Tobias Müller-Prothmann

Leveraging Knowledge Communication for Innovation

Framework, Methods and Applications of Social Network Analysis in Research and Development

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Berlin, December 2005

Tobias Müller-Prothmann

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1 Introduction

1.1 Goal

Informal communication of knowledge is a critical factor for the success and failure of organizations. Recently, the importance of knowledge in organizational environments has been widely subject to research, strategies, solutions and discussions of what is known as "knowledge management". With its initial emergence in the late 1980s, knowledge management has become a buzz phrase in the late 1990s. After the hype about knowledge management, the discussions have slowed down during the last years. Not only did the question arise, whether knowledge can be actually managed, but doubt has been cast on simplistic approaches, technical solutions and the contribution of knowledge management to the return on investment. This slow down provides the opportunity to take a closer look at the role and processes of knowledge in organizations, to undertake a more detailed analysis, and to offer more complex and (hopefully) more suitable approaches to deal with them. In this work, a close focus is put on the processes of knowledge generation through knowledge communication within and between organizations.

Studies into the informal structures within and between organizations from a network perspective are not a new invention. At the time the author started his research on methods and approaches to adopt social network analysis for knowledge management, literature and studies on this topic were rare, although discussed with other researchers and practitioners, publications on this subject were hardly to be found. Recently, social network analysis has become more widely recognized as a potential method to analyze, evaluate and influence knowledge generation processes. Various papers promote its potential usefulness as a knowledge management tool. This perception of social network analysis provides a new range of its applications. While social network analysis is conventionally used as a method of scientific research, these approaches propagate its usefulness for practical purposes of organizational design and strategy. But most of the recent approaches, that emphasize the practical adaptation of social network analysis, do not get beyond the description of its potential usefulness. The existing empirical applications are purely academic again.

The empirical applications provided in this study are taken from organizational practice itself. The case studies were undertaken due to concrete organizational needs, and their results were used to provide practical solutions for interventions

and follow-up activities. The guidelines to undertake an evaluation of the informal communication structures within a specific domain of knowledge aim at adopting the sophisticated methods of social network analysis for business practice.

In this study, the context of innovative knowledge generation in organizational research and development (R & D) environments is introduced very broadly with reference to the existing literature. The thesis argues that within this scope social network analysis proves useful both as 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. The author argues 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 will be 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.

After introducing the theoretical framework, the method of social network analysis is theoretically outlined, described for practical application, and empirically validated as an instrument and tool to analyze and facilitate organizational knowledge communication. To close the existing gap between the elaborated method for academic purpose and the potential benefits for organizational practice, the approach of social network analysis will be simplified and outlined according to its basic steps to match practical needs and illustrate its usefulness for business practice. Moreover, the outline of the method 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.

Last but not least, with this work the author provides a comprehensive reconstruction of the existing literature and research on social network analysis and the study of knowledge networks that is distributed in a variety of different articles and documentations.

1.2 Method

The systematic process of the study presented here consists of five different methodical steps (see also figure 1.1):

- step 1: theoretical problem definition;
- step 2: empirical exploration;
- step 3: model development;
- step 4: empirical evaluation of the model;
- step 5: assessment and modification of the model.

