

Knowledge Networks

WORKING METHODS FOR KNOWLEDGE MANAGEMENT

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Knowledge Networks

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Introduction to the Series – Working Methods in Knowledge Management

Knowledge sciences as a discipline has a rich and diverse history dating back to the 1950s. In the past 70 years, the discipline has drawn theory and practice from economics, engineering, communications, learning sciences, technology, information sciences, psychology, social sciences, and business and organization management. To craft this discipline, we have developed our own language and terminologies, established our own peer-reviewed journals and built a rich research foundation, created a gray literature, and established a series of networks and conferences. Over the decades there have been many knowledge management education programs, but there is no consistent curriculum and few have sustained. It has been challenging for new practitioners to gain an understanding of the field. And, while the practice of knowledge management is growing around the world, it has not yet achieved the expected organizational stature. For knowledge management to rise to the stature of other business functions and operations, it must be able to speak the language of business, align with and support the way the organization works.

This series is designed for business and knowledge management practitioners. *Working Methods in Knowledge Management* is a multi-year and multi-volume series designed to address each and all of the methods required to establish and sustain an organization-wide knowledge management function. The goal of the series is to provide a business perspective of each topic. Each book begins by grounding the method in the business context – then translates established business models and methods to a knowledge management context. It is often the case that this translation expands and extends the business model and method.

The knowledge management literature is rich with introductory handbooks, guidebooks, cookbooks, toolkits, and practical introductions. This literature is an important starting point for anyone new to the discipline. We recommend all of these books as a way to build a fundamental understanding of the scope and coverage of the field. These texts will provide a good 10–20 page introduction to all of the key issues you need to be aware of as you embark on a new career in the field or have been assigned a new knowledge management role or responsibility. Once you have that grounding, though, we recommend that you look to the *Working Methods in Knowledge Management* texts as an intermediate source for understanding “What comes next? What now?”

Just as this series is not intended as a starting point for the field, neither is it an ending point. Each text is designed to support practical application and to foster a broader discussion of practice. It is through practical application and extended discussion that we will advance theory and research. The editors anticipate that as practice expands, there will be a need to update the texts – based on what we are learning. Furthermore, the editors hope the texts are written in a way that allows business managers to extend their work to include knowledge management functions and assets. We will learn most from expanding the discussion beyond our core community.

Joint Enterprise, Mutual Engagement, and a Shared Repertoire

From the outset, the publisher and the editors have established a new and different approach to designing and writing the books. Each text is supported by a team of authors who represent multiple and diverse views of the topic. Each team includes academics, practitioners, and thought leaders. Every author has grappled with the topic in a real-world context. Every author sees the topic differently today than they did when the project began. Over several months, through weekly virtual discussions, the scope and coverage were defined. Through mutual engagement and open sharing, each team developed a joint enterprise and commitment to the topic that is enduring. Every author learned through the discussion and writing process. Each project has resulted in a new shared repertoire. We practiced knowledge management to write about knowledge management. We ‘ate our own dog food’.

Acknowledgments of Early Support

The series is a massive effort. If there is value in the series much of the credit must go to two individuals – Dr Elias Carayannis, George Washington University, and Dr Manlio Del Giudice, University of Rome. It was Dr Carayannis who first encouraged us to develop a proposal for Emerald Publishers. Of course, this encouragement was just the most recent form of support from Dr Carayannis. He has been a mentor and coach for close to 20 years. It was Dr Carayannis who first taught me the importance of aligning knowledge management with business administration and organizational management. Dr Del Giudice has been generous with his guidance – particularly in setting a high standard for all knowledge management research and practice. We are grateful to him for his careful review and critique of our initial proposal. His patience and thoughtful coaching of colleagues are rare in any field. The field will reach its full potential as long as we have teachers and editors like Dr Del Giudice.

Dr Denise Bedford, Georgetown University
Dr Alexeis Garcia-Perez, Coventry University

Preface

Overview of the Subject Matter

Knowledge networks draw from two fields – network science and knowledge sciences. Its foundation is in knowledge sciences, specifically the study of knowledge flows, grows, and changes in any context. Knowledge sciences teach us how to characterize knowledge assets, audit them, and create inventories of our knowledge stocks. Knowledge sciences also teach us how to model and measure these flows. We apply network sciences to knowledge flow models to track and quantitatively explain knowledge transactions and impacts in the knowledge economy.

Network science is an emerging discipline driven mainly by the rapid advances of technology in telecommunications, transportation, and disease surveillance. While it is a reasonably recent applied science, it is grounded in the well-established and tested statistics and analysis fields. The rapid growth and adoption of social media and social networking tools provide many new, rich opportunities to advance our understanding of human networks. Looking beyond social media, network science offers significant opportunities for modeling and monitoring knowledge flows.

