Promoting Regional Industries Through Cross-Sectoral Collaborations:

Regional System, Management, and the Management Body

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A volume in the Advances in Human Resources Management and Organizational Development (AHRMOD) Book Series

IGI Global
PUBLISHER of TIMELY KNOWLEDGE

Published in the United States of America by
IGI Global
Business Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA, USA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

Library of Congress Cataloging-in-Publication Data

Names: Kawabata, Yūki, author.
Title: Promoting regional industries through cross-sectoral collaborations : regional system, management, and the management body / Yuki Kawabata.
Description: Hershey, PA : Business Science Reference, [2024] | Includes bibliographical references and index. | Summary: “This book comprises case studies that show practical approaches to the goal of the topic above. Therefore, in conjunction with the practical implications withdrawn from the study, professionals/officials of the public sector, research institutions, and think tanks, who are involved in the survey and the program to promote regional industries and facilitate the collaborations, can benefit from this book to find the effective way to increase their performance”-- Provided by publisher.
Identifiers: LCCN 2023030246 (print) | LCCN 2023030247 (ebook) | ISBN 9781668484944 (hardcover) | ISBN 9781668484951 (paperback) | ISBN 9781668484968 (ebook)
Subjects: LCSH: Industrial management--Study and teaching--Germany. | Industries--Germany.
Classification: LCC HD30.42.G39 K39 2024 (print) | LCC HD30.42.G39 (ebook) | DDC 658.4/0380943--dc23/eng/20230711
LC record available at https://lccn.loc.gov/2023030246
LC ebook record available at https://lccn.loc.gov/2023030247

This book is published in the IGI Global book series Advances in Human Resources Management and Organizational Development (AHRMOD) (ISSN: 2327-3372; eISSN: 2327-3380)

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Advances in Human Resources Management and Organizational Development (AHRMOD) Book Series

Patricia Ordóñez de Pablos
Universidad de Oviedo, Spain

ISSN:2327-3372
EISSN:2327-3380

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Preface

BACKGROUND OF THIS STUDY

Although technological advances such as Information and Communication Technology (ICT) have enabled the global division of labor, competitive cutting-edge industries are concentrated in specific regions. In contrast, other regions continue to experience the decline of traditional industries and economic stagnation. In this context, the revitalization of regions has become a priority issue in many countries. Thus, it is necessary to stimulate the economy by promoting new industries that are highly competitive in each regional area. This is especially a pressing issue for many developed countries wherein the competitiveness of traditional industries has been declining, owing to aging populations and the advance of emerging economies. To this end, it is essential to promote new industries through business creation and innovation involving small and medium-sized enterprises (SMEs), which account for a significant share of enterprises and employees, especially in regional areas. In response to this situation and challenge, there is a movement to commercialize new fields through cross-sectoral collaborations among SMEs and other companies from different industries, universities, research institutes, and business associations, as well as a movement to support these efforts by local governments in various regions around the world. Accordingly, European countries are promoting new regional industries by facilitating cross-sectoral collaborations among different fields with the support of local governments.

In this trend, the healthcare industry is recognized as one of the most promising candidates among several industries expected to lead the next generation of growth. Furthermore, the medical technology sector in the healthcare industry is attracting attention as an industry with growth potential. This industry is showing high growth rates in the global market. Demand is expected to continue growing due to aging populations and rising incomes

in emerging countries. The medical technology industry has many niche markets, and SMEs, which have strengths in high-mix, low-volume production, can significantly improve competitiveness. For instance, in Germany, cross-sectoral collaborations are promoted under the cluster policy of each state government to promote this industry. Here, SMEs with a strong orientation toward innovation and high technological capabilities, as well as industry and academia, actively participate in the collaboration. These efforts contribute to the steady increase in exports, an indicator of international competitiveness, of the industry in Germany.

For the advancement of new regional industries, cross-sectoral collaboration must be established by industry, academia, and government in the region. This requires building a support system at the regional level to form a cooperative relationship and define and share the direction to be taken toward the collaboration. Considering the medical technology industry as an example, it is difficult for each entity to do everything from idea generation to commercialization (including understanding relevant laws and regulations, implementing clinical trials, and dealing with complex approval processes). Therefore, support is required to match the needs of the medical technology field; and development of new business ideas into collaborative projects through establishing networks of entities from various fields. In this, entities that provide relevant services required for facilitating cross-sectoral collaboration will play a significant role in creating mechanisms to facilitate collaboration among medical institutions, universities, research institutions, and medical device manufacturers and distributors (including SMEs). Moreover, the entities contribute to obtaining public budgets and competitive funds for the collaborative project and providing professional support for business creation.

Although there are many difficulties in realizing this, in Germany, the state governments are promoting the cluster policy mentioned above by building a regional system, and advanced efforts are made to facilitate cross-sectoral collaborations for promoting medical technology–related businesses. Here, involving industries and academia, local governments take the lead in promoting interactions among different fields, including SMEs, universities, other research institutions, and medical institutions, and considering regional conditions and future development potential, with the medium- to long-term goal of forming industrial clusters. In this context, cluster organizations are established to facilitate collaborations for promoting business creation. Furthermore, they are working to create opportunities for the parties involved to develop interactions and implement various interventions.

AWARENESS OF THE ISSUE AND CONTRIBUTION OF THIS BOOK

Awareness of the Issue

As described above, cross-sectoral collaboration beyond the conventional framework is indispensable for promoting new regional industries. Especially in developed countries, where the competitiveness of conventional industries is declining and local economies are becoming exhausted in the face of competition from emerging countries, upgrading the industrial structure through such collaboration in the regions across their territories is necessary. Business creation through new combinations of fields of industry, academia, and the support by the local government for these efforts are being made worldwide toward the goal of promoting new regional industries with high growth potential. Unlike the quasi-hierarchical relationship between large companies and subcontractors seen in the conventional inter-organizational relationship in Japan called "Keiretsu," these efforts are different because companies in various industries, universities, and research and medical institutions are on an equal footing, discussing business opportunities at the same table, and openly/flexibly establishing the collaborations to create new businesses toward promoting industries in the region.

Promoting regional industries requires a wide variety and a substantial number of entities interacting with each other, requiring the structure to deliberately promote self-organized collaborative efforts through mobilizing industry, academia, and government in the region. However, empirical studies comprehensively covering the management and structure required for effective promotion have been scarce. In response to this, the interest of this study is to explore the following research theme: "How to implement the management for facilitating the establishment of cross-sectoral collaborations for the purpose of promoting new competitive regional industries through business creation, and with what kind of regional system and competence of the management body to facilitate it?" More concretely, the following issues will be examined to elucidate the theme.

First, a system at a regional level to support the promotion of new competitive industries through cross-sectoral collaborations is focused. Here, it is considered what type of system, in terms of its role and structure, is required for the goal. Then, the management approach to building and operating the regional system by involving the regional stakeholders are explored.

Second, management for facilitating cross-sectoral collaboration is considered. The key is that the process of collaboration is self-organizational, featured by complexity. Therefore, the management is required to connect a number of autonomous entities by reflecting the need of stakeholders and adapting to the changing business environment to create innovative businesses.

Third, a management organization that facilitates cross-sectoral collaborations and provides relevant service is examined. The issue is considering how to build and rebuild the body to adapt to the dynamic environment and continue displaying the required organizational competence.

Contribution of this Book and the Target Reader

This study pursues both academic and practical goals. First, the academic significance of this study is developing a theory concerning management to facilitate the complex self-organization process of cross-sectoral collaboration among entities from different fields that aims to promote the regional industry. In addition to a review of previous studies, the author will conduct a comparative analysis of several cases in Germany that have achieved a certain level of performance for promoting new regional industries through advanced initiatives (e.g., cluster policies) in the face of declining competitiveness of regional industries and catch-up by neighboring emerging economies in Eastern Europe. This will enable us to develop a highly credible theoretical system for our research theme. Second, regarding practical significance, the author will be able to make valuable proposals for practitioners (i.e., officials of the public sector and facilitators of collaborations in the business society) that address the issue of how to promote competitive new regional industries through cross-sectoral collaborations by implementing public policy and providing management support.

As this is an academic book based on the field of inter-organizational relations, researchers and students of universities who major in this field are the primary target audience. In addition, as the topic is about promoting regional industries through cross-sectoral collaborations, this book is helpful for researchers and students who major in industrial development and public management, etc.

Moreover, a large part of this book comprises case studies that show practical approaches to the goal of the topic above. Therefore, in conjunction with the practical implications withdrawn from the study, professionals/ officials of the public sector, research institutions, and think tanks, who are

involved in the survey and the program to promote regional industries and facilitate the collaborations, can benefit from this book to find the effective way of increasing their performance.

Therefore, the target audience can be people from academia for their study and industry/public sector for their reference.

ORGANIZATION OF THE BOOK

This book is organized into 13 chapters which are divided into five sections. A brief description of each section/chapter is as follows:

Section 1 (Chapters 1, 2, 3)

Section 1 is the introductory part that aims to show this study's overall picture and approach.

Chapter 1 first discusses what cross-sectoral collaboration is, which is the subject of this study. Then, after introducing the perspective of cross-sectoral collaboration, the approach of this study to facilitate the collaboration and the research questions (R.Q.) are clarified. Moreover, the main concepts and theories in this study are outlined. Finally, the significance and necessity of case studies are discussed, including the appropriateness of the methodology and the target of the case study.

Chapter 2 explains, first, the overall picture and the features of the economy of Germany by focusing on the movement after the stagnation of its economy in the 1990s. Then, industrial structure and recent industrial policies (including the policies on SMEs), which aim to strengthen innovation capability and competitiveness, are described. Finally, cluster initiative is examined by focusing on the background and policy of the state government and federal governments. Moreover, the medical technology industry and cluster initiative, which are the subject of this study, are outlined.

Chapter 3 explains the research design of this study. First, the purpose and approach are discussed and clarified that this study aims to build a comprehensive theory concerning the research theme. Then, the selection of the target case is considered from the viewpoint of theoretical sampling for theory building and clarified that the three German regions that are subject to the case study fulfill the criteria. Finally, data collection for the case studies and analysis are explained. A qualitative comparative analysis method and process tracing for each case study are conducted in the analysis.

Section 2 (Chapters 4, 5, 6)

Section 2 explores the research question (R.Q.) 1, which aims to elucidate a management approach to building and operating a regional system for facilitating the self-organizing process of cross-sectoral collaboration to promote competitive regional industries.

Chapter 4 reviews the literature concerning the management approach to building and operating the regional system. Here, "Why region?" is considered, and the concept of constructing regional advantage is introduced. Then, a platform policy through building a "Regional Innovation System" based on the "Triple (Quadruple)-Helix model" is examined. The key is to combine top-down public and bottom-up creative forces. Finally, based on these arguments, a conceptual model of the management approach is proposed.

Chapter 5 describes the result of the case study that is conducted by focusing on the experiences of three states in Germany wherein the cluster programs are implemented, and medical technology industries are chosen to be promoted. In these states, regional systems to facilitate cross-sectoral collaborations are structured. Finally, it is examined how the systems are built and operated through the involvement of regional stakeholders.

Chapter 6 discusses and concludes the case study. First, based on the conceptual model, the result of the case study is comparatively analyzed and clarifies the similarity and difference between the cases. Then, each case is examined with the process tracing approach, events observed are chronologically clarified, and the causal mechanism is examined. Then, the validity of the conceptual model is considered based on the findings, and the implications of building and operating the regional system are discussed.

Section 3 (Chapters 7, 8, 9)

Section 3 explores the research question (R.Q.) 2, which aims to elucidate the management for facilitating cross-sectoral collaborations.

Chapter 7 reviews the literature. First, it discusses that inter-organizational collaboration, a type of network organization, is formed through a complex self-organization process and requires intervention for its facilitation. Second, the planned approach to change based on change management theory is examined. Here, the key elements to be targeted in management through intervention are identified. Finally, the intervention method in the key elements is considered, and a conceptual model is proposed.

Chapter 8 describes the result of the case study that focuses on the activities of the cluster organizations of the medical technology industry in three German states. All of the cluster organizations facilitate cross-sectoral collaborations and provide relevant services. First, the background of the three cases is outlined. Then, the experiences of the management of these cluster organizations are examined based on the proposed conceptual model.

Chapter 9 discusses and concludes the case study. First, the result of the case study is comparatively analyzed based on the conceptual model and clarifies the similarity and difference between the cases. Then, the individual case is examined with the approach of process tracing. Here, events observed in the intervention implemented by the cluster organizations are chronologically clarified, and the causal mechanism is examined. Finally, the validity of the conceptual model is considered based on the findings, and implications on the management for facilitating cross-sectoral collaborations are discussed.

Section 4 (Chapters 10, 11, 12)

Section 4 explores the research question (R.Q.) 3, which aims to elucidate how to build and rebuild a management body that supports facilitating cross-sectoral collaborations toward promoting regional industries.

Chapter 10 reviews the literature. First, the background of this study and the link to the research theme are explained. Then, toward the goal of facilitating the collaborations, governance by a distinctly separate administrative entity (therefore, the management body in this study) is clarified as most suitable wherein a large number and variety of autonomous and mutually dependent actors exist, that this study premises. Moreover, with identifying the organizational competence and factors to be considered for building and rebuilding a management body, a conceptual model is proposed.

Chapter 11 describes the result of the case study that focuses on the cluster organizations (equivalent to the management body) of the medical technology industry in three German states. First, the three cluster organizations are outlined. Then, based on the conceptual model, the experiences of these cluster organizations are examined by focusing on the initial, building, and rebuilding phases.

Chapter 12 discusses and concludes the case study. First, the result of the case study is comparatively analyzed, and the similarity and difference between the cases are clarified. Then, focusing on the individual case with the process tracing approach, events observed in the initial, building, and rebuilding phases of the cluster organizations are chronologically clarified,

and the causal mechanism is examined. Finally, the validity of the conceptual model is considered based on the findings, and implications for building and rebuilding the management body are discussed.

Section 5 (Chapter 13)

This part first summarizes the arguments of Sections 1 to 4. Then, findings for theoretical development are discussed by comprehensively considering the research theme and findings on research questions. Moreover, the practical implications for the concerned parties, who work on promoting regional industries, are proposed. Finally, the limitations and challenges of this study and the future research issue are discussed.

