*Introduction*

# 1 Motivation

The transformation of organizations into knowledge-intensive and knowledge-aware organizations takes place at an ever-increasing pace. Knowledge as the key resource, not labor, raw material or capital, changes production functions in organizations significantly. *Knowledge* represents the key concept to explain the increasing velocity of the transformation of social life in general and the way businesses and social institutions work in particular (Drucker 1994). Estimates at leading research organizations suggest that up to 60% of the gross national product in the United States is based on information as opposed to physical goods and services (Delphi 1997, 10). This is not surprising as it is estimated that the knowledge-intensive construction and development process of new products and services potentially determines 80 to 90% of the resulting production costs (Scherrer 1999, 131).

There is also a trend towards more complex problem-solving services where the majority of employees are well-educated and creative, self-motivated people. Employees' roles and their relationships to organizations are changed dramatically as knowledge workers replace industrial workers as the largest group of the work force. Consequently, businesses should no longer be seen from an industrial, but from a knowledge perspective (Sveiby 1997, 26ff). This is reflected by a share of 60% of US organizations which think that between 60% and 100% of their employees are so-called knowledge workers (Delphi 1997, 10) and by the fact that in 2002, about 75% of workers were employed in the service sector in the United States (U.S. Department of Labor 2003) or about 65% in Germany respectively (Federal Republic of Germany, Common Statistics Portal 2003). This scenario has been termed the information or *knowledge economy* (e.g., Kim/Mauborgne 1999). The transformation of society into a *knowledge society* has changed valuation of knowledge work dramatically. In the late twentieth and the beginning of the twenty-first century, it is no longer natural resources (especially oil) that creates

money, but knowledge. Today, for the first time in history, the world's wealthiest person, Bill Gates, is a knowledge worker (Thurow 1997, 96).

*Knowledge work* can be characterized by a high degree of variety and exceptions and requires a high level of skill and expertise. Knowledge work requires that knowledge is continuously revised, and considered permanently improvable, not as truth, but as a resource[1]. *Knowledge workers* gain more and more influence in organizations because businesses focus knowledge and their holders as key competitive factors. Knowledge workers are increasingly supported by advanced information and communication technology (ICT) systems. This is reflected by an increase in the amount of information technology (IT) capital invested per white-collar worker from around US$4,000 in 1980 to US$9,000 in 1990 for the services industry (Quinn 1992, 421). Already in 1998, 20% of Fortune 500 organizations claimed to have established the role of a Chief Knowledge Officer (CKO) in their organization and 42% of these organizations said they would establish such a position within the next three years (see Bontis 2001, 30).

Businesses therefore are transformed into *knowledge-based businesses* (Davis/ Botkin 1994). Organizations move from Max Weber's bureaucratic organization towards the ideal of a *knowledge organization* that can be viewed as an intelligent, complex, adaptive system consisting of networked individual, intelligent agents, the knowledge workers, that together are capable of quickly combining knowledge from anywhere within or beyond the organization to solve problems and thus create superior business value as well as to flexibly adapt to environmental changes[2]. Professional services companies, bio-technology firms and software and system houses are typical examples of highly *knowledge-intensive organizations* (Jordan/ Jones 1997, 392) as they depend heavily on the expertise of their (individual) employees and the networks between them to create value for their customers. Knowledge-intensive organizations are characterized by a high proportion of highly qualified staff (Blackler 1995, 1022).

The increasing specialization means that knowledge workers have to work together in various kinds of groups and teams which differ in their social structure and interactions. An organization provides the frame to bring together people holding specialized knowledge to be jointly applied to accomplish a task (Drucker 1994). This gives rise to *organizational competency* or, in other words, complex knowledge shared in intra- and interorganizational networks of knowledge workers. The organizational advantage then is that it offers an environment for joint knowledge generation and application and "gives rise to types of knowledge not supported in a marketplace of individuals linked only by market relations" (Brown/ Duguid 1998, 94f). Virtual teams, expert networks, best practice groups and communities complement traditional organizational forms such as work groups and

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1.    See Willke 1998, 21; for a detailed discussion of the concept of knowledge work see section 4.1.3 - "From traditional work to knowledge work" on page 44.
2.    Bennet/Bennet 2003, 15ff, Bennet/Bennet 2003a, 625ff.

project teams and aid collaboration between knowledge workers within and increasingly across organizations.