The economic landscape of the early twenty-first century is transforming from an industrial to a knowledge-based economy. This shift has been in progress for the past 70 years. This shift was first observed by Machlup (1962) in the 1960s and has been further chronicled and characterized by other leading economists and researchers. Since the 1950s, economists have attributed the shift to the rise in importance of services, information, an increasingly educated and trained workforce, technology, and increasingly virtual work environment and increases in artificial intelligence and automation. The common element to all of these perspectives is the increased value of knowledge. In the twenty-first century, knowledge becomes a primary factor of production. It is equivalent to financial and physical capital in the industrial economy and to land and physical labor in the agricultural economy. The shift in the value and priority of capital – knowledge capital – means that organizations must now manage and monitor their knowledge assets and transactions as they historically treated financial and physical capital.

While the knowledge sciences literature provides an extensive treatment of knowledge flows, the research is fragmented. Knowledge flows are often studied in single case studies and defined as knowledge sharing, knowledge transfer, knowledge exchange, and knowledge translation. These characterizations reflect

psychological and behavioral science, social science, and communications science factors. The economic perspective and characterization are generally absent. The alignment of network sciences and these fundamental knowledge science concepts provides an opportunity for us to rigorously model and analyze these transactions.

Where the Topic Fits in the World Today?

Neither knowledge sciences nor network sciences are a new topic. The intersection, though, is a new area of research. There is a significant amount of literature entitled or described as addressing knowledge networks. In preparing to write this book, the authors learned that little of the existing literature provides in-depth coverage of actual knowledge transactions. While referred to as knowledge networks, much of the extant discussion focuses on general human networks. It reflects the evolving shift from an industrial economy, where network analysis was applied to the machine or non-human agents (e.g., traffic networks, telecommunications networks, disease transmissions), to a knowledge economy, where human networks are prominent. The challenge is that this evolution has not yet progressed to a focus on knowledge assets.

The knowledge networks' current treatment provides critical applications and translations of network analytics and metrics to human networks. It does not, though, focus on actual knowledge capital assets. The current treatment of knowledge networks represents an organizational design perspective. It explains how people are organized within organizations, how they communicate, and with whom they interact. It does not, though, focus on knowledge as the transaction. It portrays people as nodes but does not guide how to model a node as a knowledge producer or knowledge consumer.

Where the Book Fits in the Literature Today?

This text draws extensively from the work of intellectual capital management research in modeling knowledge assets. The authors characterize knowledge assets based on their economic properties and behaviors, drawing from knowledge and information economists' ground-breaking work. We draw from the social sciences and knowledge sciences literature to model knowledge transactions and to represent the factors that influence their behaviors. Additionally, we draw from both the peer-reviewed and the grey literature (e.g., open and non-peer-reviewed) on organizational network analysis to focus and structure the work in a way that is effective for everyday business managers. Finally, we interpret all of this good work in the context of economics.

Description of the Target Audience

This text is written for business managers who are experiencing and need to understand the factors causing the changing economic landscape. The book is written for organizational executives who need to begin transitioning what they manage

and managing their organizations from an industrial to a knowledge perspective. The book is written for human resource managers whose future role in knowledge organizations will be pivotal or non-existent depending on how they navigate that future. The book is written for knowledge management professionals and practitioners who need or are willing to synthesize and interpret the existing research on knowledge sharing, transfer, and exchange as network knowledge flows and transactions. Finally, the book is written for knowledge auditors and accountants to translate current financial and physical capital audits and accounting methods to knowledge capital.

Structure of the Book

The book is organized into four sections and 16 chapters. Section 1 is comprised of three chapters and introduces the reader to the role of networks in the knowledge economy. Section 2 is comprised of three chapters. This section provides a detailed exploration of network structures and behaviors. Section 3 is comprised of three chapters. This section explores different types of knowledge networks from the practical world. Finally, Section 4 is comprised of seven chapters. This section focuses on assessing the current knowledge network landscape, building knowledge network capacity, and defining network roles, responsibilities, and competencies.

Chapter Summaries

The summaries of all 16 chapters are provided below. The reader will also find extensive references to literature, to thought leaders and practitioners in that topic.

Chapter 1. Networks in the Knowledge Economy

In this chapter, the authors highlight the emerging discipline of network sciences and the evolution and adaptation of human networks. The change is considered in a shifting economic landscape and the importance of knowledge in the twenty-first-century knowledge economy. The chapter offers a fundamental definition of networks and explores the shifting geography of networks. Specifically, the authors explore door-to-door, place-to-place, and person-to-person network geographies. The authors model economic systems as networks and explain the role of human, structural and relational capital as nodes, messages, and links in networks.