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Acknowledgment

The author would like to acknowledge the help of all the people involved in this project and, more specifically, the interviewees in the case studies, coordinators who arranged the interviews and field surveys, reviewers who took part in the review process, and officials of IGI Global. Without their support, this book would not have become a reality.

First, the author would like to thank each interviewee and coordinator for the North Rhine-Westphalia, Bavaria, and Baden-Württemberg case studies. They kindly agreed to support my research and contributed their time and expertise to this book.

Second, the author wishes to acknowledge the valuable contributions of the reviewers regarding the improvement of quality, coherence, and content presentation of chapters.

Third, the author would like to appreciate very much the tremendous support from the officials of IGI Global.

Finally, the author would like to deeply appreciate the support of Grants-in-Aid for Scientific Research (KAKENHI).

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Section 1
Introduction

Chapter 1
Overall Picture and Approach of This Study

ABSTRACT

Using the medical technology industry as an example, in the "Preface," the author explains that cross-sectoral collaboration is indispensable for promoting competitive new regional industries. This study explores the effective promotion of the industries through cross-sectoral collaboration by focusing on the regional system, management to facilitate the collaboration, and the management body to implement the management. This chapter discusses the subject, approach, and methods. First, the author clarifies cross-sectoral collaboration being self-organized among organizations with complementary functions to benefit the participants through new business opportunities. Second, the main concepts and theories are introduced regarding the regional system to support industrial promotion through collaboration, the management to facilitate a self-organizing process toward forming collaboration, and the management body facilitating the process. Finally, the significance and necessity of the case study, methodology, and target are discussed.

INTRODUCTION

The research theme of this study is to develop a comprehensive theoretical framework on how to manage to facilitate the process toward the establishment of cross-sectoral collaboration for promoting new regional industries by focusing on a regional system to support the promotion, a management approach for the facilitation, and a management body to implement the management. This study adopted a case study

DOI: 10.4018/978-1-6684-8494-4.ch001

approach. The author focuses on the cases in which advanced initiatives are made to commercialize medical technology through cross-sectoral collaboration in several regions of Germany.

This chapter first describes the subject of this study. Then, after explaining the viewpoint and approach, the main concepts and theoretical framework are discussed. Finally, the need to conduct a case study, its methodology, and the case study's target are explained.

SUBJECT, APPROACH, AND CONCEPT/ THEORY OF THIS STUDY

To explore the research theme, it is necessary to clarify the theories and concepts by reviewing previous studies, conducting case studies, and constructing a theoretical framework based on the findings obtained from the analysis.

The following sections describe the case study's subject, approach, concepts, and theories.

The Subject of This Study

This study explores establishing cross-sectoral collaboration with the medium- to long-term objectives of promoting new competitive regional industries that will become the bearers of the regional economy. The case study will focus on collaboration in the medical technology industry in Germany. Therefore, the entities participating in cross-sectoral collaboration include companies in various industries (especially SMEs), universities, research institutes, medical institutions, insurance companies, etc. This part considers the features of cross-sectoral collaboration this study focuses on and the efforts that promote its formation.

Cross-Sectoral Collaboration

Although "collaboration" is a term that can be used without limitation, the types of collaboration targeted in this study will be clarified using previous research.

First, Bryson et al. (2015) show that the term "collaborations" is interchangeable with "partnerships" (p.648). Additionally, Roberts and Bradley (1991) define "collaboration" as "a temporary social arrangement in which two or more social actors work together toward a singular common end requiring the transmutation of materials, ideas, and/or social relations to achieve that end" (p.212). Here, the

collaboration includes the following elements: 1. a transmutational purpose and participants' activities toward that purpose; 2. an explicit and voluntary membership; 3. an organization consisting of planned, coordinated, and task-specialized activities; 4. a sustained reflexive interaction among participants; and 5. a temporary property of formation (Roberts & Bradley, 1991). Bryson et al. (2006) define cross-sectoral collaboration as "the linking or sharing of information, resources, activities, and capabilities by organizations in two or more sectors to achieve jointly an outcome that could not be achieved by organizations in one sector separately" (p.44). This implies that cross-sectoral collaboration is characterized by diversity, wherein a number of actors interact in their formation. Based on these discussions, cross-sectoral collaboration, developed between actors in different fields to promote commercialization under a relationship as an equal partnership, will be the subject of consideration in this study.

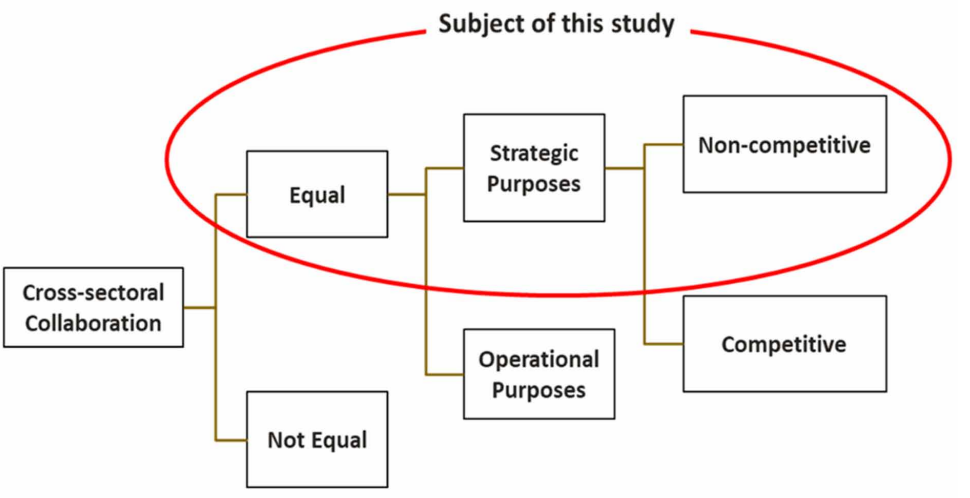
Next, there are prior studies on partnerships and alliances for inter-firm relationships.[1] More conceptually, Sheth and Parvatiyar (1992) classify forms of inter-firm alliances into four axes, one of which is strategic and operational objectives, the other being competitors and non-competitors.[2] Here, strategic objectives in the former axis are alliances that seek growth opportunities under strategic intent, while operational objectives are alliances aimed at asset utilization and resource efficiency. Since this study targets efforts to pursue growth opportunities in medical technology–related businesses through collaborations between different fields that are complementary for business creation, the collaborations formed for strategic purposes between non-competitive organizations are considered the target of this study.

Based on the above, cross-sectoral collaboration, formed between actors in different fields, has the following characteristics (Figure 1).

- Entry and exit of entities in various fields, on an equal footing with each other, determined by the will of each organization.
- Having strategic purposes to capture growth opportunities and create value through new business.
- Forming non-competitive relationships that can complement each other.

By satisfying the above conditions, it is assumed that collaboration is established between organizations with different fields that are equal and complementary to each other, with the objective of both parties benefiting from the new business opportunity.

Figure 1. Cross-sectoral collaboration targeted in this study
Source: Drawn up by the author.



Efforts to Facilitate Cross-Sectoral Collaboration

In various efforts for business creation, when it is difficult for the organization to meet its needs alone, forming collaborations with members outside the organization, including those in different fields, is becoming increasingly important. For example, in the case of business creation aimed at promoting new industries in the region, collaboration among different fields, including small and medium-sized enterprises (SMEs), is indispensable.

Currently, in many regions of the world, efforts are being made to facilitate cross-sectoral collaboration through the support of local governments and other organizations with the medium- to long-term objective of encouraging new industries. An overview of these efforts is listed below.

- A regional system is built through the local government's initiative or at the request of industry and academia. Under the system, industries to be promoted are selected, and support for promoting cross-sectoral collaborations is provided for promoting new competitive industries in the region.
- Under the regional system, a management body is built to provide related services to facilitate the establishment of cross-sectoral collaboration for business creation in each of the selected industries, and its structure is developed as required.

- The people involved in building the management body study the initial conditions of the economy, industry, companies, research institutions, etc., in the region and facilitates the establishment of cross-sectoral collaboration by involving parties concerned to discuss and share policies for facilitating the collaboration.
- Based on the study mentioned above, the management body invites or approaches members to participate in cross-sectoral collaboration, sets up meetings and events to promote interaction among members and external parties for the business creation, and provides matching opportunities and other services to facilitate the formation of the collaboration. In other words, the management body will play an intervening role in promoting new businesses in the industry by facilitating the formation of collaboration realized through new combinations of entities from different fields.

Perspectives, Approaches, and Theories/ Concepts of This Study

The approach of this study is clarified based on previous studies related to inter-organizational collaboration to examine how to facilitate cross-sectoral collaboration to encourage business creation for the promotion of new regional industries.

Perspectives of This Study on Cross-Sectoral Collaboration

In previous studies, inter-organizational collaboration has been discussed in the context of strategic alliances; its purpose is to increase competitiveness through access to partners' management resources to enhance innovation and product development capabilities (Keley & Rice, 2002), to reduce cost (George et al., 2002), and to enhance management capabilities (Jiang & Li, 2008). In addition, Thomson and Perry (2006) indicate that reforms, rapid technological change, scarcity of resources, and increased organizational interdependence are the factors that promote collaboration.

However, regarding previous research on collaboration, Huxham and Vangen (2005) state that "we are not concerned with collaborations between individuals...Our concern is with collaborative relationships between organizations" (p.4). Further, the process of interaction leading to the formation of inter-organizational collaboration has not been fully elucidated (Thompson & Perry, 2006). In addition, there needs to be research based on experience about how the process is facilitated.

As described above, conventional analysis of inter-organizational relations has been opaque in terms of the promotion of interrelationships among parties who play a central role in organizational activities and the process of establishing collaborations. Therefore, clarification of this requires an analysis focusing on the process of mutual

activities of the entities involved in the collaboration. A noteworthy perspective here is that inter-organizational collaboration is viewed as a network organization, which is argued to be established through interactions among actors of different organizations regarded as a complex self-organizing process (Ferraro & Iovanella, 2015; Hibbert et al., 2010; Zhao et al., 2012). In this self-organization process, people belonging to different organizations and fields find common goals and develop interactions for cooperation across organizations. Research on cooperation among people includes Morrison and O'Hearne's (1977) transactional analysis study on improving the efficiency of working people by focusing on human interaction and Kanter's (1994) study that describes the collaboration with a picture of marriage between man and woman and explains cooperation between individuals as a cooperative effort to create new value. Kanter (1994) shows the advantages of establishing and maintaining collaboration in business-to-business relationships as a source of competitive advantage and points out that successful relationships depend on establishing and maintaining good personal relationships between key executives. She proposes the importance of building relationships between individuals in building competitive advantage through collaboration. Child et al. (2005) further indicate that trust grows through personal relationships and develops into inter-organizational relationships.

Therefore, based on the literature, this study defines inter-organizational collaboration as "the formation of an organization for cooperation among people belonging to different organizations." Furthermore, Barnard (1968) describes, "Cooperation is a social aspect of the total situation...the process of interaction must be discovered or invented" (p.60). Moreover, he points out, "Social processes are those in which the action is a part of the system of actions of two or more men. Its most common form is verbal communication" (Ibid., p. 20). Regarding the importance of communication, Kaz and Kahn (1966) asserted that communication is the essence of a social system or organization. Bavelas and Barrett (1951) also stated that communication is the essence of organizational activities. However, concerning the formation of cooperative organizations through collaborations, Monge and Contractor (2001) indicate that previous studies have not sufficiently provided a theoretical mechanism for the formation, maintenance, and dissolution of organizations (through communication).

Based on the above discussion, this study examines the self-organization process among people from different organizations and how to facilitate the establishment of cross-sectoral collaboration by focusing on the interaction among the parties involved in the process through communication.

Approach to Consider Facilitating Cross-Sectoral Collaboration

This study aims to explore the research theme; "How to implement the management for facilitating the establishment of cross-sectoral collaborations for the purpose of promoting new competitive regional industries through business creation, and with what kind of regional system and competence of the management body to facilitate it?". As discussed in the "Preface," there are many practices concerning this research theme; however, these efforts have not always been successful. Despite this, empirical studies that comprehensively examine the factors contributing to effective promotion have been scarce. In other words, further studies for comprehensive theory building are required on this research theme, and more effective promotion practices should be pursued by utilizing the study outcome that provides systematic knowledge. Therefore, a system at a regional level, management to facilitate collaboration, and an organization that implements the management are taken into consideration to elucidate the research theme. These issues are described as the following research questions;

R.Q.1: How to build and operate a regional system for facilitating the self-organization process of cross-sectoral collaborations to promote new competitive regional industries?

R.Q.2: How is the management to be implemented for facilitating the self-organization process toward cross-sectoral collaborations?

R.Q.3: How to build and rebuild a management body to display the organizational competence for facilitating the self-organization process toward cross-sectoral collaborations?

The specific target of this study is a case in which a region-wide cross-sectoral collaboration to promote business creation was facilitated through the participation of local government, industry, and academia, with the medium- to long-term objective of promoting new regional industries.

Here, it is assumed that each entity independently makes decisions on establishing collaboration wherein all entities have equal relationships and linkages. Therefore, the subject of this study is the establishment process of collaboration through self-organization that is featured by the voluntary formation of relationships and connections toward cooperation (Imai & Kaneko, 1988). However, as discussed in detail in later chapters, the process of self-organization is characterized by complexity and does not always move in a certain direction. In contrast, Imai and Kaneko (1988) note that generating order in a self-organizing manner does not mean leaving individual behaviors completely alone but rather works to connect individuals and create new relationships to form a new context in society. Imada (2008) also refers

to self-organization as "a genetic term which means the characteristics of systems to change their structure by themselves while performing interaction with the environment" (p.1). Furthermore, he points out that it is essential to consider the control that induces fluctuations caused by the activities of the creative individual to lead to the formation of a new order and consider incorporating self-reflection into control and fluctuation (Imada, 2008). Based on the view that intervention is necessary to facilitate the self-organization process of collaboration, this study will examine management for the facilitation of cross-sectoral collaboration as a subject of R.Q.2.

Moreover, since this study aims to gain comprehensive knowledge on promoting cross-sectoral collaboration for advancing new regional industries, the following topics are also explored.