Success of an organization is more and more dependent on its capability to create an effective environment for knowledge generation and application and on the knowledge and talent it can recruit, develop and retain in order to provide value innovation rather than traditional factors of production (Kim/Mauborgne 1999, 41). In management terms, success is determined by a firm's managerial capabilities rather than comparative advantages based on production factors[3]. Consequently, organizations need concepts and instruments that help them to provide such an environment, to hone their managerial capabilities concerning knowledge and, more generally, to improve the way the organization handles knowledge. *Knowledge management (KM)* promises these concepts and instruments. Therefore, KM has recently received a lot of attention. The main driving forces behind these developments are:

**Co-evolution of society, organization, products, services, work and workers:**
Society, organizations, products and services, work and workers are transformed into the knowledge society, intelligent organizations, intelligent products and services as well as knowledge work and knowledge workers (Willke 1998, 19ff). The transformation of work and workers into knowledge work and knowledge workers is at the core of a larger shift at the organizational and at the societal level. Intelligent organizations have to provide a context supportive of knowledge workers and their needs in that they excel in the (constantly changing!) combination of individual expertise into organizational core competencies. On the societal level which provides both, the infrastructure (e.g., communication networks) and the suprastructure (e.g., the regulatory environment) for organizations, there is a strong move towards a general scientification of work and organizations (Wingens 1998). This is not only true for traditional professional work (e.g., medical doctors, lawyers, scientists), but also for all kinds of sectors and areas which were not considered knowledge-intensive before (Willke 1998, 2f). Generally, there is more and more knowledge required for individuals in order to (actively) participate in the knowledge society.

**Globalization of businesses:** Complex alterations of organizational structures and the blurring of organizational boundaries are the results of organizational activities in the globalizing economy. Examples are mergers, acquisitions[4], the development of international markets, global sourcing and the organizational expansion into countries with lower wages. Globalization transforms businesses into international or even global ones (e.g., Pawlowsky 1998a, 10f, also Hax 1989, 75). In this setting

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3. Hax (1989, 77) made this latter argument with the background of a US economy then considered weaker than the Japanese economy.
4. According to a statistic produced by Mergerstat the number of mergers and acquisitions worldwide soared from less than 2,500 involving less than US$100 million in value in 1990 to app. 9,000 in 1999 involving app. US$1,5 billion in value (Späth 2000, 10).

many benefits, e.g., from synergies or economies-of-scale, can only be realized if knowledge can easily be transferred from one part of the organization or the world into another part.

**Fragmentation of knowledge:** The latter argument also points to an increasing fragmentation of knowledge. Knowledge is spread over numerous experts, among organizational units, across organizations and does not stop at national borders. Researchers have to cooperate worldwide in order to stay competitive, especially in dynamic fields such as biotechnology, computer science or telecommunications. For an organization, this development means that it has to foster networks of experts across organizational units and even crossing the organizational boundaries in order to guarantee a free flow of knowledge that is necessary to keep their experts up to date. Also, complementary knowledge needed might not be available within the organization. This knowledge can be acquired for example by mergers and acquisitions, strategic alliances or joint ventures with organizations holding complementary knowledge on the organizational level. Other alternatives are the recruitment of experts, consulting, founding cross-organizational (virtual) teams, task forces or networks on the team and the individual level.

**Need for speed and cycle-time reduction:** This development affects virtually every organizational activity and requires an efficient handling of knowledge. It is necessary to increase the speed at which the organization's environment is scanned for opportunities and threats and to increase the speed at which knowledge flows into an organization and at which knowledge is created and distributed to those organizational members who need it.

**Need for organizational growth:** Growth can be seen as an important part of the organizations' need to survive. Growth requires a stronger emphasis on innovation and the development of new markets as traditional markets are restricted and do not grow at the pace deemed necessary.

**Complex organizational interlacings:** Meanwhile, organizations build strategic alliances, both along the value chain—vertically—and also horizontally. These cooperations can also be found between organizations which are competitors in substantial parts of their markets and are most prominently found in the IT and telecommunications industry. This form of alliances between competing organizations is also called coopetition, a term that draws together *coope*ration and com*petition* (e.g., Dowling/Lechner 1998). Many of these alliances are built because two organizations hold complementary competencies that can be aligned so that interesting product or service innovations are realized. These developments also increase the market demand for interoperability between organizations which provides organizational and technological challenges[5].