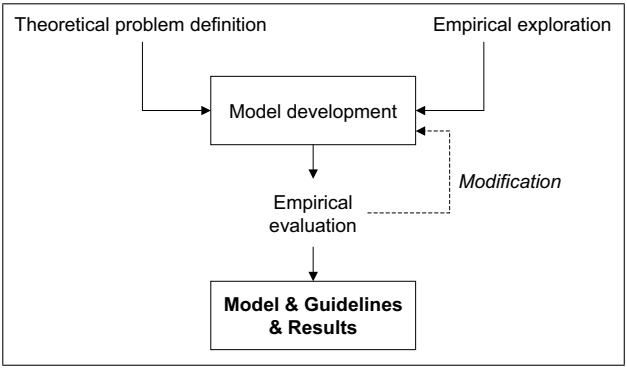

Figure 1.1: Overview Methodical Steps

Step 1 defines the subject of the work and the problems that should be addressed from a theoretical perspective. This is done through intensive study of theoretic approaches, existing empirical research, other publications and documentations, informal discussions at conferences and with colleagues and experts from academia and practice, who have a strong expertise in approaches and processes of knowledge generation and communication in communities, networks and organizations. The introduction of the theoretical background, especially through a review of literature (monographs, articles, papers), plays an important role to get an overview of the state of research and to outline the subject of this study from theoretical perspectives, to develop open questions or critical issues, and to focus on the central themes. In accordance with the qualitative paradigms in social science, it is of high importance to approach the subject of research with as much openness as possible. The principle of openness leaves theoretical structuration of the topic of research aside until it gets revealed through the subjects of research themselves (see Hoffmann-Riem 1980: 343; Lamnek 1989: 17-19). The theoretical draft of the research topic also prepares its empirical exploration in step 2.

Step 2 empirically explores the research topic that has already been theoretically outlined in step 1. The exploration tries to grasp the views, conceptions and genuine perspectives of experts on the research topic and with regard to the theoretical foundations of the method development. This is done through a 2-step

expert survey based on a structured questionnaire with open questions (see section 2.4.1 about the method in more detail).

Step 3 compares the theoretical outline of the research subject derived from step 1 with the results from the explorative interviews carried out in step 2. This procedure leads to the development of a method and guidelines to undertake social network analysis for purposes of organizational knowledge communication. The method development is part of an empirical case study (pre-test study) that was undertaken as a project co-operation with the Fraunhofer Institute for Production Systems and Design Technology (Fraunhofer IPK), Berlin (see section 5.4).

Step 4 gives an empirical evaluation of the method and guidelines developed in step 3. Results and insights gained from theoretical consideration, empirical exploration and the first case study are evaluated in a second case study (evaluation study) on entrepreneurial network evolution in the advanced training program "Entrepreneurship in the Knowledge Society" at the Freie Universität Berlin (see section 5.5). In a third case study (application study) the methodical process and selected measures are confronted with organizational practice. This case study is undertaken in the field of inter-organizational knowledge communication between the different research institutes of the Fraunhofer-Gesellschaft, a large German organization for contract research in all fields of the applied engineering sciences (see section 5.6).

Step 5 allows for the assessment and final discussion of the framework outlined above and the method developed within this framework. It provides the basis for further applications and possible modifications of them. This could be done through further theoretical considerations as well as through further case studies.

The overview over the basic steps of the study presented here, shows the basic resources that build the theoretical and empirical core of this work:

- a broad theoretical background that is derived from extensive study of the literature,
- different sources of profound empirical data collected by the author:
    1. reports of research, experiments, simulations and other studies from the literature and from current research,
    2. exploration of current research questions through a 2-step expert survey (see section 2.4.1) and paper presentations by the author and their informal discussion at conferences and meetings,
    3. development of the method in an empirical project (step 3, see section 5.4), and
    4. its evaluation and application in two subsequent case studies (step 4, see sections 5.5 and 5.6).

In summary, the research presented here is an exploratory-descriptive study. It is theoretical in that it provides a comprehensive outline of the existing approaches on social network analysis and the study of knowledge networks. At the same time, it is applied research in that it promotes social network analysis as a method for analysis and facilitation of knowledge communication in organizational practice.

1.3 Overview

Knowledge, communication and their social organization constitute the central points of reference to this work. Wersig (1996) identifies the first two aspects as being central to the analysis of the complexity of the knowledge (or information) society. Here, we add to our perspective the social organization as the structural environment for the communication of knowledge. Human action is always knowledge-based: "Social groups, social situations, social interaction and social roles all depend on, and are mediated by, knowledge" (Stehr 1999). Relationships between individuals as well as between social aggregates are based on knowledge. Taking this position as a starting point, the study is composed of three major blocks as presented in figure 1.2: (1) context and position (chapter 2) , (2) conceptual framework and relevance (chapters 3 and 4), and (3) analytical method and empirical case studies (chapter 5).

Context and position of the study are introduced in *chapter 2*, starting with debates about the emergence of a knowledge society (section 2.1). Since knowledge as a subject of theoretical analysis as well as an empirical phenomenon is no less than complex, the next section aims at providing some kind of fundamental abstract on perceptions of knowledge (section 2.2) and constitutional conditions of knowledge management and its institutionalization from a sociological perspective (section 2.3). Results from an 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 (section 2.4). This chapter concludes with a basic overview over conceptual approaches of knowledge communication and management (section 2.5).