Regarding the regional system that is the subject of R.Q. 1, the author focuses on the region as a locus for shaping innovation processes and patterns and improving competitiveness (Fiore et al., 2011) and considers the management approach to building and operating a regional system to promote new competitive regional industries through the collaboration. Here, the local public sector will play the role of facilitator and catalyst, involving local stakeholders, mainly industry and academia, in promoting new regional industries and providing direction for promotion based on learning and understanding the initial conditions of the region. The key points are to build and improve platforms for developing interactions between entities in different fields and to support a management body's foundation and activities that facilitate collaboration.

Concerning the management body that is the subject of R.Q.3, first, the organizational competence required for facilitating the cross-sectoral collaboration is summarized based on the findings from the study on R.Q.2. Further, how to build/rebuild the management body to demonstrate the competence is explored by focusing on the factors to be considered in the initial phase, the building phase, and the rebuilding phase.

Theories and Key Concepts of This Study

Although the details are given in later chapters, the theories and concepts for each research question are outlined below.

First, with regard to R.Q.1, which explores how to build and operate the regional system, Cooke et al. (2006) presented the constructing regional advantage approach, which proposes to create institutional and governance capacity with the engagement of diverse elements (actors) in the region on identifying initial conditions, pursuing and finding unique solutions, innovative activities of businesses, the dynamic role of the public sector, and public-private partnerships toward increasing the

competitiveness of the region. As a measure to achieve this, Asheim et al. (2011) and others advocate a platform policy, a strategy based on related variety, which would allow for more flexibility in scope and strengthen territorial competence. To achieve this, the Triple (Quadruple)-Helix model is proposed by Etzkowitz and Leydesdorff (1997) and Yawson (2009) to promote systematic, research- and technology-oriented (user-oriented) innovation by industry, academia, and government (public such as civil society), with the public sector playing a catalytic role (Koschatzky & Kroll, 2009) involving industry and academia to build and operate the regional system.

Next, concerning R.Q.2, management to facilitate cross-sectoral collaboration has been discussed from the perspective of inter-organizational collaboration as a network organization formed through a complex self-organization process (Fuchs, 2003; Heylighen, 2013; Plowman et al., 2007). Therefore, the management is not based on the assumption of a hierarchical organization but is oriented toward facilitating a self-organizing process of network organization characterized by complexity. On this point, Imada (2008) describes the concept of "goal-directionality" and explains the intentional self-organization by the intervention of the management layer in terms of facilitating the process. These arguments suggest that the intervention of an entity equivalent to the management layer can also direct the complex self-organization process of collaboration. Burnes (2004a) shows that the complexity theory and planned approach to change advocated by Kurt Levin share common ground. On this basis, the latter approach can be applied to facilitate complex self-organization processes (Burns, 2004b). In light of the above, this paper explores a systematic approach to the targets of intervention and how it should be implemented. Additionally, the effectiveness of an action research-based intervention by the management layer is proposed based on the discussion of leadership under complexity (Baker et al., 2011; Plowman et al., 2007). Furthermore, based on discussions by Burnes (2004b), Gray (2008), Imada (2008), Itami (1999), and others, the author derives "fostering felt-need by learning initial conditions," "establishment and refinement of field," and "emerging interaction toward collaboration" as targets of intervention, and show that management of the self-organization process by intervention is effective in promoting cross-sectoral collaboration.

Finally, regarding the organizational competence of the management body and how to build/rebuild it, which are explored in R.Q.3, first, the author focuses on the concept of network governance. Based on the discussion by Provan and Kenis (2008) and others, governance by a distinctly separate administrative entity is optimal from the viewpoint of network effectiveness in facilitating cross-sectoral collaboration among the diverse, many, and independent entities that are interdependent on each other. Then, based on Henderson and Cockburn (1994) and Kawabata (2020), the author clarifies the organizational competence required for a management body to facilitate cross-sectoral collaboration. Last, based on the arguments by Franks and

Bory (2017), Taatila (2004), and others, it is considered how to build and rebuild the management body by focusing on (1) factors to be considered in the initial phase, (2) attributing factors of organizational competence in the building phase, and (3) approach in the rebuilding phase to adapt to the change in environment.

NEED FOR CASE STUDY

Significance of Case Studies: Lessons From Practice by Facilitators of Cross-Sectoral Collaboration

Toward the medium- to long-term goal of promoting new regional industries as the bearers of the local economy, many regions of the world have selected industrial sectors for promotion after examining regional conditions and resources. Moreover, they are working to facilitate the establishment of cross-sectoral collaboration to encourage new businesses.

In this trend, local governments are promoting the business creation of the medical technology field because of the high growth potential of this industry. However, since it is difficult for companies alone to promote, these efforts often involve the establishment of research groups for mutual exchange and learning, holding exchange meetings for different sectors, and implementing support measures to match each other for facilitating cross-sectoral collaborations between companies, research institutions (universities), and medical institutions.

However, these efforts have not always been successful. Even in regions that have achieved a certain level of success, how they have facilitated cross-sectoral collaboration has remained a matter of individual experience and has not been clarified as systematic knowledge. In response, this study focuses on regional systems, management for facilitating cross-sectoral collaboration, and the management body (cluster organizations in the case studies), aiming to draw on the knowledge gained from the experiences of those involved in similar efforts. Based on relevant previous studies, the author will explore mechanisms for facilitating cross-sectoral collaboration to promote new regional industries. This is a useful approach in pursuing the academic value of developing a body of knowledge by building a theory on the above research questions and the practical value of the implications for promoting similar efforts.

How to Proceed With the Case Study

While the details of the research method and design will be discussed in Chapter 3, how to conduct the case studies is briefly described here.

Eisenhardt (1989) states that theory building through case studies is a research strategy for theory building from empirical evidence. Eisenhardt and Graebner (2007) also argue that empirical research based on relevant previous studies should identify the research gap and derive research questions to fill the gap, where qualitative data can answer the how and why questions about these complex social processes.

This study aims to gain systematic knowledge on how to facilitate cross-sectoral collaboration for business creation toward the promotion of new regional industries and practical knowledge on how to implement the measures for that purpose. Therefore, the author will present a conceptual model by comprehensively examining the previous studies regarding the concepts and theories introduced above concerning each research question, collect qualitative data through interviews and other means in case studies, examine the validity of the conceptual model through comparative analysis among the cases, and then develop a theoretical and practical knowledge base. Therefore, the study will employ a qualitative comparative analysis of multiple cases to explore how cross-sectoral collaboration has been facilitated with support by each region's local government and management body. The author will trace the events over time to the present to elucidate the causal relationships.

Cross-Sectoral Collaboration in Medical Technology Fields as a Target of Case Study

This study will conduct case studies of efforts to facilitate cross-sectoral collaboration for business creation in the medical technology field, with the medium- to long-term objective of promoting new regional industries. The case studies will focus on the three regions (North Rhine-Westphalia, Bavaria, and Baden-Württemberg) which have achieved relatively high performances among their efforts in the various regions of Germany.

Local governments and others in each region are embarking on support activities to expand business opportunities through involving industry, research institutions (including universities), medical institutions, etc., intending to promote entry, especially of SMEs with accumulated technologies in the medical technology field that has high growth potential. In addition, the management bodies facilitate collaboration by implementing various interventions to stimulate interaction among parties from different sectors. Under such support, independent and voluntary entities with complementary capabilities spontaneously develop interactions and try to establish cross-sectoral collaborations with a strategic intention to create new businesses.

Looking at the medical technology industry, the most distinctive feature is that the industry's products are used on humans, therefore, are subject to meet special demand and are tightly regulated to ensure safety (Mejtoft et al., 2022; MedTech

Europe, 2021). They also have to apply and be approved for reimbursement. Additionally, the products use interdisciplinary technologies such as materials science, engineering, electronics, software, ICT, plastics technology, etc. (Lee et al., 2019; MedTech Europe, n.d.). R&D for new products and innovations in the industry is based on these technologies. Moreover, the products are continuously upgraded and improved through feedback from users (i.e., hospitals, patients). Furthermore, the products of the medical technology field range from simple devices to complex instruments (Mejtoft et al., 2022); therefore, there are many niche markets and opportunities for SMEs to enter the markets (Japan Agency for Medical Research and Development, 2020). For instance, in the German medical technology industry, approximately 93% are companies with fewer than 250 employees (Germany Trade & Invest (GTAI), 2022).

These are the characteristics of medical technology; however, the study on this industry contributes to the following points that can be applied to the promotion of other industries. First, from an initial idea to a product on the market, multifaceted collaborations deployed cross-sectionally are required between industries (including SMEs, various experts, and insurance companies), research institutions and universities, medical institutions, patient organizations, etc. As is discussed in the argument on open innovation, this is the facilitation of cross-technological and sectoral cooperation between partners toward innovations; therefore, the implications withdrawn from the study are beneficial for the efforts in other industries. Moreover, the study result also provides an essential implication for promoting regional industries wherein SMEs are the backbone of the economy.

Lastly, this study focuses on several regions in Germany where the conventional structure of economies and industries shows the limitation of growth. As a countermeasure, they promote new regional industries by facilitating new combinations (therefore, collaborations) of various sectors and technologies. Therefore, the cases in which efforts are being made to facilitate cross-sectoral collaboration to promote medical technology fields as a new regional industry meet the conditions to explore the research theme of this study. Moreover, considering the characteristics of the medical technology industry and the regions' experience above, the lessons obtained from the study contribute significantly to providing implications applicable to a wide range of sectors and regions in the world wherein they have the challenge to promote innovative and competitive regional industries.

REFERENCES

Asheim, B. T., Boschma, R., & Cooke, P. (2011). Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases. *Regional Studies*, *45*(7), 893–904. doi:10.1080/00343404.2010.543126

Baker, E., Kan, M., & Teo, S. T. T. (2011). Developing a collaborative network organization: Leadership challenges at multiple levels. *Journal of Organizational Change Management*, *24*(6), 853–875. doi:10.1108/09534811111175797

Barnard, C. I. (1938). *The functions of the executive*. Harvard University Press.

Bavelas, A., & Barrett, D. (1951). An experimental approach to organizational communication. *Personnel*, *27*(5), 366–371.

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, *66*(s1), 44–55. doi:10.1111/j.1540-6210.2006.00665.x

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2015). Designing and implementing cross-sector collaborations: Needed and challenging. *Public Administration Review*, *75*(5), 647–663. doi:10.1111/puar.12432

Burnes, B. (2004a). Kurt Lewin and complexity theories: Back to the future? *Journal of Change Management*, *4*(4), 309–325. doi:10.1080/1469701042000303811

Burnes, B. (2004b). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, *41*(6), 977–1002. doi:10.1111/j.1467-6486.2004.00463.x

Child, J., Faulkner, D., & Tallman, S. (2005). *Cooperative strategy: Managing alliances, networks, and joint ventures* (2nd ed.). Oxford University Press. doi:10.1093/acprof:oso/9780199266241.001.0001

Cooke, P., Asheim, B., Annerstedt, J., Blazek, J., Boschma, R., Brzica, D., Lindholm Dahlstrand, Å., Del Castillo Hermosa, J., Laredo, P., Moula, M., & Piccaluga, A. (2006). *Constructing regional advantage: Principles, perspectives, policies*. European Commission.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550. doi:10.2307/258557

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25–32. doi:10.5465/amj.2007.24160888

Etzkowitz, H., & Leydesdorff, L. (1997). *Universities and the global knowledge economy: A triple helix of university-industry-government relations*. Pinter.

Ferraro, G., & Iovanella, A. (2015). Organizing collaboration in inter-organizational innovation networks, from orchestration to choreography. *International Journal of Engineering Business Management*, *7*(24), 1–14. doi:10.5772/61802

Fiore, A., Grisorio, M. J., & Prota, F. (2011). Regional innovation systems: Which role for public policies and innovation agencies? Some insights from the experience of an Italian region. *European Planning Studies*, *19*(8), 1399–1422. doi:10.1080/09654313.2011.586173

Franks, R. P., & Bory, C. T. (2017). Strategies for developing intermediary organizations: Considerations for practice. *Families in Society*, *98*(1), 27–34. doi:10.1606/1044-3894.2017.6

Fuchs, C. (2003). Structuration theory and social self-organization. *Systemic Practice and Action Research*, *16*(2), 133–167. doi:10.1023/A:1022889627100

George, G., Zahra, S. A., & Wood, D. R. Jr. (2002). The effects of business–university alliances on innovative output and financial performance: A study of publicly traded biotechnology companies. *Journal of Business Venturing*, *17*(6), 577–609. doi:10.1016/S0883-9026(01)00069-6

Germany Trade & Invest (GTAI). (2022). *Medical technology cluster in Germany.* Germany Trade & Invest. https://www.gtai.de/resource/blob/64176/0b820ca68223cf736433b4eb60d921c9/20221019_FS_MedTech_WEB.pdf

Gray, B. (2008). Intervening to improve inter-organizational partnerships. In S. Gropper, M. Ebers, C. Huxham, & P. S. Ring (Eds.), *The Oxford handbook of inter-organizational relations* (pp. 664–690). Oxford University Press.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, *15*(S1, s1), 63–84. doi:10.1002mj.4250150906

Heylighen, F. (2013). Self-organization in communicating groups: The emergence of coordination, shared references and collective intelligence. In A. Massip-Bonet & A. Bastardas-Boada (Eds.), *Complexity perspectives on language, communication and society* (pp. 117–149). Springer. doi:10.1007/978-3-642-32817-6_10

Hibbert, P., Huxham, C., & Ring, P. S. (2010). Managing collaborative inter-organizational relations. In S. Cropper, M. Ebers, C. Huxham, & P. Ring (Eds.), *Handbook of interorganizational relations* (pp. 390–416). Oxford University Press.

Huxham, C., & Vangen, S. (2005). *Managing to collaborate: The theory and practice of collaborative advantage*. Routledge.

Imada, T. (2008). *Self-organization and society*. Springer.

Imai, K., & Kaneko, I. (1988). *Nettowa-ku soshikironn [Theory of network organization]*. Iwanami-Shotenn.

Itami, K. (1999). *Ba no manejimento: Keiei no shinparadaimu [Managing "ba": New paradigm for management]*. NTT Publishing.

Japan Agency for Medical Research and Development. (2020). *Ikorenkeiniyoru iryokikijigyoka gaidobukku [Guidebook for medical device commercialization through medical-engineering collaboration]*. Japan Agency for Medical Research and Development.