Chapter 2. Network Structures and Components

This chapter focuses on the treatment and characterization of networks as an emerging discipline. The classic definition of networks is offered. The authors call out and explain the importance of network domains, network geographies and topologies, network behaviors, network nodes, network links, relationships and flows, and network messages. While network sciences provide a strong foundation for research and analysis, the authors note the lack of knowledge networks within

the broader networks discipline. This chapter highlights the need to expand coverage to include knowledge networks.

Chapter 3. Knowledge Networks

This chapter provides a deep dive into knowledge networks. An inclusive definition of a knowledge network is offered, with nodes as sources and targets of knowledge, relationships as knowledge links, and messages as knowledge transactions and flows. The authors note how knowledge networks differ from other types of networks, specifically their dynamic and chaotic state and continuous transactions. These peculiarities reflect the economic properties and behaviors of knowledge. The elements of networks described in Chapter 2 are elaborated for knowledge networks. The chapter calls out knowledge network domains, geographies, typologies, nodes, messages, and relationships.

Chapter 4: Network Nodes and Knowledge Sources

This chapter explores the role of nodes in knowledge networks. Knowledge nodes are defined by the type of actors they represent, including individual human agents, collective human groups and teams, explicit non-human objects and resources, and non-human agents and machines. Knowledge nodes are also characterized in terms of their role in the network, including as producer, consumer, or broker of knowledge. And in terms of the stock of knowledge, they represent their capacity to absorb knowledge made available in the network.

Chapter 5. Messaging Knowledge

This chapter explores the role of messages in knowledge networks. Messages are characterized in terms of the type of knowledge they represent and their attributes. Messages represent knowledge transactions in a network. The authors describe the type of message in terms of the knowledge capital it contains. The chapter considers what is involved in making all forms of knowledge capital available, accessible, and consumable in a network. Making knowledge available involves articulation – semantic, linguistic, visual, acoustic, and kinesthetic. Making knowledge accessible means encoding the knowledge, formatting, and packaging it as a message. The chapter also addresses factors that influence knowledge consumption, including coherence, completeness, verifiability, usefulness, relevance, orientation, freshness, and redundancy. The authors also provide examples of messaging human, structural, and relational capital.

Chapter 6: Network Links, Knowledge Flows, and Relationships

This chapter focuses on network links as knowledge flows and relationships. Knowledge links are defined as channels for communicating and distributing knowledge. The literature on network links is aligned with the literature on knowledge sharing, transfer, exchange, and appropriation. This chapter focuses on the peculiar attributes of knowledge network links, including the direction of the link, the length of link and distance between nodes, the strength and durability of the link, the concentration and congestion of links, the velocity of and impact of

links, the meaning and intention of a link, and the coverage and spread of links. The authors also describe standard configurations of knowledge networks.

Chapter 7. Developing a Knowledge Networks Strategy

This chapter highlights the importance of strategically managing knowledge networks. Strategic management is defined as being aware of current knowledge networks, understanding current knowledge stocks, and identifying gaps. It also involves assessing the knowledge needs of business units and ensuring that those needs are addressed. The chapter also highlights the importance of having a vision of a healthy knowledge network.

Chapter 8. Designing and Operationalizing the Knowledge Network Analysis

This chapter explains how to design and operationalize a knowledge network analysis. The authors walk through a nine-step methodology that addresses each stage of the process. The nine-step process is the result of an in-depth review of the theoretical and applied literature. The authors explain how and why each step contributes to the quality and goodness of the analysis. The risks of skipping or sub-optimizing steps are explained. The step-by-step process highlights the dependence of a knowledge network analysis on data sources. The authors explain the importance of identifying, collecting, and curating sources.

Chapter 9. Building Capacity for Knowledge Network Analyses

This chapter describes capacity building as a general concept and as a networking capability specifically. There are two essential components to building capacity. The first is building the network capacity, building relational capital, and sharing knowledge. The second is building the capacity to support knowledge network analyses. The authors offer a set of key questions for determining the health of networking capacity at the strategic, operational, and individual levels. The chapter also describes the roles and competencies required for network analysts, managers, and general employees.

Chapter 10. Scientific and Research Networks

This chapter focuses on scientific and research networks. All six facets of knowledge networks are described. The importance of three facets is called out, including domain, knowledge, and nodes. The authors provide profiles of five networks, including an invisible college in chemistry, a professional association network in engineering, an editorial network, a national biological observation collaboration, and a national science museum.

Chapter 11. Learning Networks

This chapter focuses on learning networks. All six facets of knowledge networks are described. The importance of three facets is called out, including geography, topology, and nodes. The authors provide four networks, including pedagogy networks – teachers, certification and professional learning networks, school networks, and informal and collaborative learning networks.