**Increasing pace of organizational redesign and increasing employee mobility:**
    The disruptive nature of work relationships with an increasing number of mobile workers fails to provide a stable, highly interactive, co-located, face-to-face work

environment[6]. Such an environment is needed for employees in order to develop trust and identity. It supports the easy sharing of knowledge (Holtshouse 1998, 278). This requires measures that aid a quicker development of networks and an improved locating of knowledge providers, experts or simply employees interested in or working on the same topics. These help to build up trust and social (partly virtual) identities that transcend the memberships in one particular project team or work group. Moreover, stable social environments can be created with the help of collectives, also called communities[7], which endure the constant shift of people between different organizational units.

**Business process reengineering and lean management:** These management initiatives have resulted in considerable losses of organizational knowledge and networks which have to be substituted. Additionally, the establishment of profit centers and "internal markets" within organizations leads to organizational units competing with each other for scarce resources and consequently hinders knowledge sharing between competing units.

**New information and communication technologies:** Recently, ICT tools and systems have been developed that provide sophisticated functions for publication, organization, visualization, contextualization, search, retrieval and distribution of knowledge as well as functions supporting communication, cooperation and linking of individuals in networks at comparably low cost. They are also relatively easy to use. The situation as found in many organizations is that there is an advanced ICT infrastructure in place. This is regularly a solution based on a set of Internet technologies (Intranet) or based on the market-leading Groupware platform, Lotus Notes. This ICT infrastructure needs strategy to define knowledge goals and the subsequent implementation of organizational instruments, roles and processes and

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5. Examples for organizational challenges are to design and implement business processes that span organizations, to support cross-organizational (virtual) teams and work groups, to negotiate appropriability of knowledge generated in cross-organizational projects and to prevent that the organization's competitive advantages are transferred to competitors. Examples for technological challenges concerning interoperability are to standardize interfaces between or to integrate important knowledge-related information and communication systems, such as experience data bases, document and content management systems, asynchronous and synchronous communication and collaboration tools, to establish shared work spaces for virtual teams across organizational boundaries or to handle access and security of ICT systems.

6. Mobile is understood in a broad sense here. It comprises mobility within and between jobs. Within one organization, employees play multiple roles and participate in multiple projects at the same time often requiring them to switch work environments. Additionally, the duration of projects decreases and employees often take on new job assignments with different co-employees. On the other hand, the duration of employment with one employer decreases and the rate of employees moving to a new city to take on a new job increases. Thus, on the one hand, the networks of employees in terms of the number of people they know in many different organizations might get bigger due to the numerous changes in environments. On the other hand, the intensity of interactions within the networks might decrease.

7. See also section 6.1.3.3 - "Communities" on page 160.

an organizational culture supportive of knowledge sharing in order to create bene-
fits for the organization.

The fundamental transformation of businesses and the enormous changes in
organizations due to these driving forces have also created considerable reflection
in the corresponding literature. Recent approaches that transform businesses using
a combination of organizational and ICT instruments are studied under concepts
such as internet economy, network economy or e-conomics in the discipline Eco-
nomics, e-business, e-government, e-commerce, m-commerce or u-commerce[8] in
the discipline Business Administration at the (inter-) organizational level and cus-
tomer relationship management, business intelligence, e-learning, and—last but
not least—knowledge management[9] on the intra-organizational level.

The field of knowledge management draws concepts and ideas from a variety of
fields and disciplines. Examples are organization science, particularly organiza-
tional learning and organizational memory, human resource management (HRM),
strategic management, pedagogy, psychology, sociology, artificial intelligence,
computer science and management information systems (MIS). Researchers with a
background in all of these disciplines show a vivid interest in knowledge manage-
ment[10].