Jiang, X., & Li, Y. (2008). The relationship between organizational learning and firms' financial performance in strategic alliances: A contingency approach. *Journal of World Business*, *43*(3), 365–379. doi:10.1016/j.jwb.2007.11.003

Kanter, R. M. (1994, July-August). Collaborative advantage: The art of alliances. *Harvard Business Review*, *72*(4), 96–108.

Katz, D., & Kahn, R. L. (1966). *The social psychology of organizations*. John-Wiley & Sons.

Kawabata, Y. (2020). Managing to facilitate cross-sectoral inter-organizational collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *10*(2), 13–41.

Kelley, D. J., & Rice, M. P. (2002). Advantage beyond founding: The strategic use of technologies. *Journal of Business Venturing*, *17*(1), 41–57. doi:10.1016/S0883-9026(00)00053-7

Koschatzky, K., & Kroll, H. (2009). Multi-level governance in regional innovation systems. *EKONOMIAZ. Revista vasca de Economía, Gobierno Vasco / Eusko Jaurlaritza / Basque Government, 70*(1), 132-149.

Lee, M., Park, S., & Lee, K. S. (2019). What are the features of successful medical device start-ups? Evidence from Korea. *Sustainability*, *11*(7), 1948. doi:10.3390u11071948

MedTech Europe. (2021). *The European medical technology industry in figures 2021*. MedTech Europe. https://www.medtecheurope.org/wp-content/uploads/2021/06/medtech-europe-facts-and-figures-2021.pdf

MedTech Europe. (n.d.). *Medical devices and pharmaceuticals: Two different worlds in one health setting*. https://www.medtecheurope.org/news-and-events/news/medical-devices-and-pharmaceuticals-two-different-worlds-in-one-health-setting/

Mejtoft, T., Lindahl, O., Öhberg, F., Pommer, L., Jonzén, K., Andersson, B. M., Eklund, A., Wåhlin, A., & Hallberg, P. (2022). Medtech innovation guide: An empiric model to support medical technology innovation. *Health and Technology*, *12*(5), 911–922. doi:10.100712553-022-00689-0

Monge, P. R., & Contractor, N. S. (2001). Emergence of communication networks. In F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research and methods* (pp. 440–502). Sage Publications. doi:10.4135/9781412986243.n12

Morrison, J. H., & O'Hearne, J. J. (1977). *Practical transactional analysis in management*. Addison-Wesley.

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341–356. doi:10.1016/j.leaqua.2007.04.004

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration: Research and Theory*, *18*(2), 229–252. doi:10.1093/jopart/mum015

Roberts, N. C., & Bradley, R. T. (1991). Stakeholder collaboration and innovation: A study of public policy initiation as the state level. *The Journal of Applied Behavioral Science*, *27*(2), 209–227. doi:10.1177/0021886391272004

Sheth, J. N., & Parvatiyar, A. (1992). Towards a theory of business alliance formation. *Scandinavian International Business Review*, *1*(3), 71–87. doi:10.1016/0962-9262(92)90012-U

Taatila, V. (2004). *The concept of organizational competence: A foundational analysis.* [Doctoral dissertation, University of Jyvaskyla]. Jyväskylä University Digital Repository.

Thomson, A. M., & Perry, J. L. (2006). Collaboration processes: Inside the black box. *Public Administration Review*, *66*(6), 20–32. doi:10.1111/j.1540-6210.2006.00663.x

Yawson, R. M. (2009). *The ecological system of innovation: A new architectural framework for a functional evidence-based platform for science and innovation policy* [Paper presentation]. The Future of Innovation Proceedings of XX ISPIM 2009 Conference, Vienna, Austria.

Zhao, K., Yen, J., Ngamassi, L. M., Maitland, C., & Tapia, A. H. (2012). Simulating inter-organizational collaboration network: A multi-relational and event-based approach. *Simulation*, *88*(5), 617–633. doi:10.1177/0037549711421942

ENDNOTES

1 For example, Huxham and Vangen (2005) examine partnerships, alliances, joint ventures, etc., to study inter-organizational collaborations.

2 The four categories indicate that competitive alliances fall under strategic/competitors, cartels under operational/competitors, cooperative ventures under strategic/non-competitors, and inter-firm agreements such as facility use under operational/non-competitors.

Chapter 2
Overview of the Case: Economy, Industry, and Cluster Initiatives for Promoting Cross-Sectoral Regional Industries

ABSTRACT

The purpose of this chapter is to overview the background of the case study by focusing on the economy and industry of Germany, then to explain the movements toward cluster initiatives, which aim to promote regional industries through cross-sectoral collaborations and the policies to support them. First, the overall picture of Germany is introduced, then the features of the German economy and its reform are explained by focusing on the movement after the stagnation in the 1990s. Second, industrial structure and policies, which aim to strengthen innovation capability and competitiveness, are overviewed. Moreover, features of SMEs and policies on them, which perform a significant role in the economy, are discussed. Finally, cluster initiative in Germany is examined by focusing on the background and support programs of the state and federal governments. In addition, the medical technology industry and cluster initiative, which are the subject of this study, are outlined.

OVERVIEW

Germany has the largest population and economy among E.U. countries. Moreover, it shows presence as one of the largest economies in the world and the home ground of the world's top makers. Although facing the recession in the 2020s due to the pandemic and the world economic/political turmoil, it substantially impacts the world. Table 1 outlines the socioeconomic environment of Germany.

DOI: 10.4018/978-1-6684-8494-4.ch002

Germany is a federal parliamentary republic composed of 16 states (including the three city-states) (European Union, n.d.-a). As a member of the E.U., its federal legislation is influenced by E.U. law (Hestermeyer, 2015). Aiming to stimulate innovation, ensure the best effect distribution of resources, and strengthen consumer sovereignty, the policy and business law put competition as a core element (Federal Ministry for Economic Affairs and Climate Action, n.d.-a). The notable feature is that Germany has a long tradition of decentralization. Each state is autonomous and has its own constitution (European Union, n.d.-a). Moreover, it is defined by the German Basic Law that federal state governments have substantial authority for implementing the policy, such as for economic development (European Association of Development Agencies).

Table 1. Socioeconomic environment of Germany

• Capital: Berlin
• 16 states (including 3 city-states; Bremen, Berlin, and Hamburg)
• Surface area: 349,380 km^2
• Population (2021) 83,129 m. (largest among European countries)
• GDP (2021) U.S. $ 4,226 bn. (largest among European countries, 25% increase from 2000)
• GDP per capita: U.S. $ 50,795 (2021)
• Unemployment rate (persons aged 15+) (2021): 3.5%
• Foreign trade balance (2021): U.S. $ +208 bn. (Export of goods: U.S. $ 1,631 bn., Import of goods: U.S. $ 1,423 bn.)
• Gross domestic expenditure on R&D (2018): 3.1% of GDP (OECD Total: 2.4% in 2018)
• Elderly population(2021): 22.09% of the Population (OECD Total: 17.65%)
• Human Development Index (HDI) (2019): 6 (rank of 188 countries)

Source: European Union (n.d.-a), Federal Statistical Office of Germany (Destatis) (2022a), and OECD Data (n.d.).

Regarding the economy, the GDP of Germany is ranked 4th in 2021 (Statista, n.d.-a). The country is featured as an export-oriented economy which accounts for 47.0% of GDP and is the 3rd largest in the world in 2019 (OECD, 2020; Statista, n.d.-b). Furthermore, the unemployment rate was 3.8% in 2020, by age between 20 and 64, which is the 4th lowest among 27 countries of the European Union (European Union, n.d.-b; Eurostat, n.d.-a).

Social quality in Germany performs well in several dimensions, such as jobs, work-life balance, life satisfaction, etc. (OECD Better Life Index). Moreover, the country provides good access to healthcare and education and is ranked high on human development (9th out of 191 countries on the Human Development Index

in 2021) (United Nations Development Programme). On the other hand, like many advanced countries, Germany also faces a dwindling birth rate and an aging population (fertility rate: 1.53 in 2020, elderly population: 22.09% in 2021) (OECD Data, n.d.).

Concerning technology and innovation in Germany, the total percent of GDP of gross domestic spending on R&D was 3.13% in 2020 (OECD total average: 2.67%), and the amount of spending is the largest in Europe (OECD Data, n.d.). Moreover, the country has diversified industrial sectors and companies that play as global technology leaders. Notably, 24% of researchers in the E.U. live in Germany, and research institutions, such as Fraunhofer-Gesellschaft, Leibniz Association and Max Planck Society, and Helmholtz Association, work on fundamental or applied research and cooperate with universities and companies for generating innovation (Germany Trade & Invest (GTAI), 2021).

ECONOMICS AND INDUSTRY

Economic Stagnation and Revival

Germany is one of the largest economies in the world, occupying approximately 24.8% of the GDP of E.U. countries in 2021 (Eurostat, n.d.-b). The country shows steady economic growth and has been the engine of growth in Europe since the mid-2000s.

However, the economy stagnated before the period, and Germany was called "the sick man of Europe" from the late 1990s and early 2000s (Dustmann et al., 2014, p. 167). Although the temporal boost of the economy was observed after the reunification in October 1990, the economy declined sharply. Moreover, the massive transfer for aiding the eastern federal states from the west worsened the budget balance, and the government hiked taxes (Barysch, 2003). As a result, the economy experienced a decrease in growth and an increase in the unemployment rate (it rose from 5.53% in 1991 to 9.45% in 1998 and hit its highest at 11.28% in 2005) (OECD Data, n.d.).

In response to this situation, the Schroeder government (from 1998 to 2005) implemented policies comprised of a series of legislative labor market reforms (Hartz reforms), tax reform (tax cut), and fiscal reforms, etc. (Barysch, 2003; Dustmann et al., 2014). The next Merkel government inherited the reform-oriented course (from 2005 to 2021). During the life of this government, industrial policies were proactively introduced to increase innovation capability and competitiveness. These structural reforms, implemented in the early 2000s, contributed to the German economy and industry revival after the mid-2000s. The economy strongly recovered from the financial crisis in 2008 (Figure 1), lowered the unemployment rate (Figure 2), and increased the average wage (Figure 3) and GDP per capita (Figure 4).

Figure 1. GDP (million U.S. dollars)
Source: OECD Data (n.d.).

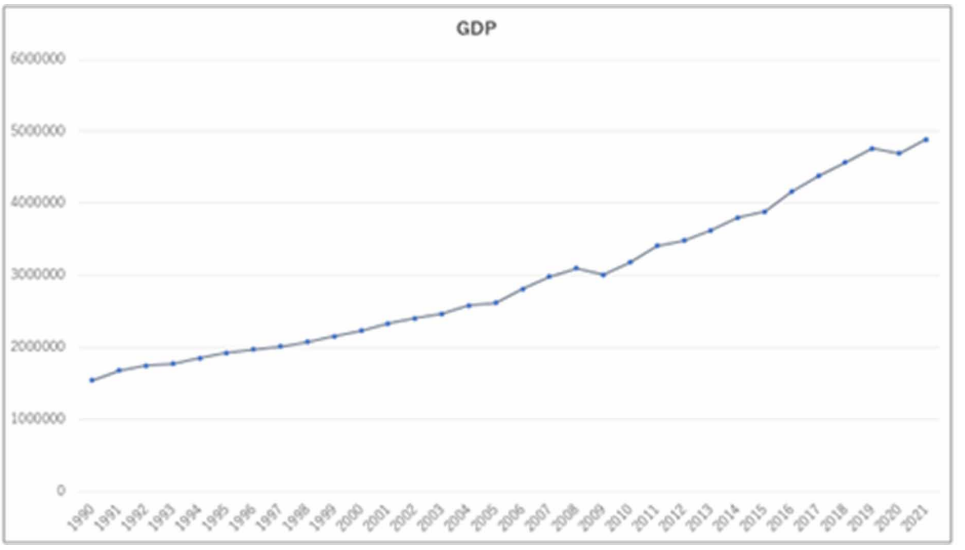


Figure 2. Unemployment rate (% of the labor force)
Source: OECD Data (n.d.).

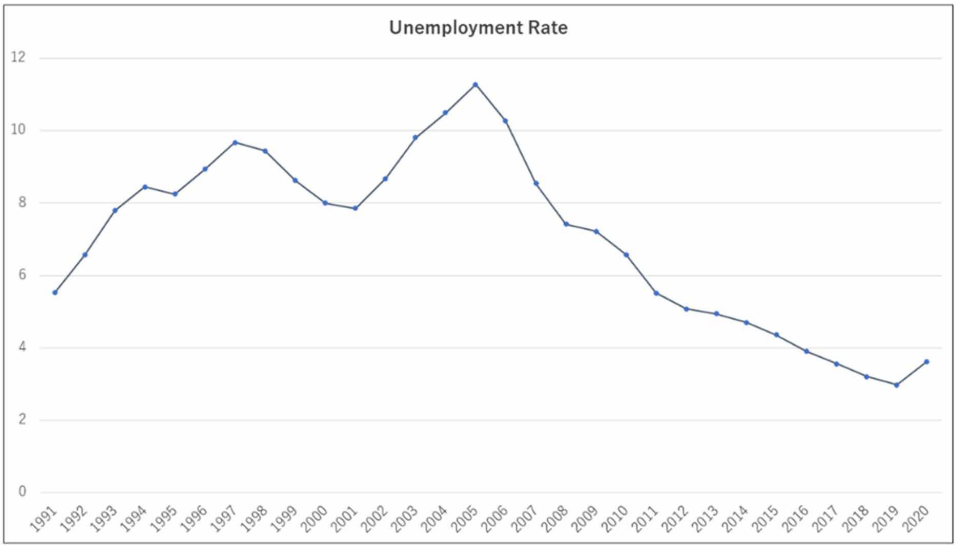


Figure 3. Average wage (U.S. dollars)
Source: OECD Data (n.d.).