In *chapter 3*, the focus is put on communities and social networks, which provide the conceptual framework for the study of organizational knowledge communication. The first section of this chapter introduces theories of organizational communication with its emphasis on informal knowledge communication (section 3.1). The practical role of communities for knowledge communication in organizations is accentuated by the empirical findings of the expert survey that put a special focus on knowledge communities (section 3.2). Sociological perspectives and limits of the community concept are discussed by revisiting the classic

works and authors in sociology (section 3.3). Then, the next section highlights the concepts of knowledge communities, communities of practice, and knowledge networks from a comparative perspective based on the results of the expert survey (section 3.4). This discussion provides the background for a fundamental critique of the prominence of community concepts in recent knowledge management debates and the proposal for a more fruitful social network perspective on knowledge communication processes within and between organizations (section 3.5).

Since knowledge communication within and between organizations is a broad field of study, we narrow our perspective and put our focus especially on social networks and the generation of innovations in *chapter 4*. The generation of innovations in the knowledge society is explored within the theoretically and practically highly relevant field of organizational research and development (R & D) and with regard to the role of entrepreneurs as the drivers of innovation (section 4.1). Views of experts illustrate role and impact of knowledge management in R & D (section 4.2). The next sections focus on networks and knowledge communication in R & D environments and their role as intermediaries for the institutionalization of knowledge transfer (section 4.3 and 4.4). Making a digression on a prominent network concept, the generation of innovation through networking and the social capital of the entrepreneurial person is illustrated briefly (section 4.5). Finally, this chapter concludes with a discussion of the limits of the network concept (section 4.6).

Social network analysis as a knowledge management tool is presented in *chapter 5*. This chapter starts with an introduction of the approach of social network analysis, its basic definitions, network properties and structures (section 5.1). Then, method conceptualization and development of social network analysis as a knowledge management tool is outlined according to its aims and fields of applications with an additional focus on multi-level analysis (section 5.2). A guideline for social network analysis to leverage communication within and between organizations provides detailed steps for application (section 5.3). The practical value of social network analysis for analyzing and supporting intra- and inter-organizational knowledge communication is demonstrated by three empirical case studies:

1. a *pre-test study* on the identification of expertise and knowledge transfer (section 5.4) that was a small part of the project “Wachstum mit Wissen” (economic growth through knowledge), sponsored by the German Federal Ministry of Education and Research (BMBF), at the Fraunhofer Institute for Production Systems and Design Technology (Fraunhofer IPK), Berlin, in co-operation with the author at the Department of Information Science, Institute for Media and Communication Studies, Freie Universität Berlin;
2. an *evaluation study* on communication of knowledge and entrepreneurial network evolution (section 5.5), undertaken in the advanced training pro-

gram “Unternehmertum in der Wissensgesellschaft” (entrepreneurship in the knowledge society), a project at the Freie Universität Berlin funded by the European Social Fund (ESF), that aims at transferring new insights into the knowledge society from academia to business practice for entrepreneurs;

3. an *application study* on inter-organizational knowledge communication (section 5.6), supporting the community building process for knowledge sharing within the domain of knowledge management between 17 research institutes of the Fraunhofer-Gesellschaft and its headquarters, a large German organization for contract research in all fields of the applied engineering sciences.

The final section of this chapter provides approaches to interpretations of network properties, structures, roles and positions and gives illustrative examples of interventions to foster knowledge communication and improve the flows of knowledge within and between organizations (section 5.7).

A conclusion is given in *chapter 6* with a synopsis of the study (section 6.1), its contributions to research (section 6.2), and an outlook over fields of further explorations (section 6.3).

