrate on the relationships of knowledge exchange between the formal organizational boundaries and the informal inter-organizational network structures. Above all, findings of the third case study suggest that community building may prove as an effective measure to overcome organizational boundaries, although relationships largely remain internally oriented. Thus, it becomes very obvious that institutionalization of inter-

organizational relationships takes time. Nevertheless, the network integrates almost all actors. Especially domain-related network activities significantly gained importance during the period of observation. Within the different domain-related networks, a small number of members is of critical importance and key to knowledge flows.

The thesis explores the potential and limits of social network analysis to study and support intra- and inter-organizational knowledge communication. Results of the case studies provide practical examples and lead to the development of approaches toward interpretations of network properties and structures for interventions to foster knowledge communication and improve the flows of knowledge within and between organizations for the generation of innovations. Interventions, derived as the results from the case studies, aim at the development of personal competencies and expertise, integration of hidden expertise, exploitation of marginally connected members, and promotion of cross-departmental knowledge transfer.

6.2 Research Contribution

The main contributions to research of the study presented here aim at (1) the outline of a theoretical framework for the study of knowledge communication in social networks in R & D environments and (2) the adoption of methods from social network analysis for application in organizational practice.

To achieve these aims, a wide conceptual framework is derived from a theoretical perspective through a comprehensive reconstruction of the existing literature and research on social network analysis and the study of knowledge networks in R & D. Based on sociological institutional analysis, institutionalization of knowledge management can be understood as the differentiation of a reference frame that makes productive use of knowledge possible. Thus, a framework is derived that builds up the basis to enable knowledge flows, to internalize modes of knowledge transfers, and to institutionalize living knowledge environments within and between the individual, organizational, and societal levels. Moreover, current state and challenges of knowledge management issues and relevance of the various findings from research are empirically explored through results of an expert survey that was held by the author.

From this background, it is argued that social network analysis proves useful as both a theoretical concept and a practical tool. From theoretical perspectives, the argumentation presented here pushes ahead the de-construction of the community concepts that have become popular in organization and business studies during the last decade. It is basically argued that the introduction of community concepts in organizational and business contexts is based on serious misconceptions of the

core concepts of community and, therefore, community is not an adequate concept to analyze and design social processes of knowledge communication within and between organizations. As an alternative, the much more pragmatic approach of networks is provided as a useful concept to grasp the social relationships between individuals as well as between social aggregates for conceptual and analytical purposes with striking simplicity.

Within this framework, methods of social network analysis are theoretically outlined, practically described, and empirically validated as an instrument and tool to analyze and facilitate organizational knowledge communication. Social network analysis as a sociological method to undertake empirical analysis of the structural patterns of social relationships in networks lays the foundation to develop a methodical knowledge management tool to help us identify, visualize, and analyze the informal personal networks that exist within and between organizations. The method development provides an adaptation of social network analysis to suit practical needs as a strategic tool for expert localization, identification of knowledge communities and analysis of the structure of intra- and inter-organizational knowledge flows.

Results of social network analysis can be used for a variety of applications, like, for instance, help to identify expertise, facilitate so-called communities of practice, or support brokers and disseminators of useful information and knowledge. Results of social network analysis can contribute to decisions on personal competence and leadership development. Outsiders can be identified and supported in such a way that they are better integrated in teams and projects. Barriers of knowledge flows can be uncovered and interventions for their removal can be introduced. Furthermore, knowledge of social network structures may contribute to realize efficiency loss through hierarchical structures or through a lack of hierarchical power.

To close the existing gap between the elaborated methods for academic purpose and the potential benefits for organizational practice, the approach of social network analysis is simplified and outlined according to its basic steps to match practical needs and illustrate its usefulness for business practice. Moreover, the outline of the methods does not remain on a merely descriptive level but provides illustrative examples for interventions and follow-up activities to improve organizational knowledge generation and communication from the interpretations of its results. Thus, the action model developed here goes beyond the boundaries of a passive descriptive-analytical academic method toward an intervening active framework to shape the relationships of knowledge communication in organizations.