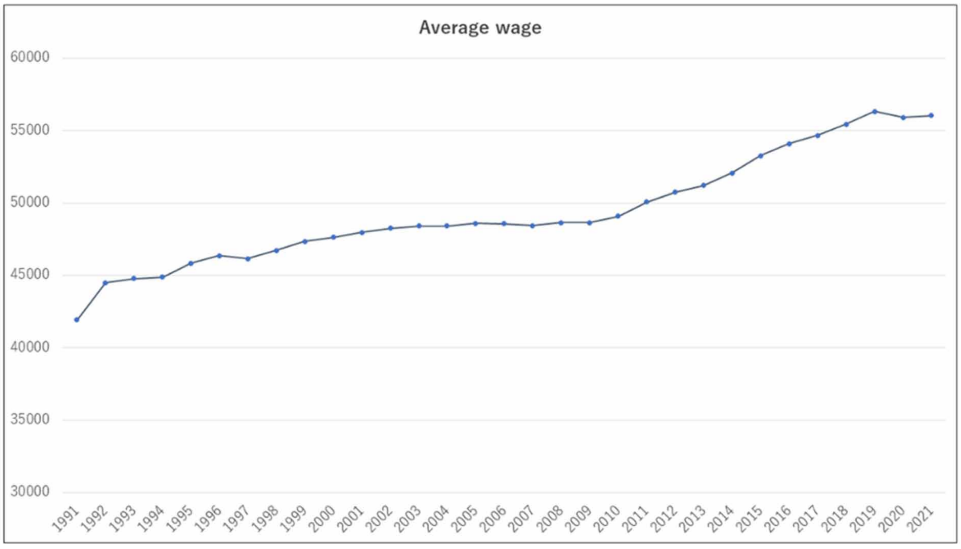
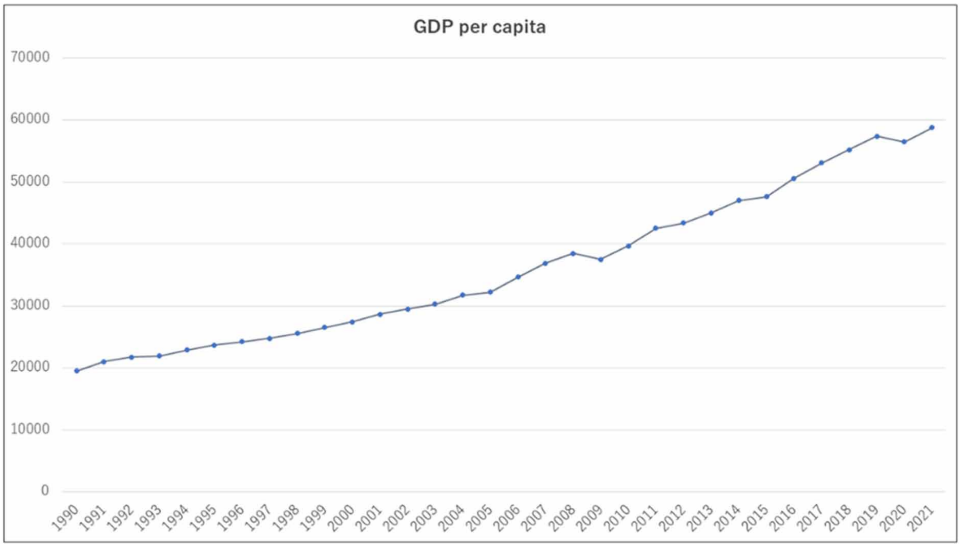


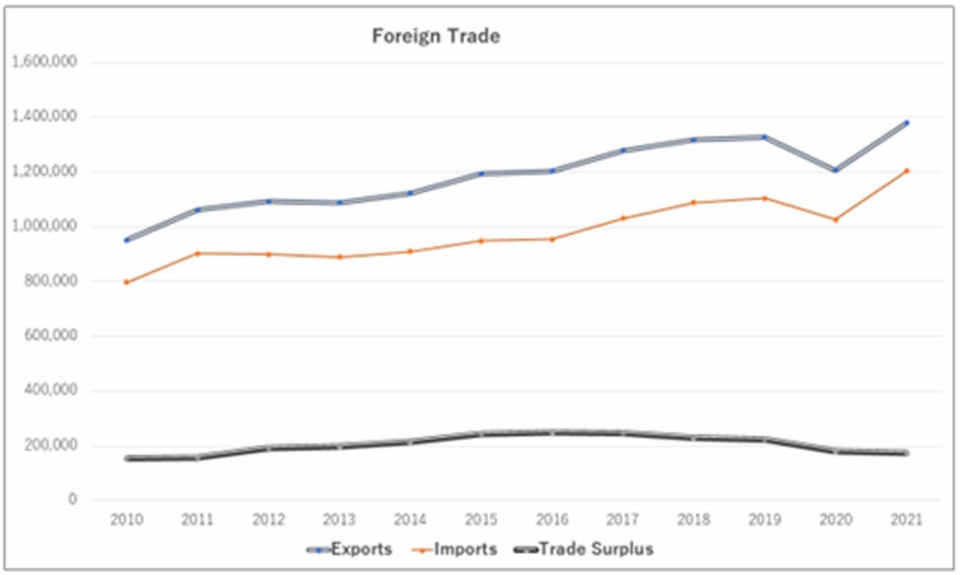
Figure 4. GDP per capita (U.S. dollars)
Source: OECD Data (n.d.).



In addition, the notable feature of the German economy is characterized by a high export orientation (Figure 5). The export continuously accounts for more than 40% of GDP. Its scale is the 3rd largest in the world after China and the U.S. (Federal Ministry for Economic Affairs and Climate Action (BMWK), 2022). Moreover, the trade surplus is the 2nd largest after China in 2021 (Statista, n.d.-c).

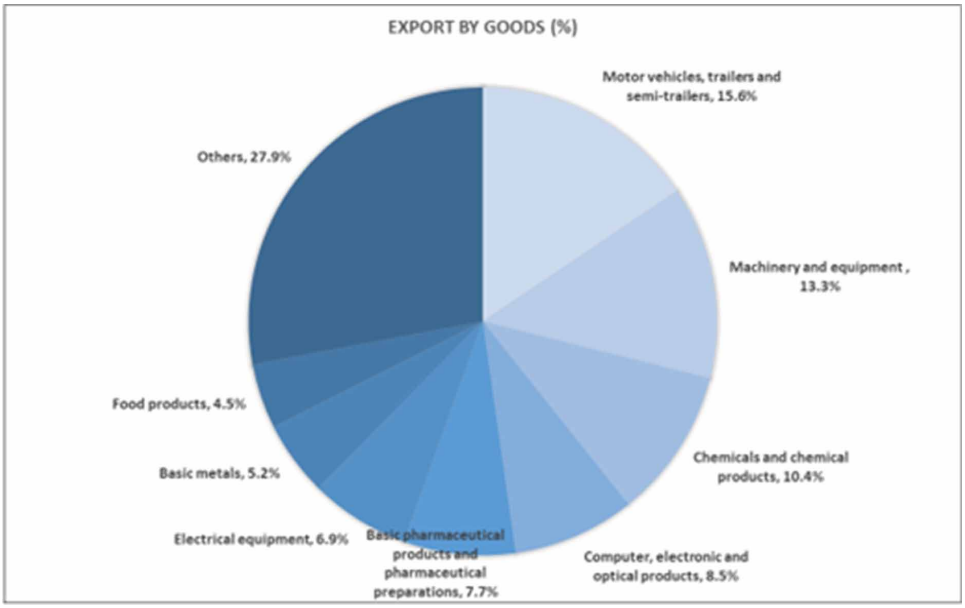
The largest export counterpart of Germany is the E.U. countries (53% of total export in 2020) (European Union, n.d.-a). The country enjoys the benefit of the single market in this area. Moreover, looking at export to each country, it is also diversified to other areas (e.g., the United States is ranked first (8.9%), and China was ranked second (7.5%) in 2021) (Federal Ministry for Economic Affairs and Climate Action (BMWK), 2022).

Figure 5. Foreign trade (million Euro)
Source: Federal Statistical Office of Germany (Destatis) (n.d.-a).



Looking at the export goods (Figure 6), Germany has its strength in the manufacturing industry, and the main export goods in 2022 are "motor vehicles, trailers, and semi-trailers" (15.6% of total export), "machinery and equipment" (13.32%) and "chemicals and chemical products" (10.4%) (Federal Statistical Office of Germany (Destatis), n.d.-b).

Figure 6. Export by goods (%) (2022)
Source: Drawn up from Federal Statistical Office of Germany (Destatis) (n.d.-b).
**As at 11 August 2023.*



As many countries are experiencing after 2020, Germany also faces some economic difficulties due to the pandemic and the world economic/political turmoil. However, from the trend above, Germany has been performing a favorable cycle of the economy through gaining from external demand, wage increase, and economic growth after the mid-2000s.

INDUSTRIAL PROMOTION IN GERMANY

Industrial Structure

The value-added and the share (%) of each sector of the gross value-added generated in the German economy are as follows (Table 2).

The notable feature is that the share of the manufacturing sector in the German economy remains higher than other major E.U. countries (such as France, Italy, and Spain) and the average of E.U. (Federal Statistical Office of Germany (Destatis), n.d.-c). Moreover, the value-added of the German manufacturing sector is the highest among E.U. countries. For example, in 2019, the share was 33.0% of the total value-added in the E.U. (European Union, 2022).

Table 2. The value-added (billion Euro) and the share (%) of each sector*

		2010		2022	
		Value-Added	**Share**	**Value-Added**	**Share**
Agriculture and forestry, fisheries		20.61	0.89%	42.9	1.23%
Manufacturing		688.51	29.86%	1,031.63	29.49%
	Manufacturing without construction	588.59	25.53%	820.52	23.45%
	Construction industry	99.93	4.33%	211.1	6.03%
Service areas		1,596.56	69.24%	2,423.97	69.29%
	Trade, Traffic, hospitality	364.35	15.80%	596.48	17.05%
	Information, Financing, Rental and sub-company service provider	724.55	31.42%	1,046.48	29.91%
	Public and others service provider	507.67	22.02%	781.01	22.32%
Total		2,305.68	100.00%	3,498.50	100%

Source: Drawn up from Federal Statistical Office of Germany (Destatis), 2022b).

* Gross value-added at current prices.

Industrial Policy

According to The Global Competitiveness Report 2019, Germany is ranked 1st for its innovation capability, ahead of the U.S. and Switzerland (World Economic Forum, 2019). The government's efforts for industrial promotion and policies on innovation and competitiveness appear to be the significant contributors to the economy's recovery after the mid-2000s and good performance in the global market.

As stated above, the Merkel government (from 2005 to 2021) succeeded in the reform-oriented course of the former government. It implemented the growth strategy by increasing innovation capability and labor productivity to revitalize the industry and strengthen international competitiveness.

In 2006, the federal government started the "High-Tech Strategy." It targeted to support 17 high-tech sectors (including health research and medical technology, energy technology, information and communication technology, material technology and nanotechnology, etc.) with a total budget of 12 billion euros (Bardt & Lichtblau, 2020). Moreover, based on the Lisbon Strategy by E.U., which set a 3% target on research and development expenditures (European Parliament, 2009), spending on education, science, and research increased (3.4% in 2008) (Bardt & Lichtblau, 2020).

Facing a declining birthrate, aging population, and increased competition with emerging countries, in 2010, the federal government presented "High-Tech Strategy 2020," then developed ten forward-looking projects which included Industry 4.0 featured by converting the real world and the virtual world to form "Internet of things

(IoT)" (Federal Ministry of Education and Research (BMBF), 2014). Moreover, in 2018, the federal government presented "High-Tech Strategy 2025," which showed concrete fields of action (composed of societal challenges, Germany's future competencies, and open innovations and venture culture) emphasizing digitization. The strategy aims to maintain a leading position as a location for innovation by meeting the challenge and global competition (Federal Ministry of Education and Research (BMBF), 2018).

In the trend of increasing competition accelerated by the globalization of economy and business, the high-tech strategies above emphasize strengthening the competitiveness of Germany as a business location through networking research and business for driving innovations. Moreover, Germany also faces the threat of technological autonomy by transferring sensitive or security-related technologies to a third country by acquiring German companies (Federal Ministry for Economic Affairs and Energy (BMWi), 2019a). In response to these challenges, in 2019, the Federal Ministry for Economic Affairs and Energy (BMWi) presented "Industrial Strategy 2030," which aims to protect and strengthen German industry and business. The measures are composed of 1. Improvement of the policy environment of the industry, which includes the reduction in corporate taxation etc., 2. Strengthening innovation and start-up dynamics, 3. Protection of technology of Germany and fostering competitiveness (Bardt & Lichtblau, 2020; Federal Ministry for Economic Affairs and Energy (BMWi), 2019a).

Economic Significance of SMEs and Their Promotion

Germany has many top makers who are well-known in the global market, and they display significant contributions to the country's industries. In addition, Germany is also endowed with small and medium-sized enterprises (SMEs), one of the leading actors of the cross-sectoral collaborations in this study, which largely contribute to industrial promotion.

SMEs in Germany (called Mittelstand) are based in all locations across Germany and drive innovation and technology (Federal Ministry for Economic Affairs and Climate Action (BMWK), n.d.-b). Moreover, they are regarded as a backbone of the economy and a central pillar of society (Federal Ministry for Economic Affairs and Energy (BMWi), 2019b). The performance played by SMEs in the German economy is as follows (Institut für Mittelstandsforschung (IfM) Bonn, 2022).

- Accounting for 99.3% (approximately 3.35 million) of all companies in the private sector.
- Contributing over 33% of the total turnover and more than 60% to all companies' net added value.

- Employing over 54% of all employees.
- Generating more than 16% (2020) of the export turnover of all companies.

Regarding the policy on SMEs, the competition act of Germany has a particular rule for SMEs that exempts the restraint of competition by allowing binding agreements between SMEs for the rationalization of economic activities if they do not significantly affect competition on the market and if they contribute to improving the competitiveness of SMEs (Federal Ministry of Justice; OECD, 1997). It means SMEs in Germany are supported by the policy that enables them to promote inter-firm cooperation and to be networked. The exemption rule intends to increase SMEs' competitiveness with the aims "to increase output or enhance quality, to broaden the range of products, to shorten routes or periods of delivery, to streamline the purchasing or selling structures or to provide for the common use of advertising" (The Bundeskartellamt, 2007, p. 15).