The ever-increasing pace of innovation in the field of ICT support for organiza-
tions has provided numerous technologies ready to be applied in organizations to
support these approaches. Examples for information and communication technolo-
gies that are related to knowledge management are[11]:

- *Intranet infrastructures* provide basic functionality for communication—email,
  teleconferencing—as well as storing, exchanging, search and retrieval of data
  and documents,

- *document* and *content management systems* handle electronic documents or Web
  content respectively throughout their entire life cycle,

- *workflow management systems* support well-structured organizational processes
  and handle the execution of workflows,

- *artificial intelligence technologies* support for example search and retrieval, user
  profiling and matching of profiles, text and Web mining,

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8. The u in u-commerce stands for ubiquitous, universal, unique and unison (Watson
   2000).
9. See also Wiig 1993, Nonaka/Takeuchi 1995, Davenport/Prusak 1998, Probst et al.
   1998, Bach/Österle 2000, Grothe/Gentsch 2000, Hildebrand 2000, Lehner 2000, Wat-
   son 2000, Zerdick et al. 2000, Alavi/Leidner 2001, Gora/Bauer 2001 and the literature
   cited in section 4.1 - "Knowledge management" on page 19.
10. The influences of the various fields and disciplines on knowledge management are
    investigated in section 4.1.1 - "From organizational learning to knowledge manage-
    ment" on page 20.
11. For a detailed discussion of these ICT technologies and their impact on knowledge
    management systems see also section 4.3 - "Knowledge management systems" on
    page 79.

- *business intelligence tools* support the analytic process which transforms fragmented organizational and competitive data into goal-oriented "knowledge" and require an integrated data basis that is usually provided by a data warehouse,
- *visualization tools* help to organize relationships between knowledge, people and processes,
- *Groupware* supports for example the time management, discussions, meetings or creative workshops of work groups and teams,
- *e-learning systems* offer specified learning content to employees in an interactive way and thus support the teaching and/or learning process.

*Knowledge management systems* (KMS) promise significantly enhanced functionality through an integrated combination of a substantial portion of the above mentioned information and communication tools and systems from the perspective of knowledge management[12]. KMS should not be seen as a voluminous centralized data base. They can rather be imagined as large networked collections of contextualized data and documents linked to directories of people and skills and provide intelligence to analyze these documents, links, employees' interests and behavior as well as advanced functions for knowledge sharing and collaboration. Goals of using KMS are for example to generate, share and apply knowledge, to locate experts and networks, to actively participate in networks and communities, to create and exchange knowledge in these networks, to augment the employees' ability to learn and to understand relationships between knowledge, people and processes. Examples show the often substantial size of KMS. Ernst & Young manages more than 1,000,000 documents in more than 5,000 networked internal Lotus Notes data bases and a large number of external sources, such as on-line data bases provided e.g., by Reuters, the Gartner Group, Forrester or OneSource (Ezingeard et al. 2000, 810).

Knowledge management systems require a systematic knowledge management initiative in order to be used effectively and efficiently. This includes a KM strategy and the development of KM goals, an appropriate organizational design describing roles responsible for knowledge-related tasks and processes that use KMS, a supportive organizational culture and a corresponding KMS controlling that evaluates whether the goals of using these systems have been achieved.

This book reviews the state of theory—concepts, approaches and theories from a variety of contributing fields and disciplines—and the state of practice—initiatives, projects and activities in organizations—of KMS to support knowledge management initiatives. The focus is on KMS or, more generally, on information and communication technology for KM initiatives. In order to get a more holistic picture of how organizations deploy KMS, this focus is extended to include KM strategy, organization and economics which are studied from the perspective of KMS. In the following, the goals of this book will be discussed in detail.

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12. For a detailed analysis and a definition of KMS see also section 4.3 - "Knowledge management systems" on page 79.

# 2   Goals

The leading research question of this book therefore is: To what extent can information and communication tools and systems support holistic knowledge management initiatives aimed at improving an organization's way of handling knowledge?

On the one hand, the focus has to be broad enough to cover the interesting mixture of perspectives, concepts approaches, theories and results fueling KM research and practice that are due to the cross-disciplinary, multi-faceted nature of the field. On the other hand, it is a clear goal to rigorously study the notion of KMS in theory and practice in order to gain insights into the implementation and deployment of ICT technologies to support an organization's KM initiative. The result is a compromise between rigor—a focussed study of KMS in theory and practice—and relevance—a holistic perspective on the field of KM. Goal of this book is to investigate the state of theory and practice of KMS supported KM initiatives using this perspective. The complexity of this undertaking is reflected in the volume of the book. There are a lot of unresolved research questions in this area. The following ones will be addressed in this book:

**Strategy:** How can KM initiatives be linked to an organization's strategy? What knowledge management strategies can be distinguished? How can a KM strategy be described and detailed? Which factors influence the selection of a strategy for an organization? Which strategies are potentially successful? What are important success factors and barriers for the deployment of KMS?