Empirical case studies are undertaken with a clear focus on concrete organizational needs, and their results are used to provide practical solutions for interventions and follow-up activities. Based on the conceptual background and the

empirical application, guidelines are derived that aim at adopting the sophisticated methods of social network analysis for business practice to undertake evaluation of the informal communication structures within a specific domain of knowledge.

To put it briefly, the major contributions to research of this thesis are:

- outline of a comprehensive conceptual framework of knowledge communication, networks and the generation of innovations in R & D environments,
- exploration of prominent knowledge management approaches and their reconceptualization from an institutional perspective,
- critical examination of community concepts within processes of intra-organizational and inter-organizational knowledge communication and promotion of the much more simple approach of network concepts,
- adaptation of social network analysis as an applied method for organizational practice within an overall comprehensive framework,
- development of guidelines, basic steps, and basic interventions for the practical application of social network analysis and its results within organizational R & D.

6.3 Further Research

On the one hand, findings of this thesis suggest further research of theoretical conceptualizations to adequately deal with processes of knowledge communication and the generation of innovations from an academic perspective. On the other hand, further research and experience is needed with methods of social network analysis in business practice.

A greater theoretical foundation is necessary to facilitate the development of a common language and greater understanding of knowledge creation and communication processes within and between organizations and of the popular concepts of knowledge communities, communities of practice and knowledge networks. From a theoretical perspective, a comparative focus on the different existing concepts and the relationships between them is necessary. Moreover, future attention is required to the “divide” that exists between already well-founded theoretical conceptualizations of organizational knowledge communication and the use and interpretation of these concepts in the knowledge management practitioner community. To resolve these inconsistencies, new forms of research that integrate theoretical distinctions, empirical studies, and practical relevance are needed. The expert study described here is a first step in this direction, providing an exploration of the subject as a basis for further research and discussions. Further research into theoretical foundations, empirical studies and practical relevance could lead to a revised set of conceptualizations in theory and applications in practice.

With regard to the application of methods of social network analysis in organizational practice, further research has to take into account that results of social network analysis are of a descriptive nature. While formal methods allow for precise measures and visualizations allow for illustrative descriptions, their adequate interpretation is dependent on individual and situational conditions. The same is true for interventions based on results from social network analysis. Thus, social network analysis provides basic means to evaluate character and efficiency of knowledge communication as influenced through network structures and performance within organizational settings. As understood here, such an analysis focuses on precisely defined domains of knowledge. Further research needs to integrate wider perspectives on the one hand and to further specify scope of analysis and its circumstances on the other.

Research about further adaptation of social network analysis as a method to analyze and facilitate network structures for knowledge communication needs to focus on

- further refinement of selected methods,
- continual improvement by further application in organizational practice and their monitoring and evaluation through academic research,
- systematic extension of adequate models for interpretations and study of practical interventions for the purposes of knowledge communication.

A social perspective on processes of knowledge communication, as proposed here, takes into account factors and prerequisites for mutual orientation of the acting individuals. These factors need to be further explored and systematically studied in future research. Relevant factors include shared language, common standards, or social and situational norms, for instance. They play a primary role especially within the complex processes of knowledge communication in R & D environments.

The outline of a theoretical framework and the research into applied methods for the analysis and facilitation of processes of knowledge communication in social networks, as understood here, is an approach to systematically integrate the complexities of innovative environments. More generally, this thesis provides a step among others that tries to clearly integrate the recognition and acceptance of complexities as the integral characteristics of the world we live in, and thus, contributes to not turning the visions of a knowledge society to being useless. To conclude, we must accept and learn by future studies that the knowledge society does not aim at the reduction and overcoming of complexities. Although we have lost the securities we have previously derived from knowledge, we must deal and live with the existing complexities through individual, organizational, technological, and societal strategies and processes of adaptation.