With consideration of the impact on the economy and society as well as the expectation to SMEs for playing the role of driving innovation/technology, SMEs in Germany are supported by various measures for accessing financial sources, conducting education/training, and promoting innovations (including digitization), etc. (Federal Ministry for Economic Affairs and Energy (BMWi), 2019b). In addition to these public supports, SMEs in Germany practice their own approach to promoting innovation to strengthen competitiveness by themselves. Therefore, SMEs in Germany (Mittelstand) have a mindset and culture to take full responsibility for their managerial decisions, which enables them to respond swiftly to the changing business environment and firmly attached to their region with continuity and for long-term success (Federal Ministry for Economic Affairs and Climate Action (BMWK), n.d.-b). Therefore, they must find how to survive in the severe competition and develop their way of strengthening and continuously generating innovation. On this point, in order to overcome the restraint of the management resources and to promote innovations by SMEs, universities and public research institutes such as Fraunhofer IWM of each area play significant roles in implementing R&D projects through being outsourced by SMEs (Bullinger et al., 2007; Fraunhofer, 2018; Fraunhofer IWM, n.d.).

CLUSTER PROGRAM AND PROMOTION OF MEDICAL TECHNOLOGY

Background

As discussed above, facing stagnation in the 1990s and the decline of the conventional industries of each area, several reforms were implemented in Germany. One of the major policies is to strengthen innovation capability and increase the industry's competitiveness. Furthermore, affected by the success of Silicon Valley and the argument by Michel Porter (Porter, 1990, 1998), Germany also focused on developing industrial clusters and stressed support for building the industrial network of each geographical area.

Based on the recognition above, from the mid-1990s, each state government, which has substantial authority to implement the policy as discussed above, started the cluster program and supported the "cluster initiatives," which is featured by "intensive goal-oriented interaction of the involved actors" (Buhl et al., 2019, p. 8) in the region and plays the role as "drivers of regional innovation processes" (Buhl et al., 2019. p. 26). The motivation of the state government to support the cluster initiative was "concerns over deindustrialization, loss of employment, and the need to raise profiles in the location-based competition" (Kiese, 2019, p. 1705). In other words, to avoid the outflow of regional businesses to emerging countries and loss of employment under a high-cost structure in Germany, creating a business environment where firms in the region could earn enough revenue from their activities was an urgent challenge. Considering the impact on the economy/society of the region and the restraint of the managerial resource to develop innovative businesses, measures to support SMEs was set as a priority, and the approach was taken to increase productivity and innovation through forming "close cooperation with regionally concentrated partners along the value chain" (Hantsch et al., 2013, p. 1). Cross-sectoral collaboration promoted in the industrial cluster was the suitable approach to realize the goal.

While each state pursued its own way, the federal government provided support such as funding measures to maintain the coherence of policies between the federal and the state government through dialogue and coordination wherein the federal government and the state government consult about the relevant programs and measures (e.g., Cluster Platform Germany) (Federal Ministry of Education and Research (BMBF), 2014).

Cluster Policy

Distribution of Industrial Cluster in Germany

Since the promotion of industrial clusters is recognized as a critical pillar for competitiveness, various measures have been implemented at the federal and state level to strengthen the excellence of these initiatives (Clusterportal Baden-Württemberg). Consequently, the regional industrial clusters, which are certified as satisfying a certain excellence by the federal government (e.g., "go-cluster"), have been developed dispersedly across the countries (Table 3) and are playing their role as backbones of the regional economy.

Table 3. Distribution of "go-cluster" members by state

State	Number of "Go-Cluster"
Baden-Wuerttemberg	14
Bavaria	21
Berlin	5
Brandenburg	5
Bremen	2
Hamburg	5
Hesse	4
Mecklenburg-West Pomerania	3
Lower Saxony	8
North Rhine-Westphalia	6
Rhineland-Palatinate	2
Saxony	7
Schleswig-Holstein	6
Thuringia	3

Source: Drawn up from Clusterplattform Deutschland (n.d.-a) (Confirmed on April 28, 2023).

Support by the State Government

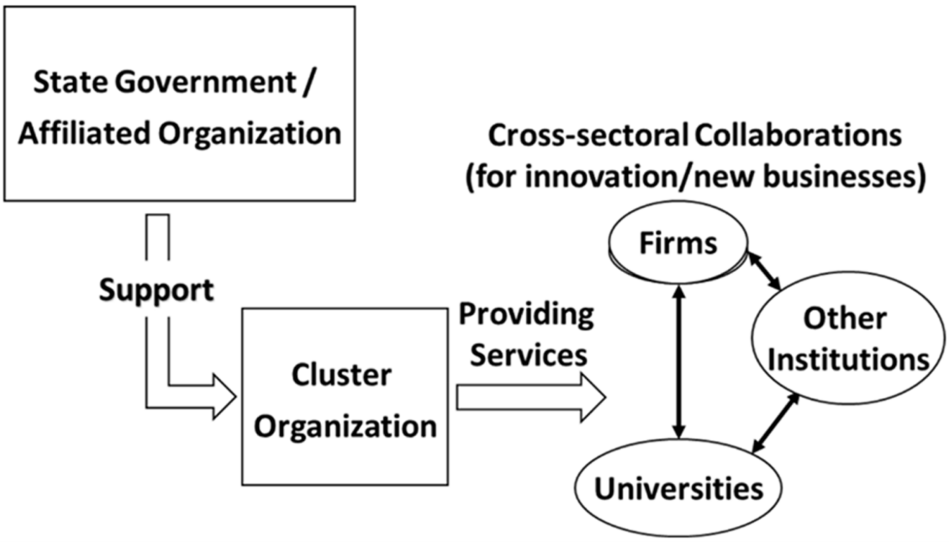
The spread of industrial clusters across Germany is primarily due to the bottom-up efforts of industry, academia, and the public sector (e.g., city government). They often receive support from the state government. Started in the State of Hesse in 1993 (Buhl et al., 2019), other states in Germany followed to support the regional

industrial network to form the industrial cluster of high growth potentiality, with consideration of existing structure, particularities, and strengths such as technology, economy, and innovation competencies (Clusterportal Baden-Württemberg, n.d.).

For launching and implementing the cluster program (the detail is described in Chapter 5 of Section 2), the state government takes the initiative to build and operate the regional system that performs as a platform for interaction among regional stakeholders and supports to build cluster organization which is the management body to implement cluster initiatives and often takes formal legal structures (e.g., associations; e.V. in Germany). In this process, the state government surveys to grasp the situation (strength and opportunity, etc.) and bottom-up movements toward promoting new industries within the region. Then, the state government summons the stakeholders from industry and academia and sets events and meetings to interact and form networks for finding a common goal toward promoting industrial clusters and launching cluster organizations. Here, the activities of a cluster organization are to promote a particular field of industry in the region and manage to "form the framework for strategic, systematic and innovation-oriented cooperation relationships and are usually integrated into regional structural and innovation policies" (Gerdes et al., 2019, p. 6). In other words, cluster organization provides relevant services to its members from industry and academia, etc., to promote innovation and new businesses through facilitating cross-sectoral collaborations. In addition to the support above, in implementing the cluster program, the state government provides financial support, funding of collaborative innovation projects, training activities, and joint public relations (Clusterportal Baden-Württemberg, n.d.). Figure 7 depicts the structural outline of the cluster program.

One of the main purposes of state government to support cluster initiatives is to promote SMEs. According to the benchmark survey conducted from 2015 to 2018, among the actors (e.g., business firms, public sectors, universities, and research institutions) enrolled as members of cluster organizations (125 members on average, ranging from 7 to 554), the composition of SMEs is approximately 55% and occupies the most significant proportion (Buhl et al., 2019). Since regional clusters enable firms (especially SMEs) to have excellent access to knowledge, technologies, and partners in the value chains, it appears to be enticing for the state government to support cluster initiatives and gain the popularity of the excellence of the industrial clusters of the region (therefore, to raise profiles in the location-based competition as discussed above), then, to attract firms that make a profit and enrich the region (Iwamoto, 2015).

Figure 7. Structural outline of the cluster program
Source: Drawn up by the Author.



Support From the Federal Government

While the state government mainly implements the cluster programs in its region, the federal government builds and operates the structure to encourage these efforts of each region with evaluation and incentives to sort out the excellent initiatives through the following programs.

One of the major programs is implemented by the Federal Ministry for Economic Affairs and Climate Action (the former Federal Ministry for Economic Affairs and Energy). Launched as "Competence Networks (Kompetenznetze)" in 1999 and changed its name to "go-cluster" in 2012, the program selects cluster initiatives in Germany that already satisfy specific criteria of excellence and supports them for further development of their management excellence (Gerdes et al., 2019) to be internationally competitive, be able to provide new services, and gain national/international visibility. The selected industrial clusters are certified and can use the logo of "go-cluster" as qualified clusters. Moreover, they can have the public presentation (in events, newsletters, and website), have access to opportunities for interaction and networking with other clusters in Germany and E.U., participate seminars, have individual counseling, and be entitled to apply for funds (Clusterplattform Deutschland, n.d.-b).

The following program to be focused on is the "Leading-Edge Cluster Competition (Spitzencluster-Wettbewerb)," promoted by the Federal Ministry of Education and Research, launched in 2007 within the framework of the High-Tech Strategy drawn up in 2006. In this program, the most efficient cluster initiatives are selected through the competition rounds and receive funding for five years to realize the motto of more innovation, more growth, and more employment (Clusterplattform Deutschland, n.d.-c; Gerdes et al., 2019).

In addition to these programs, in 2019, the Federal Ministry of Education and Research launched the first competition round of "Clusters4Future (Zukunftscluster - Initiative)". The fund program is based on one of the central goals of the High-Tech Strategy 2025. The program aims to select and develop the next generation of regional innovation networks (therefore, clusters) by technology transfer through promoting the cooperation between research institutions (universities), businesses, and other relevant players (CLUSTERS 4 FUTURE; Federal Ministry of Education and Research (BMBF), n.d.).

Medical Technology Industry and Cluster Initiative

In this part, the medical technology industry in Germany and its cluster initiatives, which are the subject of this book's case study, are outlined.

Medical technology is the product, service, or solution comprising the following three categories; medical devices, in vitro diagnostics (IVDs), and digital health (MedTech Europe, 2021). This is one of the industries in which cluster initiatives have significantly increased since the 2000s (Buhl et al., 2019).

With the most prominent hospital sector in Europe (almost 1,900 hospitals and approximately 500,000 beds) (Germany Trade & Invest (GTAI), 2022), the market scale of the medical technology industry of Germany is ranked 3rd after the U.S. and Japan and is the largest in Europe (International Trade Administration). Total sales are over 36 billion Euro in 2021 (a 6.3% increase from 2020), and as Figure 8 shows, the volume has steadily increased in these years (SPECTARIS, 2022). The notable movement is that the medical industry of Germany has been performing a high export ratio (66.5% in 2021). Therefore, the industry has substantial competitiveness in the global market. The most important export destination is other E.U. countries; the U.S. and China follow after (SPECTARIS, 2022).

In the medical technology industry, over 152,000 jobs are created by (approximately) 1,450 companies with more than 20 employees. Approximately half are located in Baden-Württemberg, North Rhine-Westphalia, and Bavaria (SPECTARIS, 2021). Looking at the figures, which include micro and commercial enterprises, more than 236,000 employees are employed by approximately 12,000 companies (SPECTARIS,

2021). The notable feature of this sector is that approximately 93% are companies with fewer than 250 employees (therefore, SMEs) (Germany Trade & Invest (GTAI), 2022). Table 4 shows the performance trends of medical technology in Germany.

Figure 8. Total sales of medical technology in Germany (billion Euro)
Source: SPECTARIS (2022).

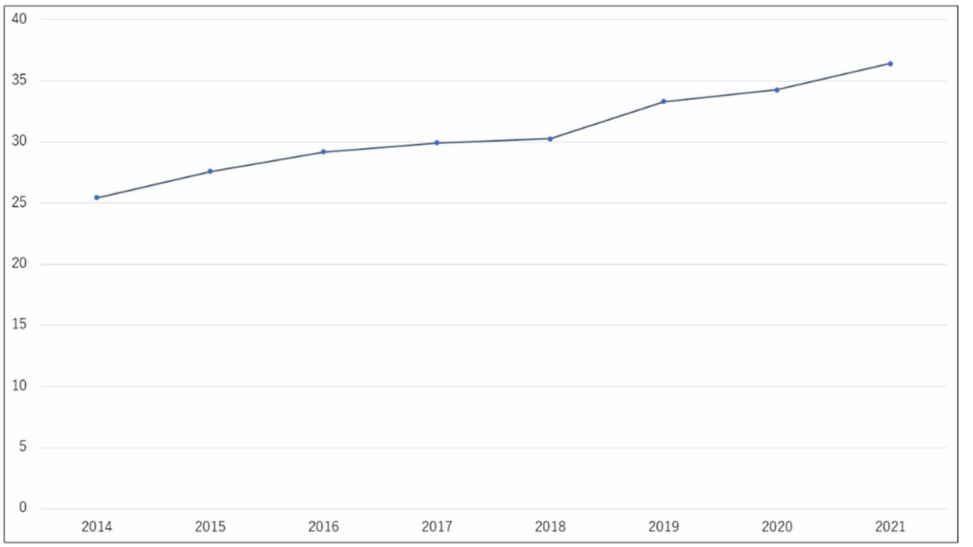


Table 4. Performance of medical technology in Germany (except total sales)

	2017	2018	2019	2020	Dev. 2020/19
Domestic sales (€ bn.)	10.85	10.49	11.46	11.72	+2.3 %
Foreign sales (€ bn.)	19.08	19.79	21.95	22.53	+2.60%
Export ratio (%)	63.7	65.4	65.7	65.8	+0.20%
Employees	137,900	143,200	148,800	152,100	+2.20%
Companies	1,310	1,352	1,375	1,446	+5.20%

Source: SPECTARIS (2021).
* Performance of companies with 20 employees and more.

More than 46 active industrial clusters of medical technology are operating across Germany (Germany Trade & Invest (GTAI), 2022). These clusters connect companies, hospitals, universities, research institutions, etc., to facilitate collaborations and pursue the goal of continuous innovation (BIOCOM AG, 2022). Moreover, in addition to promoting cooperation and partnering, cluster organizations support obtaining R&D

funding, having education and training opportunities, and providing shared facilities (Germany Trade & Invest (GTAI), 2022). Table 5 shows the number of involved clusters in each area of activity out of the 18 major medical technology clusters.