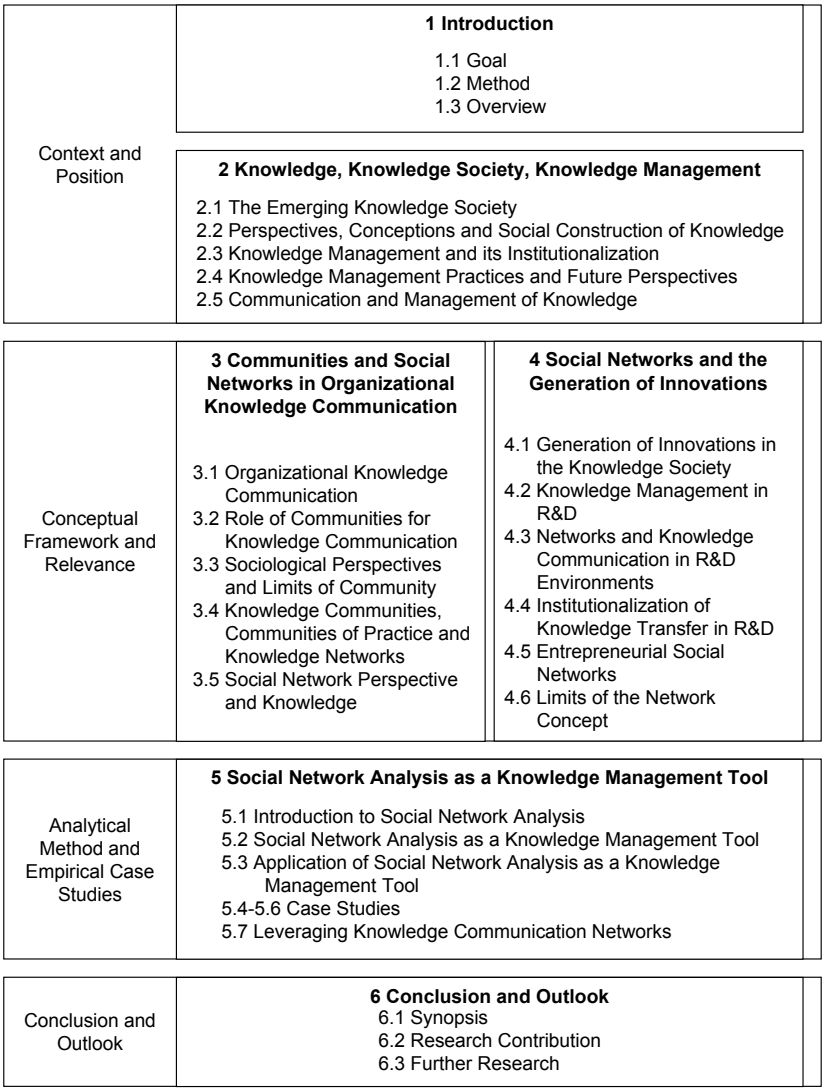

Figure 1.2: Overview Conceptual Structure

2 Perceptions of Knowledge, Knowledge Society and Knowledge Management – Context and Position

2.1 The Emerging Knowledge Society

> Today, as we construct a new info-sphere [...], we are imparting to the "dead" environment around us not life but intelligence.
>
> (TOFFLER 1980: 168)

2.1.1 Basic Descriptions and Characteristics of the Knowledge Society

The description of our society as a knowledge society is only one approach among many others to characterize the society we live in (authors prefer to talk of media society, risk society, multiple option society, individualized society, multicultural society, global society etc., for example; for an overview over the authors and their different approaches see, e.g., Pongs 1999, 2000). Above all, to describe our society as a knowledge society is a self-description from an internal perspective of the society we live in, it is not a description of our society from an external point of view (see, e.g., Nassehi 2000a). Krohn (2000) identifies two different sets of variables that can be emphasized to analyze the contemporary societal change toward knowledge society: technological innovation and institutional transformation. Following Krohn (2000: 1), "the impact of technological change on the organizational and cultural institutions of society as well as on the enormous monetary and cultural investments of corporate and individual agencies in developing and using new knowledge" build the interrelated focus of these two aspects.

The term of the knowledge society is strongly influenced by the early studies in the 1960s on the (economically) dominant role of knowledge. The contribution of knowledge work to the economy was first clearly emphasized by Fritz Machlup (1962) (on the notion of knowledge work see Hayman and Elliman 2000). Peter Drucker (1969) provided guidelines for mastering the discontinuities brought about by information technology and knowledge work. Robert E. Lane (1966) is known as one of the first authors who noted the term "knowledgeable society". In the late 1960s and early 1970s, Amitai Etzioni (1968) and Daniel Bell (1975 (1973)) further investigated the emerging predominant role of (especially theoretical) knowledge as the new "axial principle" of society, particularly in the fields