**Organization:** What alternatives for the organizational design of KM initiatives are there and which ones are actually implemented in organizations? What knowledge management tasks and processes can be distinguished? Which knowledge management roles can be differentiated? How can KM initiatives support the handling of knowledge in formal work groups and teams and informal networks and communities? Who should be responsible for what kind of KM tasks? What impact does the application of knowledge management systems have on organizational culture and vice versa? What models can be used to aid the design of KM initiatives as well as the design and implementation of KMS?

**Contents and knowledge management systems:** How can KMS be defined and classified? What are the differences to other types of ICT systems? What are the technological roots of KMS? What architectures for KMS can be distinguished? What kinds of KM technologies exist or what kinds of technologies are proposed for the use in KM approaches? What functions do KMS provide? To what extent are KMS and particularly KMS functions implemented and actually used in organizations? What types of contents and media are used in KMS?

**Economics:** How can success of KMS and KM initiatives be measured? What could a KMS controlling look like? How should KM initiatives be funded? What is the state of practice concerning evaluation of success of KMS and KM initiatives?

Moreover, the relationships between these four main areas describing KMS supported KM initiatives will be studied. The general research question underlying this investigation is: What could a KM initiative look like in which strategy, organization, contents as well as KMS match each other effectively and efficiently?

In the following, the procedure of this investigation to answer the research questions will be outlined along with the methods used. Part A will be concluded by an overview of the structure of the book.

# 3   Procedure, Methods and Overview

Due to its interdisciplinary nature, knowledge management is a field that is still far from being consolidated[13]. The substantial complexity and dynamics of the field have turned theory-based investigations into knowledge management as well as knowledge management systems into challenging enterprises. Recently, both, researchers, with varying backgrounds as described above, and practitioners, especially in knowledge-intensive businesses such as professional services firms, biotechnology, pharmaceutical, chemical, computer and telecommunications companies, have shown considerable interest in the field of KM. Consequently, it seemed appropriate to answer the research questions of this book on the basis of a *combined theoretical and empirical investigation* of KMS.

Figure A-1 shows the general research design of the research program on knowledge management (systems) directed by the author.
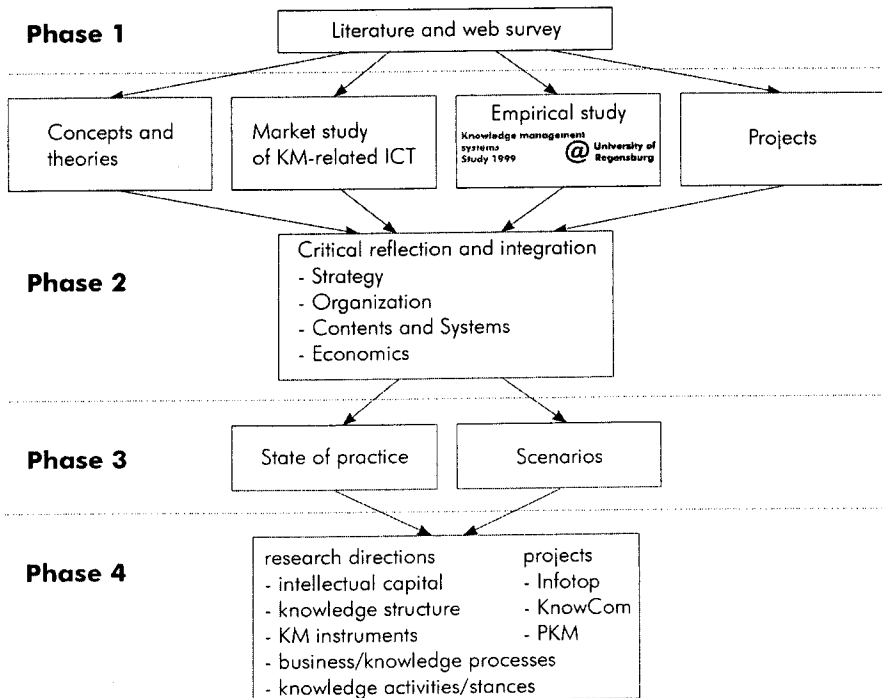


**FIGURE A-1.**   General research design

The program was started with the research project *Knowledge management systems: concepts for the use in organizations* at the Department of Management

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13.  See section 4.1 - "Knowledge management" on page 19.