Concerning the trend of the activities, under the development of digitization and change in the business model stemming from it, the focus is transforming from promoting classic device technology to digital and holistic healthcare solutions (SPECTARIS, 2021).

Table 5. Areas of activities of medical technology clusters

Areas of Activities	Numbers of Involved Clusters (Out of the 18 Major Clusters)
Digital Health	17
Diagnostics	15
Implants	12
Rehabilitation	11
Minimally Invasive Technologies	10
Medical Imaging	10
Cardiology	10
Assistive Technologies	10
Robotics	9

Source: SPECTARIS (2021).

* The number of involved clusters of more than nine are listed.

REFERENCES

Bardt, H., & Lichtblau, K. (2020). *IW-analysen 139 industriepolitische herausforderungen: Horizontale ansätze und neue aufgaben für den staat* [IW analysis 139 industrial policy challenges: Horizontal approaches and new tasks for the state]. Köln: Herausgegeben vom Institut der deutschen Wirtschaft Köln e. V. https://www.iwkoeln.de/en/studies/hubertus-bardt-karl-lichtblau-industrial-policy-in-germany.html

Barysch, K. (2003). *Germany–The sick man of Europe?* Policy brief. Center for European Reform. https://www.cer.org.uk/sites/default/files/publications/attachments/pdf/2012/policybrief_germany_man_kb-5422.pdf

BIOCOM AG. (2022). *Guide to German medtech companies, 7.* BIOCOM AG. https://medtech-zwo.de/fileadmin/medtech-zwo/PDF/MedtechGuide_2022.pdf

Buhl, C. M., zu Köcker, G. M., & Sedlmayr, B. (2019). *Development of cluster initiatives in Germany from 2008 - 2018*. Institute for Innovation and Technology. https://www.researchgate.net/publication/337671892_Development_of_Cluster_Initiatives_in_Germany_from_2008_-_2018

Bullinger, H. J., Bannert, M., & Brunswicker, S. (2007). Managing innovation capability in SMEs - The Fraunhofer three-stage approach. *Tech Monitor,* 17-27.

Clusterplattform Deutschland. (n.d.-a). *Search clusters*. https://www.clusterplattform.de/SiteGlobals/CLUSTER/Forms/Suche/EN/Clustersearch_Form.html?cl2Categories_Typ_name=gocluster&oneOfTheseWordsEN=Enter+search+term

Clusterplattform Deutschland. (n.d.-b). *The "go-cluster" programme*. https://www.clusterplattform.de/CLUSTER/Navigation/EN/NationalLevel/go-cluster/go-cluster.html

Clusterplattform Deutschland. (n.d.-c). *Germanys leading-edge clusters*. https://www.clusterplattform.de/CLUSTER/Redaktion/EN/Downloads/Publications/deutschlands_spitzencluster.html

Clusterportal Baden-Württemberg. (n.d.). *Cluster policy in Germany*. https://www.clusterportal-bw.de/en/cluster-policy/cluster-policy-in-germany/

CLUSTERS 4 FUTURE. (n.d.). https://www.clusters4future.de/

Dustmann, C., Fitzenberger, B., Schönberg, U., & Spitz-Oener, A. (2014). From sick man of Europe to economic superstar: Germany's resurgent economy. *The Journal of Economic Perspectives*, *28*(1), 167–188. doi:10.1257/jep.28.1.167

European Association of Development Agencies. (n.d.). *Regional development agencies in Germany*. European Association of Development Agencies. https://www.eurada.org/fileadmin/user_upload/docs/RDAs-from-Germany.pdf

European Parliament. (2009). *Briefing note for the meeting of the EMPL Committee October 5 2009 regarding the exchange of views on the Lisbon Strategy and the E.U. cooperation in the field of social inclusion*. https://www.europarl.europa.eu/meetdocs/2009_2014/documents/empl/dv/lisbonstrategybn_/lisbonstrategybn_en.pdf

European Union. (2022). *Key figures on European business 2022 edition*. https://ec.europa.eu/eurostat/documents/15216629/15230677/KS-06-22-075-EN-N.pdf/930f2188-48cb-ef84-678e-e6f96682b072?t=1672841155329

European Union. (n.d.-a). *Country profile: Germany*. https://european-union.europa.eu/principles-countries-history/country-profiles/germany_en

European Union. (n.d.-b). *Facts and figures on the European Union economy*. https://european-union.europa.eu/principles-countries-history/key-facts-and-figures/economy_en

Eurostat. (n.d.-a). *Unemployment rate by age*. https://ec.europa.eu/eurostat/databrowser/view/tepsr_wc170/default/table?lang=en

Eurostat. (n.d.-b). *GDP and main components (output, expenditure and income)*. https://ec.europa.eu/eurostat/databrowser/view/nama_10_gdp/default/table?lang=en

Federal Ministry for Economic Affairs and Climate Action (BMWK). (2022). *Facts about German foreign trade*. Federal Ministry for Economic Affairs and Climate Action (BMWK). https://www.bmwk.de/Redaktion/EN/Publikationen/Aussenwirtschaft/facts-about-german-foreign-trade-2022.pdf?__blob=publicationFile&v=2

Federal Ministry for Economic Affairs and Climate Action (BMWK). (n.d.-a). *Competition policy: Protecting free competition*. https://www.bmwk.de/Redaktion/EN/Dossier/competition-policy.html

Federal Ministry for Economic Affairs and Climate Action (BMWK). (n.d.-b). *'Future of the German Mittelstand' action programme: SMEs are a recipe for success*. https://www.bmwk.de/Redaktion/EN/Dossier/sme-policy.html

Federal Ministry for Economic Affairs and Energy (BMWi). (2019a). *Industrial strategy 2030: Guidelines for a German and European industrial policy -*. Federal Ministry for Economic Affairs and Energy (BMWi). https://www.bmwk.de/Redaktion/EN/Publikationen/Industry/industrial-strategy-2030.pdf?__blob=publicationFile&v=7

Federal Ministry for Economic Affairs and Energy (BMWi). (2019b). *Valuing SMEs strengthening opportunities easing the burden the German SME strategy*. Federal Ministry for Economic Affairs and Energy (BMWi). https://www.bmwk.de/Redaktion/EN/Publikationen/Mittelstand/german-sme-strategy.pdf?__blob=publicationFile&v=3

Federal Ministry of Education and Research (BMBF). (2014). *The new high-tech strategy innovations for Germany*. Federal Ministry of Education and Research (BMBF). https://ec.europa.eu/futurium/en/system/files/ged/hts_broschuere_engl_bf_1.pdf

Federal Ministry of Education and Research (BMBF). (2018). *Research and innovation that benefit the people: The high-tech strategy 2025*. Federal Ministry of Education and Research (BMBF). https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/FS/31538_Forschung_und_Innovation_fuer_die_Menschen_en.pdf?__blob=publicationFile&v=7

Federal Ministry of Education and Research (BMBF). (n.d.). *Zukunftscluster-initiative (Clusters4Future)* [Future cluster initiative (Clusters4Future)]. https://www.bmbf.de/bmbf/de/forschung/zukunftsstrategie/zukunftscluster-initiative-clusters4future/zukunftscluster-initiative-clusters4future_node.html

Federal Ministry of Justice. (n.d.). *Competition act (Gesetz gegen wettbewerbsbeschränkungen - GWB)*. https://www.gesetze-im-internet.de/englisch_gwb/englisch_gwb.html#p0021

Federal Statistical Office of Germany (Destatis). (n.d.-a). *Foreign trade: Overall developments*. https://www.destatis.de/EN/Themes/Economy/Foreign-Trade/Tables/lrahl01.html#242374

Federal Statistical Office of Germany (Destatis). (n.d.-b). *Exports and imports (special trade) by division of the national product classification for production Statistics 2022*. https://www.destatis.de/EN/Themes/Economy/Foreign-Trade/Tables/imports-exports.html

Federal Statistical Office of Germany (Destatis). (n.d.-c). *Industrial sector in Germany remains stronger than in many other E.U. member states*. https://www.destatis.de/Europa/EN/Topic/Industry-trade-services/Industry_GVA.html

Federal Statistical Office of Germany (Destatis). (2022a). *Germany: Statistical country profile, edition 08/2022*. https://www.destatis.de/EN/Themes/Countries-Regions/International-Statistics/Country-Profiles/germany.pdf?__blob=publicationFile

Federal Statistical Office of Germany (Destatis). (2022b). *Fachserie 18 reihe 1.5, volkswirtschaftliche gesamtrechnungen, inlandsproduktberechnung, lange reihen ab 1970* [Subject series 18 series 1.5, national accounts, domestic product calculation, long series from 1970]. https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Publikationen/Downloads-Inlandsprodukt/inlandsprodukt-lange-reihen-pdf-2180150.pdf?__blob=publicationFile

Fraunhofer, I. W. M. (n.d.). *R & D for small and medium-sized enterprises*. https://www.iwm.fraunhofer.de/en/how-to-work-with-us/research-development-small-and-medium-sized-enterprises.html

Fraunhofer. (2018). The Fraunhofer model: Technology transfer from universities to industry. Commentary. *2018 Japanese-German Symposium.* https://www.janu.jp/eng/wp/wp-content/uploads/2021/04/20180426-jpde-presentation14.pdf

Gerdes, T., Noegel, L., Buhl, C. M., Neugebauer, K., & Shajek, A. (2019). *Wissenschaftliche weiterbildung und clusterinitiativen: Wie clustermanagement-organisationen bei der entwicklung neuer angebote unterstützen können* [Scientific training and cluster initiatives: How cluster management organizations can support the development of new offers]. Institut für Innovation und Technik (iit). https://www.iit-berlin.de/iit-docs/b60ea32529d24773965e7fa18bdb4bf0_2019_09_02_Studie_Cluster_NEW_final.pdf

Germany Trade & Invest (GTAI). (2022). *Medical technology cluster in Germany.* Germany Trade & Invest. https://www.gtai.de/resource/blob/64176/0b820ca68223cf736433b4eb60d921c9/20221019_FS_MedTech_WEB.pdf

Germany Trade and Invest (GTAI). (2021). *Facts & figures economic overview Germany: Markets, productivity, innovation*. Germany Trade & Invest. https://www.gtai.de/resource/blob/686860/41221e6729bb71ea7300fb8dbab8343c/Economic_Overview_Germany_2021_GTAI.pdf

Hantsch, S., Kergel, H., Lämmer-Gamp, T., zu Koecker, G. M., & Nerger, M. (2013). *Cluster management excellence in Germany: German clusters compared with European peers*. European Secretariat for Cluster Analysis (ESCA). https://www.iit-berlin.de/iit-docs/21e1a4a8b3de460b8ca5170991d08314_cluster-management-excellence.pdf

Hestermeyer, H. P. (2015). The implementation of European Union law in Germany. In E. De Wet, H. Hestermeyer, & R. Wolfrum (Eds.), *The implementation of international law in Germany and South Africa* (pp. 444–467). Pretoria University Law Press.

Institut für Mittelstandsforschung (IfM) Bonn. (2022). *Der Mittelstand im überblick* [The Mittelstand at a glance]. https://www.ifm-bonn.org/fileadmin/data/redaktion/ueber_uns/ifm-flyer/IfM-Flyer-2022.pdf

International Trade Administration. (n.d.). *Germany - Country commercial guide: Healthcare and medical technology*. https://www.trade.gov/country-commercial-guides/germany-healthcare-and-medical-technology

Iwamoto, K. (2015). Hitorigati no Doitu kara Nihon no chiho/chushokigyo heno sisa: Doitu genchichosa kara [Suggestion from sole-winning Germany to local regions/small and medium-sized enterprises in Japan: From field survey in Germany]. *RIETI Policy Discussion Paper Series,* 15-P-002, 1-59.

Kiese, M. (2019). Regional cluster policies in Germany: Challenges, impacts and evaluation practices. *The Journal of Technology Transfer*, *44*(6), 1698–1719. doi:10.100710961-017-9589-5

MedTech Europe. (2021). *The European medical technology industry in figures 2021*. MedTech Europe. https://www.medtecheurope.org/wp-content/uploads/2021/06/medtech-europe-facts-and-figures-2021.pdf

OECD. (1997). *General cartel bans: Criteria for exemption for small and medium-sized enterprises 1996*. OECD Publishing. https://www.oecd.org/competition/cartels/1920345.pdf

OECD. (2020). *OECD economic surveys: Germany 2020*. OECD Publishing.

OECD Better Life Index. (n.d.). *Germany*. https://www.oecdbetterlifeindex.org/countries/germany/

OECD Data. (n.d.). https://data.oecd.org/

Porter, M. (1990). *The competitive advantage of nations*. Macmillan. doi:10.1007/978-1-349-11336-1

Porter, M. (1998). Clusters and the new economics of competitiveness. *Harvard Business Review*, *76*(6), 77–90. PMID:10187248

SPECTARIS. (2021). *Industry profile: Medical technology*. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Steckbrief_Medical_Technology_2021.pdf

SPECTARIS. (2022). *Die Deutsche medizintechnik-industrie: SPECTARIS jahrbuch 2022/2023* [The German medical technology industry: SPECTARIS yearbook 2022/2023]. SPECTARIS. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Zahlen-Fakten-Publikationen/SPECTARIS_Jahrbuch_2022-2023_01-2023_Lesezeichen_3.pdf

Statista. (n.d.-a). *The 20 countries with the largest gross domestic product (GDP) in 2021*. https://www.statista.com/statistics/268173/countries-with-the-largest-gross-domestic-product-gdp/

Statista. (n.d.-b). *Leading export countries worldwide in 2021*. https://www.statista.com/statistics/264623/leading-export-countries-worldwide/

Statista. (n.d.-c). *The 20 countries with the highest trade surplus in 2021*. https://www.statista.com/statistics/256642/the-20-countries-with-the-highest-trade-surplus/

The Bundeskartellamt. (2007). *Information leaflet of the Bundeskartellamt on the possibilities of cooperation for small and medium-sized enterprises*. https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Merkblaetter/Leaflet%20-%20Cooperation%20for%20SMUs.pdf?__blob=publicationFile&v=3

United Nations Development Programme. (n.d.). *Human development report*. https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

World Economic Forum. (2019). *The global competitiveness report 2019*. https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Chapter 3
Research Design

ABSTRACT

This chapter explains the research design of this study. The objective is to explore a management approach for facilitating the establishment of cross-sectoral collaboration to promote the regional industry through building/operating the regional system and building/rebuilding the management body. First, since this study aims at theory building, it is considered how to conduct case studies based on the review of the previous studies. Next, the selection of the target case is considered. Here, the criteria for selecting cases are listed, and the cases of three German regions are discussed as fulfilling the criteria. Finally, data collection and analysis are described. In this section, data collection for conducting the case studies is described in detail. Additionally, it is explained that a qualitative comparative analysis method and process tracing for each case study are used to analyze the results of the case studies.