of politics, work and science. A parallel line of reasoning can be found by reform Marxists in the Richta report (Richta 1971) of 1968 and the Japanese "Plan for an Information Society" of 1972 (see Masuda 1990 (1981)). Porat (1977) contributed a larger set of empirical data to the conceptual path toward a knowledge society, Lyon (1988) reflected on the validity of the concept of an information society, and Edelstein (1978) studied the different developments in the USA and Japan in a comparative analysis (as cited by Krohn 2000). During the 1980s and early 1990s, the academic and public awareness became steadily intensified "and extended the general themes of the societal centrality of knowledge to a broad variety of fields of investigation" (Krohn 2000: 1-2): the reconstruction of class structure in the knowledge society (Schiller 1984 (1981)) and its relation to postmodernism (Lyotard 1984; Poster 1990).

The growing popularity of the term knowledge society during the 1990s was fostered especially through the work of Peter Drucker and Robert Reich, both researchers in management theory. With regard to business management, features of knowledge society are strongly emphasized as the spread of expert culture (see several contributions in Stehr and Ericson 1992) and the primary importance of intellectual capital as the wealth of organizations (Stewart 1997). The OECD can be identified as an important promoter of the development toward a knowledge-based economy in its influential working paper of 1996 (OECD 1996) and various subsequent reports and activities (e.g., OECD 2001a,b). In Germany, the parliament (Deutscher Bundestag) provides a comprehensive outline of a global knowledge society (Enquête-Kommission 2002: 259-308).

A newer and widely recognized approach to the study of reconstruction of class structure in knowledge society with regard to the developments of globalization can be found in Castells' "The Rise of the Network Society" (Castells 1997) and with regard to social relationships in post-traditional knowledge societies in Knorr-Cetina (1998). As in the early concepts of the 1960s and 1970s, the dominant role of science and technical-scientific knowledge is still stressed as a basic feature of knowledge society (see, e.g., Gibbons 1994).

Lane (1966: 650) defined a knowledgeable society as one that is characterized by members who "(a) inquire into the basis of their beliefs about man, nature, and society; (b) are guided (perhaps unconsciously) by objective standards, and, at the upper levels of education, follow scientific rules of evidence and inference in inquiry; (c) devote considerable resources to this inquiry and thus have a large store of knowledge; (d) collect, organize, and interpret their knowledge in a constant effort to extract further meaning from it for the purposes at hand; (e) employ this knowledge to illuminate (and perhaps modify) their values and goals".

From a socio-economic point of view, the knowledge society is characterized primarily through three facts that have been identified in the 1960s and 1970s

debates (Machlup 1962; Bell 1975 (1973); Porat 1977) already:

- knowledge as productive force: the manufacturing of goods and services increasingly needs knowledge-based resources compared to material resources,
- employment structure dominated by knowledge workers: more than half of the employees of a society are employed at a workplace with knowledge-based work,
- general expansion of public and private research activities, like high increase of R & D expenditures.

Beyond merely focusing on mainly economic aspects, knowledge society can be distinguished on four different levels as described by (Wirth 2000) for example:

- On a sociological level, knowledge society means that knowledge and expertise based structures and processes spread throughout society and into everyday live.
- On a technological level, knowledge society is characterized through extensive dissemination of technological infrastructures in the form of knowledge-based, sensitive transport systems for information, communication, persons, goods, energy and financial transactions.
- On an organizational level, it is stated that knowledge-based management methods, globalization of business communication and knowledge as resource for production of goods and services, gain increasing importance.
- On a psychological level, education, life-long learning and the individual ability to handle excessive information overload are popular keywords.[1]

Maasen summarizes the conceptions of knowledge societies as widely-accepted at the end of the 1990s debates as follows (Maasen 1999: 59-60):

1. Besides money and power, information, knowledge and expertise play an important role as influential resources for social reproduction.
2. Increase of knowledge-based work and occupations and their permanent diffusion into other social spheres (for quantitative empirical analysis to this point see Machlup 1962, Machlup and Kronwinkler 1975). Education and career paths are not linear anymore.

[1] Nonetheless, with regard to the individual level of the knowledge society, Wirth (2000) notes that the term of the knowledge society should be used very carefully to avoid what is known by social scientists as an "ecological misinterpretation": what is true on the level of a society, is not necessarily true for each individual person. So, the gap between supply and use of information is getting bigger and bigger. While production and conservation of information (or better: data) exponentially increase, the human capacity for information processing and the memory of the individual person remains on a constant level. The psychologist Werner Kroeber-Riehl concludes that between 95 and 99 per cent of all information that is produced every day must remain unused (as cited by Wirth 2000).