Information Systems III, University of Regensburg, Germany that lasted from 1997 to 2001 and then taken to the Department of Management Information Systems, Martin-Luther-University Halle-Wittenberg, Germany[14].

The project comprises the first three phases which are depicted in Figure A-1. The *first phase* consisted of a detailed literature and Web survey on KM and related concepts. It turned out that KM has been a broad, complex and dynamic field. Various management approaches and scientific disciplines have played a role in the development of KM approaches. The perspective taken on the literature was that the approaches, theories and concepts should aid the implementation and deployment of KMS. The results of the first phase were summarized and integrated.

The *second phase* of the project consisted of four activities that were based on this extensive discussion of related work and the clarification of focus. The *concepts and theories* found in the literature were identified, analyzed and compared to each other in order to build a sound theoretical basis for the subsequent empirical activities.

A *market study* on knowledge management tools and systems was performed[15]. The study compared several KMS available on the market in the sense of platforms that provide an integrated set of functions for KM (a KM suite) and derived a list of KMS functions that was used in the empirical study.

The central activity was the *empirical study* which comprised a broad questionnaire and numerous interviews with knowledge managers of large German corporations.

The study was complemented by a number of knowledge management *projects* in which the author and his colleagues participated or which were observed. The latter was in most cases accomplished with the help of a number of graduate students who performed KM-related activities at the author's department, joined several companies and reflected their KM initiatives or wrote up a series of case studies in several companies in the course of their master theses[16].

The manyfold results of these four activities were bundled and compared, reflected and integrated into the four major areas of theoretical and empirical consideration: *strategy, organization, contents/systems* as well as *economics*.

These empirical and practical activities were backed by the theoretical work of an interdisciplinary work group at the University of Regensburg. This group was initiated and co-led by the author, consisted of MIS researchers and psychologists who met every two weeks for a period of 15 months to discuss a set of theories and approaches to guide the implementation and use of KMS. The author also has participated in a knowledge community focused on knowledge management (AG Wissensmanagement), a lively network of approximately 40 research assistants, Ph.D.

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14. URL: http://www.wiwi.uni-halle.de/maier/.
15. A list of the tools and systems surveyed can be found in chapter 21 - "Knowledge Management Tools and Systems" on page 622.
16. See Igl 1999, Schierholz 1999, Seidel 1999, Hädrich 2000, Hassberg 2000, Jahn 2000, Gebuhr 2001, Paur 2001, Wäschle 2001.

and habilitation students, from industry, research institutes and Universities. The members of this community have different backgrounds—computer science, MIS, pedagogy, psychology, sociology, strategy, organization science and HRM—and meet twice a year to share knowledge about knowledge management. The discussions in the interdisciplinary work group and the knowledge community were particularly useful to ensure that the investigation never lost sight of the holistic nature of the research topic in spite of the concentration on information and communication technologies supporting knowledge management.

In the *third phase*, the results of the second phase were used to paint a comprehensive picture of the *state of practice* of knowledge management systems and to develop *scenarios* for their use. The scenarios describe ways to apply information and communication technologies potentially successfully to support KM initiatives and thus can be used as general architectures and blueprints for the design of such systems and their embedding in a holistic KM initiative.

In the *fourth phase* of the program, on the one hand the concepts, models and techniques developed in the first three phases have been applied to a number of research projects, e.g., Infotop[17], an information and communication infrastructure for knowledge work, PKM[18], the design and implementation of process-oriented KM strategies and KnowCom[19], Knowledge and Co-operation-Based Engineering for Die and Mould Making Small and Medium Enterprises, a project funded by the European Union. On the other hand, five promising research directions have been studied[20]:

- *intellectual capital*: the economic consideration of knowledge as intellectual capital, the analysis of an organization's (core) competencies and the evaluation of success of KMS supported KM initiatives,
- *knowledge structure*: the development of knowledge structures, taxonomies and ontologies,
- *KM instruments*: the investigation of KM instruments that consist of person-oriented and organizational measures as well as supporting ICT solutions,
- *business/knowledge processes*: the design of knowledge-intensive business processes and knowledge processes to support a business process-oriented KM approach,
- *knowledge activities/stances*: modeling knowledge work that consists of a description of a situation, or stance, in which certain knowledge activities, actions and operations are performed.