Chapter 12. Industry and Business Networks

This chapter focuses on business and industry networks. All six facets of knowledge networks are described. Three of the six facets have particular importance for these networks, specifically domain, relationships, and how messages are managed and controlled. The authors provide six network profiles, including health care industry networks, fashion industry networks, technology industry networks, food production industry networks, building industry networks, and transportation industry networks.

Chapter 13 Community and Group Networks

This chapter focuses on community and social group networks. All six facets of knowledge networks are described. The importance of three of the six facets is called out, including geography, domain, and the messages exchanged across the network. The authors provide profiles of five networks, including family networks, neighborhood networks, issue and support networks, community organization networks, gangs and criminal networks, and sports and gaming networks.

Chapter 14. Protective and Emergency Service Knowledge Networks

This chapter focuses on emergency and hastily formed knowledge networks. All six facets of knowledge networks are described. The importance of four of the six facets is called out, including domain, topology, nodes, and relationships among the networks' members. The authors provide four network profiles, including emergency and disaster response networks, law enforcement networks, military networks, and militia and vigilante networks.

Chapter 15. Civic and Political Networks

This chapter focuses on civic and political networks. All six facets of knowledge networks are described. The importance of three of the six facets is called out, including topology, domain, and messages exchanged across the network. The authors provide three networks' profiles, including civic and governance networks, advocacy networks, and political parties and networks.

Chapter 16. Networks of Things

This chapter focuses on networks comprised of explicit sources of data and information, and machines. All six facets of knowledge networks are interpreted for these types of networks. Given these networks' peculiar nature, three facets have particular importance, including geography, topology, and relationships. The authors provide several illustrative networks, including concept networks, semantic networks, citation networks, database networks, telecom networks, computer networks, energy networks, and robotics.

How this Book Impacts the Field?

The authors intend to provide a holistic picture of knowledge networks to help business managers understand how to better leverage the value embedded in their knowledge stocks and provide a foundation upon which to ground and grow

more productive and high-performance networks. The authors hope the practical coverage of the issues will give managers the insights and guidelines they need to develop healthy and high-performance knowledge networks.

The book aims to create a new dialog among knowledge scientists, network scientists, economists, business managers, organizational designers, and human resource managers around knowledge networks. We hope the experimental treatment will encourage those in the business community to expand this overview and introduce practical, working strategies. Bridging these perspectives and areas of practice is essential for success in the knowledge economy. This new context calls for a coalescing of perspectives and practices and a new focus on knowledge networks. Until this dialog begins, each area of practice will operate in isolation. Until this dialog begins, each area of practice will focus on part of the solution. Until this dialog begins, no one area of practice will effectively address the challenge. The authors hope this book will be a catalyst for that dialog.

How to Read this Book?

This book represents a blended practical and academic approach. How you read the book depends on your purpose. Suppose you are reading this book to learn how to translate and interpret network analysis to knowledge organizations, begin at the beginning. The book will walk you through the interpretation of ideas from related disciplines. If you are reading the book to gain a practical, real-world perspective of practical, everyday knowledge networks, begin with Section 4. Section 4 is comprised of chapters that define and explain how our everyday communities and institutions can be modeled as knowledge networks. From Section 4, you can refer back to the earlier chapters that provide context and explanations. If you are a manager who needs to design and implement an organizational knowledge network strategy and analysis, begin with Appendix A. Appendix A provides an easy-to-follow, step-by-step project plan. Regardless of how you read the book after reading the book, the authors encourage you to take your thoughts and experiences to your communities – to expand the dialog.

Note from the Authors

The authors have collaborated on this text during a period of significant change. The issues we had chosen to address were issues we all experienced firsthand. Our working environments changed from rich in-person physical interactions – at a local and international level – to sequential virtual activities. Our primary networks blended with our secondary networks. Networks were no longer associated with places or institutions but instead were all accessible through a single view. Zoom became our window to the world, and all of our networks were deliberate, intentional, and structured. Rather than serendipitous conversations and communications, our worlds became more deliberate, intentional, and scripted. We were forced to redesign kinds of events that had become commonplace (e.g., conferences, office hours and meetings, hallway conversations, brainstorming around a whiteboard, happy hours, and collegial dinners) to something entirely new.

Our work and home environments have blended. Becoming more virtual has opened our homes to our coworkers. What were previously segregated work networks have now become part of our home and neighborhood networks. Where work-related transactions happen is now – by definition – at and from home. When knowledge exchange happens is now whenever we have the time. Everyone has now become a part-time knowledge producer, broker, and consumer. The COVID-19 pandemic of 2020 propelled most societies into a knowledge economy. The pace of transformation accelerated dramatically. This dramatic change brought the economic changes into a clearer focus. Interactions and transactions designed for the physical environment have been forced to adapt to the virtual environment. The shift continues – we may not know the current situation’s true effect for several years to come. We hope that the way we have framed this topic has value as we all navigate this shift.