3. These developments are caused by science as the dominant paradigm, globalization of information and knowledge networks, higher awareness of risks and contingencies, increase of knowledge from the demand as well as from the supply side.
4. Transformational social effects due to the extension of knowledge as the basis for all the functional spheres in society as an evolutionary process.

All these conceptualizations of knowledge societies presented above, predominantly constructed from an economic perspective, consider the knowledge society as an attractive counterpart to the industrial society and as a societal concept to successfully approach the social and economic problems in the near future. Krohn (2000: 2) writes: "The reality of knowledge societies might have pleased Plato as putting into practice his ideal of philosophy governing society. It could also be taken as fulfilling the predictions of Condorcet (1743-1794) and Comte (1789-1857) according to which knowledge about the (laws of the) development of society would be put in control of shaping its structure". But "[n]one of these visions has even approximately come true. Neither wisdom, nor generally valid law-like insights, nor integrative and comprehensive scenarios [...] The permanent modernization of societies leaves all actors in successive states of uncertainty, insecurity, and ambiguity" (Krohn 2000: 2). Or as Nassehi (2000a) puts it, we are more and more forced to learn that self-stabilization of truths and certainties does rather prevent than enable the abilities needed in an accelerated and complex world: the permanent cognitive self-adaption of our knowledge to the world and the adaption of the world to our knowledge. As long as a society was able to assign a certain solution to a certain problem, i.e. to find unambiguous causalities and, moreover, to implement these clarities in the different realms of economics, science, politics, media or education, knowledge always provided the solution to solve the problem and did not cause a problem by itself. According to Nassehi (2000a), this was the very successful constellation of the industrial society, the paradigm of unambiguous scientific-technical solutions for the industrial-technical world.

Compared to the first studies and expectations of the developments toward knowledge society as presented in the 1960s and 1970s, things have changed today. Professional knowledge workers are not confronted with the task to find any solution for a given problem, they are confronted with the problem that they know too much to reach *the* solution (and to choose their actions within a given time; see also various contributions in Hennings et al. 2003). Knowledge is not only the resource for the industrial production anymore, it is its subject.[2] Not the knowledge assets (or repositories) are the critical factors today, but structures and processes

[2] Based on this argumentation, Nassehi (2000a) suggests that we probably live in a knowledge-industrial society.

of knowledge production and transfer. And since we all know that there is not one solution, if there is any, the aim here is to provide some very small steps that may provide analytical insights and practically relevant methods among others to address these critical factors of knowledge production and transfer.

2.1.2 Knowledge Society and the Organization

In "The Rise of the Network Society", Manuel Castells (1997) describes the fundamental characteristic of modern life as being strongly influenced by the technological revolutions in the field of micro-electronics that have lead to the dissolution of the static into dynamic processes, i.e. everything flows, especially information. Social space has become a space of flows, and networks are the organizational form of these flows, i.e. of flows of resources, products, capital, information etc. And network structures have their own laws and dynamics. Not to discuss evidence of Castells' statement here, the paradigm of networks has changed our perspective of observation and analysis of social interaction without doubt. And the network paradigm can be considered as being a much more pragmatic approach than the approach of system theory for example (see also Graggober et al. 2003: 4-5).

Looking back on the preceding model of information society, Gernot Wersig (1996) explains the goal of complexity reduction as its underlying basic concept. Defining information as the reduction of complexity (Wersig 1974 (1971)), the concept of information society inheres the utopian vision to reduce complexity. Following Wersig (1996: 14-15), we can distinguish between (1) complexity of action and (2) complexity of knowledge. Complexity of action results from the interplay between increased scopes for action and a lack of corresponding models of action that guarantee safety in an insecure world. Complexity of knowledge results from a combination of various facets: technical, organizational and cultural interrelations, general complexity of the world—that has not necessarily increased in fact, but without doubt, we have become more conscious about it—, the individual situation between knowledge and the unknown, and last but not least, the loss of instruments to reduce complexity that have previously been perceived by our senses (like spirits, gods, myths and stories) and are cold, rational and not sensually perceptible anymore due to our scientific conception of the world. The conceptualization of information society was still connected with the hope to reduce and overcome complexity through extensive knowledge production and means of information and communication technologies. The same was true for the early drafts of knowledge society. If we do not want to turn the visions of a knowledge society to being useless, we should try to clearly integrate the recognition and acceptance of complexities as its integral basic characteristics. Then, knowledge society does not aim at the reduction and overcoming of complexities, but

at dealing and living with them through individual, organizational, technological, and societal strategies and processes of adaptation.