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17. See section 7.4.3 - "Example: Infotop" on page 286; also Maier/Sametinger 2002, 2003, 2004.
18. See section 6.2.3 - "Example: Process-oriented knowledge management" on page 184; also Maier/Remus 2002, 2003.
19. For a detailed description of the KnowCom project see KnowCom 2003, Enparantza et al. 2003.
20. See also chapter 18 - "Outlook" on page 543 for a more in-depth coverage of these four research directions.

Figure A-2 gives an overview of the structure of this book and shows how the chapters of the book are related.
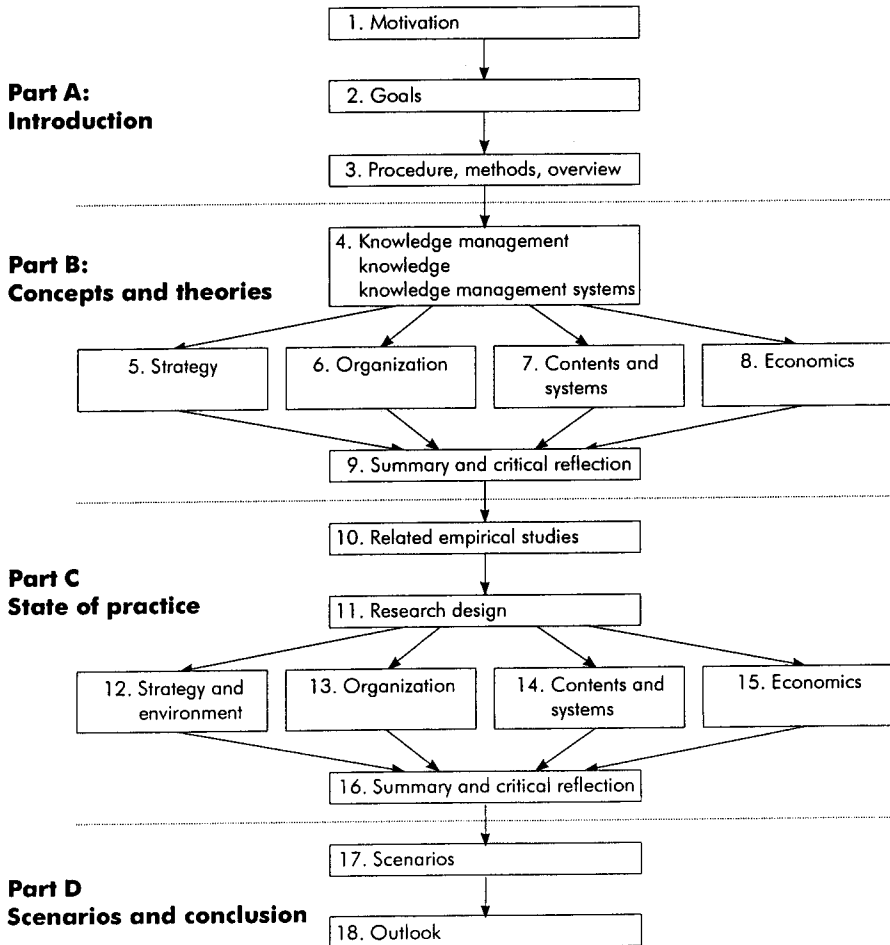


**FIGURE A-2.**   Overview of the book chapters and their relationships

*Part A* motivates the investigation, defines its goals and gives an overview of the procedure and the sequence of the chapters in the following parts.

*Part B* starts out to introduce the reader into the multi-faceted field of *knowledge management*, its history, interdisciplinary roots, its goals and ambition and its critics (chapter 4). It turned out that a large part of the inconsistencies between various approaches to knowledge management have their roots in different perspectives on the term *knowledge*. Therefore, the chapter continues with an overview of perspectives on and classifications or typologies of knowledge and discusses aspects of knowledge that influence the implementation of KMS. As *knowledge management*

*systems* are the primary focus of the investigation, the chapter finally discusses and defines the term KMS and analyzes related concepts.