The notions of intelligent enterprise and intellectual capital as the new wealth of organizations have been prominently introduced into the debates of the last decade by Quinn (1992) and Stewart (1997). Organization development is a field of foremost studies to analyze the social and economic dimensions of what has become conceptualized as knowledge societies. Organizations are social systems that settle and control social action and processes, and that reduce complexity and communicative spaces. Thus, organizations replace insecurities through "self-made" securities (Luhmann 2000: esp. 183-221; and Luhmann 1972 (1964): 172-190, Luhmann 1993 (1981): 335-389). Since organization aims at a reduction of complexities and their handling through formal procedures, these procedures of formalization, of course, include the realm of organizational knowledge creation, transfer and conservation—and become a serious problem that all these knowledge management discussions try to address (see also Nassehi 2000a).

Following the argumentation of Nassehi (2000a), the successful paradigm of industrial modernism was complexity reduction through clear responsibilities, division of labor and functional differentiation. With regard to knowledge, this paradigm was realized through the separation of knowledge problems into small fragments, their individual solution and, finally, their combination. New perspectives on organizations from the viewpoint of a knowledge society seem to intend on making these hidden routines and their inherent restrictions visible. Nowadays, organizations are advised to make strategic use of insecurities and risks, to operationalize non-knowledge and to make mistakes. Sometimes, they must even actively try to forget what they know. Organizations must learn to limit their own expectations according to their stock of knowledge. From a social constructivist perspective of knowledge, organizations must consider that knowledge is a self-relying construction, and not an image of the world that is independent from the observer.

As Nassehi (2000a) concludes, the debates about knowledge society, as a self-description of the society we live in, then can be understood as pointing to the fact that knowledge is not the solution anymore but has become a problem itself. And that not knowledge itself is a scarce resource,[3] but the securities we have previously derived from knowledge (see also, e.g., Beck 1986; Bauman 1992, 2001). Based on these considerations, Nassehi's "game of knowledge" means exploring the differences that are made if a subject is viewed from this perspective or from another.

[3] Like the Digital Rights Management (DRM) initiatives promote, for instance, that aim at the application of production methods from industry on knowledge.

2.2 Perspectives, Conceptions and Social Construction of Knowledge

> If we were going to be meticulous in the ensuing argument, we would put quotation marks around the two aforementioned terms every time we used them.
>
> (BERGER AND LUCKMANN 1967 (1966): 2)

2.2.1 Preliminary Remarks

Knowledge as a subject of theoretical analysis as well as an empirical phenomenon is no less than complex. To deal with knowledge, a lot could be written, a lot has been written already, and probably much more is being written about it today and will be in the future. One single discipline like the sociology of knowledge is a vast field of research that is not easily surveyed. Therefore, the aim here cannot be to fully treat knowledge from the perspective of a discipline or even from multiple disciplines. Rather, the following sections aim at gathering some of the small pieces of a jigsaw on knowledge, and fit them together to form a whole picture for the progress of this work—while the subject of this work itself, the communication of knowledge through social networks in research and development (R & D) and the method of social network analysis as a means of studying and facilitating them, is nothing more than another piece of a jigsaw of the larger picture of knowledge communication between individuals, within and between organizations and in society.

According to Maasen (1999: 7), the sociology of knowledge is currently perceived as being

- neither positivistically nor idealistically oriented, but rather constructivistically;
- situated on this side of objectivism and subjectivism;
- concerned with everything that claims the status of knowledge without any exception;
- under suspicion of relativism; and finally
- a vehicle of theoretical self-understanding of the intellectual person (especially of the social scientist).

2.2.2 Epistemology of Knowledge Sociology

The sociology of knowledge as a discipline of its own goes back to the early 20th century, especially represented by scientists like Karl Mannheim and Max