Then, the constructs are presented which play a role in the implementation of KM initiatives that use knowledge management systems. These constructs are discussed according to the following levels of intervention of a KM initiative:

- *strategy* (chapter 5) embeds the knowledge management approaches in strategic management, proposes a framework for process-oriented knowledge management strategies and reviews the literature about KM goals and strategies,
- *organization* (chapter 6) discusses new forms of organizational designs, structure, processes, roles and stakeholders, issues of the organizational culture as well as approaches to modeling for knowledge management,
- *contents and systems* (chapter 7) is dedicated to knowledge management systems and discusses architectures, contents and functions of KMS, platforms and systems which are classified accordingly,
- *economics* (chapter 8) discusses approaches to measure success of KMS and KM initiatives as well as alternative ways to fund KM initiatives.

At the end of part B, the most important theoretical findings are summarized (chapter 9).

*Part C* presents empirical results challenging the theoretical concepts, approaches and theories. It starts out with an overview of related empirical studies (chapter 10). The design of the empirical study is laid out in chapter 11 together with a summarized presentation of the hypotheses. Then, the results of the empirical study are presented and compared to the related empirical studies according to the same structure as used in chapters 5 to 8 of part B:

- *strategy and environment* (chapter 12) shows the organizational and business environment of the participating organizations and the KM goals at which these organizations aim as well as the ones that they have achieved,
- *organization* (chapter 13) presents the findings about organizational designs, structure, processes, roles as well as certain concepts describing the organizational culture,
- *contents and systems* (chapter 14) discusses the state of practice of knowledge management systems, the platforms and KMS used, their functionality as well as the contents handled in these systems,
- *economics* (chapter 15) discusses to what extent organizations invest in KM, how they fund their KM initiatives, and what benefits they gain with the help of their KMS and KM initiatives.

Chapter 16 summarizes the descriptive empirical results and the hypotheses tested and discusses the state of practice of KMS in organizations.

*Part D* comprises a set of *scenarios* of the application of KMS in organizations and an *outlook* to the future of KMS. Chapter 17 presents the essence of the combined analysis of theoretical and empirical results in the form of scenarios for the successful application of KMS in holistic KM initiatives. Chapter 18 gives an outlook on probable future developments in the market for KMS.

The bibliography is structured into literature (chapter 19) and links to on-line resources (chapter 20). Finally, an extensive list of KM tools and systems is presented in chapter 21.

Since the first edition of this book, the author has been involved in several KM projects and has also supervised a number of diploma and Ph.D. theses. The results of these projects and the research activities in the five research directions intellectual capital, knowledge structure, KM instruments, knowledge and business processes as well as knowledge activities and stances have found their way into almost every chapter of this book. The 2nd edition particularly provides a more in-depth coverage of the theoretical foundation of knowledge management including a new account of knowledge work (chapter 4). The section on process-oriented knowledge management was extended substantially and also provides the example of a process-oriented KM approach in a large transaction bank[21] (chapter 6). Models play an important role in KM initiatives. Thus, a detailed account of modeling approaches that can be used in KM has been added to chapter 6 due to its importance for the organizational design of KM initiatives. As modeling is also required in the design and implementation of KMS, it provides the link to chapter 7.

Chapter 7 was also substantially reorganized and extended in order to cover the most recent developments in ICT-supported knowledge management, distributed or peer-to-peer knowledge management systems. The 2nd edition also includes an update of the comprehensive list of KM tools and systems and related ICT tools that support KM initiatives as well as of the bibliography that provides a good overview of the latest developments in KM which is neither restricted to a technocratic, nor to a human resources or organizational approach.

Due to the dynamic nature of this research field, a portion of the results and considerations has a short half-life. This is especially true for the market supply of KMS and generally of information and communication technology supporting KM initiatives. Consequently, this quickly changing part is supported by a Web site[22] that keeps information about KM technologies and links to important KM-related Web sites up to date. Also, for reasons of keeping the book within a reasonable page limit, the detailed results of the empirical study that were part of the appendix in the first edition are no longer part of this book and can now be found at the book's support Web site[23].

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21. See section 6.2 - "Process organization" on page 175.
22. URL: http://www.wiwi.uni-halle.de/maier/kms/.
23. URL: http://www.wiwi.uni-halle.de/maier/kms/.