INTRODUCTION

As described in Chapter 1, the promotion of regional industries is premised on the interaction of diverse and many entities. However, the experience of how the interaction is managed for facilitating cross-sectoral collaboration has not been clarified as systematic knowledge. Therefore, there needs to be more empirical research on what kind of management is required to facilitate self-organized collaboration efforts of these entities intentionally and effectively and how to build a regional system and management body to support such efforts.

This study pursues academic and practical value by exploring research questions based on the conceptual model presented. This chapter will detail the methodology used to conduct this study and the research conducted.

DOI: 10.4018/978-1-6684-8494-4.ch003

PURPOSE AND APPROACH

Purpose of This Study

This study explores the research theme of "How to implement the management for facilitating the establishment of cross-sectoral collaborations for the purpose of promoting new competitive regional industries through business creation, and with what kind of regional system and competence of the management body to facilitate it?". Here, the case is assumed wherein the public sector (e.g., local government) promotes industrial fields with high growth potential in the region through cross-sectoral collaboration among diverse entities for business creation. Therefore, the project is envisioned in which a regional structure (regional system) and support organization (management body) are established with the involvement of local industry and academia, and a management body implements management to facilitate cross-sectoral collaborations.

In exploring this research theme, the following research questions posed in Chapter 1 are considered.

R.Q.1: How to build and operate a regional system for facilitating the self-organization process of cross-sectoral collaborations to promote new competitive regional industries?

R.Q.2: How is the management to be implemented for facilitating the self-organization process toward cross-sectoral collaborations?

R.Q.3: How to build and rebuild a management body to display the organizational competence for facilitating the self-organization process toward cross-sectoral collaborations?

The Approach of This Study

As mentioned above, more attempts at comprehensive theory building should be made based on detailed case studies regarding this research theme. Eisenhardt (1989) identifies that theory building through case studies is an appropriate research method to explore a new theme or when current perspectives or evidence are insufficient, indicating that an eclectic approach to theory building, utilizing both an inductive approach based on case studies and a deductive approach based on existing research, contributes to raising the level of internal validity, generality, and theory building. Eisenhardt and Graebner (2007) also note that empirical analysis should be based on relevant previous studies and the importance of presenting a research question

that clarifies the research gap. Additionally, the success or failure of the research depends on the quality of the research question, which can provide insight into complex social processes (Eisenhardt & Graebner, 2007).

This study focuses on the cases of efforts to promote business creation in the medical technology fields through cross-sectoral collaboration in multiple regions. First, the main questions are how the facilitation of cross-sectoral collaboration is implemented and how the regional system and management body required for support are built. Second, the research subject differs from experimental methods and cannot be controlled by the researcher. Third, the subject of the study is a current case, and primary data can be obtained as current events. Therefore, the research topic is explored through case studies based on the criteria for selecting appropriate research methods, as Yin (2003) indicates.

Glaser and Strauss (1967) propose that a comparative analysis through theoretical sampling is an approach toward theory building. Moreover, Eisenhardt (1989) states that theoretical sampling is not from a statistical perspective but rather the selection of cases that replicate or expand the theory being formed. Similarly, Eisenhardt and Graebner (2007) also state that theoretical sampling is the selection of cases that clarify and expand relationships among concepts and elucidate logic.

Based on these perspectives, this study will examine the validity of the conceptual model derived from related previous studies by considering inductive findings obtained through comparative analysis of multiple selected cases. Based on the findings, it will consider constructing a comprehensive theory for facilitating cross-sectoral collaboration to create new businesses for promoting new regional industries. This methodology has two advantages. First, multiple case studies increase construct validity and internal validity through theoretical sampling in theory building (Glaser & Strauss, 1967). In addition, Yin (2003) confirms that multiple case studies increase external validity and provide a stronger foundation for theory building.

SELECTION OF CASES

In this study, it is considered how to facilitate the self-organization process of cross-sectoral collaboration among companies (including SMEs), universities and other research institutions, and various other organizations for the advancement of business creation toward promoting new industries with the medium- to long-term objective of a leading role in the regional economy. It is also considered how to build and operate the regional system and how to build and rebuild the management body, which supports/manages the facilitation above. This is to build a comprehensive theory and propose practical implications through case studies.

In exploring the research topic, a valid case study subject should meet the following criteria:

- Industrial fields with high growth potential are targeted, and the regional system is built and operated by the public sector with the involvement of local industry and academia to support industrial promotion by facilitating cross-sectoral collaborations.
- A management body is established with the cooperation of the public sector, local industry, and academia to realize the above objectives, working on facilitating cross-sectoral collaboration and providing related services.
- The cross-sectoral collaboration to promote business creation must be considered as an inter-organizational collaboration formed through the voluntary participation of multiple organizations from different fields that are equal and complementary to each other to create value through growth opportunities and new business.

Considering the above criteria, three German regions (North Rhine-Westphalia, Bavaria, and Baden-Württemberg) are selected as case study targets, where the public sector, local industry, and academia are working together to facilitate cross-sectoral collaboration for the promotion of medical technology industries in the regions. As described in Chapter 2, Germany is highly competitive in the medical technology industry. The cluster policies implemented in each region promote advanced efforts to encourage the industry through collaboration among different sectors. Furthermore, the three states mentioned above are the leading regions in terms of the number of companies in the industry. A summary (See also Table 1) and the reason for the selection of each case are provided below.

North Rhine-Westphalia (NRW)

In this case, 16 industrial sectors with high growth potential were designated for support under the cluster policy launched in 2007 by the NRW state government. Efforts to facilitate cross-sectoral collaboration are made to promote the medical technology industry. In 2011, with the support of the state government, the three local medical technology cluster organizations in the state established Innovative Medizin NRW as a cluster organization to promote state-level activities and facilitate collaboration among different sectors. Currently, local cluster organizations are still active.

This case is about an effort to build a regional system for industrial promotion through cooperation between industry, academia, and government in the state of NRW, where a management body (i.e., cluster organization) was established, and management has been implemented to facilitate a self-organization process toward the cross-sectoral collaboration. Therefore, it is judged to be an appropriate case for exploring the theme of this study.

Bavaria

In this case, under the cluster policy launched in 2006 by the Bavarian state government, cluster organizations in 17 industrial sectors with high growth potential are targeted for support. As one of these, a cluster organization was designated to promote the medical technology field by facilitating cross-sectoral collaboration. Support is provided to facilitate cross-sectoral collaboration for business promotion.

In this case, a regional system for industrial promotion was established with the cooperation of the Bavarian government, local industry, and academia. Further, a management body (i.e., cluster organization) promotes business creation by supporting the facilitation of cross-sectoral collaboration. Therefore, it is an appropriate case for exploring this research theme.

Baden-Württemberg (BW)

In 2006, the state government of BW designated 25 industrial sectors with high growth potential, and several management bodies (i.e., cluster organizations) in each sector were targeted for support. The cluster organizations have been promoting business creation by facilitating cross-sectoral collaboration in each area of BW.

In this case, the regional system was established and operated through information sharing and exchange of opinions between the government, local industry, and academia. In addition, the supported cluster organizations facilitate cross-sectoral collaboration to promote commercialization. Therefore, it is an appropriate case for this research theme.

Table 1. Summary of each case

	NRW	Bavaria	BW
Operating entity of the regional system	NRW State Government	Bavarian state government and an affiliated organization (Bayern Innovativ).	BW State Government and an affiliated organization (Cluster Agency BW).
The management body (cluster organization) to facilitate cross-sectoral collaboration	Innovative Medizin NRW (–2018) (Owned by three local cluster organizations in the state).	Cluster MedizinTechnik (In effect, activities are implemented through cooperation and segregation of activities between the two cluster organizations in the state).	Five state-recognized cluster organizations, such as Mannheim Medical Technology Cluster.
Start of activity of the cluster organization	2011 (The three local cluster organizations have been active since before 2011).	2006 (The two operating cluster organizations have been active since before 2006).	2011 (Mannheim Medical Technology Cluster)
Purpose of activity	Promoting innovation and business creation in medical technology fields.	Promoting innovation and business creation in medical technology fields (and other healthcare fields).	Promoting innovation and business creation in medical technology fields.
Base of operations	Dusseldorf	Nuremberg	Mannheim

Source: Drawn up by the author.

DATA COLLECTION AND ANALYSIS

Data Collection

Data collection for each case study (Chapters 5, 8, 11) began with secondary data available to third parties, including the websites of state governments and cluster organizations, etc., to gain an overview of the case. Then, to collect primary data, questions were developed to gather more details, and semi-structured interviews were conducted with several people involved in the case. The questions were given to the interviewees before conducting the interviews. Internal documents, such as survey reports received during the interviews, are also utilized.

Given COVID-induced considerations, interviews in 2022 were conducted by remote meeting system. Other interviews were conducted face-to-face at the interviewees' office or in the venue of MEDICA (a trade fair of medical devices in Dusseldorf).

Details of data collection through interviews in each case are as follows.

The Case of NRW

The interviews were conducted with the following parties concerned for collecting the data on the case of NRW.

An official of the Ministry of Economy, Innovation, Digitization and Energy[1] of NRW state government (interview conducted on November 14, 2017), a staff member who played as a managing director as well as a project manager of Innovative Medizin NRW (interview conducted on November 14, 2017, November 14, 2018, and November 20, 2019), a staff member of MedEcon Ruhr (interview conducted on November 14, 2017), and a staff member of the Health Region Cologne/Bonn (interview conducted on November 16, 2017). Innovative Medizin NRW is a statewide cluster organization in the medical technology field. The latter two are the local cluster organizations that deploy in certain state areas (e.g., the Ruhr area) in the same field. Innovative Medizin NRW was established and owned by the three local cluster organizations (two of them are Health Region Cologne/Bonn and MedEcon Ruhr). Since the system was restructured in the medical technology field and a new system (a cluster organization) was launched in January 2019, the case study (described in Chapter 5 of Section 2 and Chapter 8 of Section 3) describes the movement before the period.

Since the system was restructured as above, the case study for Chapter 11 of Section 4 focuses on MedEcon Ruhr, one of the cluster organizations that owned Innovative Medizin NRW. The cluster organization focuses on the Ruhr area for its activities. In addition to the above interview with staff, the following interviews were conducted to update and obtain the data for the case study, especially for Chapter 11 of Section 4. A managing director (interview conducted on November 19, 2019, and June 24, 2022) and a former staff member of MedEcon Ruhr (interview conducted on June 23, 2022).

The Case of Bavaria

The interviews were conducted with the following parties concerned for collecting the data on the case of Bavaria.

An official of the state government (Bavarian Ministry of Economic Affairs Regional Development and Energy)[2] responsible for cluster policy (interview conducted on November 19, 2018). A CEO and a member of the Executive Board of Bayern Innovativ, an affiliated organization of the state government, which supports cluster organizations' activities (interviews conducted on December 10, 2018). A managing director of Forum MedTech Pharma, a cluster organization in the medical technology field (Interview conducted on December 10, 2018).

Moreover, to update and obtain the data for the case study, especially for Chapter 11 of Section 4, on December 2, 2022, an interview was conducted with a managing director of Forum MedTech Pharma, who was assigned in 2019 as the successor of the managing director interviewed on December 10, 2018.

The Case of BW

The interviews were conducted with the following parties concerned with collecting the data on the case of BW.

A staff member of the Cluster Agency BW that supports the activities of cluster organizations in the state as an affiliated organization of the state government of Baden-Wuerttemberg (interview conducted on January 15, 2019). A staff member of Baden-Wuerttemberg International, also an affiliated organization of the state government, for promoting the internationalization of industries in the state and collaborating with the Cluster Agency BW (interview conducted on January 15, 2019). A managing director of Mannheim Medical Technology Cluster, which belongs to the city government of Mannheim as one of the units and operates as a cluster organization in the field of medical technology (Interview conducted on March 26, 2019; Additional interview was conducted by email on January 28, 2020).

Moreover, to update and obtain the data for the case study, especially for Chapter 11 of Section 4, on July 21, 2022, an interview was conducted with a managing director of Mannheim Medical Technology Cluster, who was assigned in 2021 as the successor of the managing director interviewed on March 26, 2019.

Data Analysis

The methodology for analyzing the case studies for each research question is as follows.

Eisenhardt (1989) indicates that a detailed description of each case is necessary to grasp and gain insight into the unique patterns before generalizing the patterns among multiple cases. Therefore, the initial focus is on the critical concepts in the conceptual model presented based on a review of previous studies on the questions posed above. Then, 5W1H for each case is described in detail.

A method of qualitative comparative analysis with a small number of cases is used to extract similarities and differences for each question between cases, and a preliminary screening of causal relationships is conducted.

Moreover, process tracing is used in each case study to elucidate the details of the causal chain and mechanisms that led to the outcome of each case study (George & Benett, 2004). In process tracing, focusing on human actions (Martin, 1964), a time-ordered sequence of events is analyzed to clarify the event structure (Heise,

1989), then, the causal network will be clarified by focusing on how each event is causally related. Therefore, this study also focuses on the chronology of events and the cause and effect or logical linkage of each event, confirming causal relationships and organically linking them by examining the "how" and "why" issues over time (Yin, 2003).

Finally, for each research question, the results of the case study will be compared with the conceptual model to examine its validity and to derive theoretical and practical findings.

REFERENCES

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550. doi:10.2307/258557

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25–32. doi:10.5465/amj.2007.24160888

George, A. L., & Benett, A. (2004). *Case studies and theory development in the social sciences*. MIT Press.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing.

Heise, D. R. (1989). Modeling event structures. *The Journal of Mathematical Sociology*, *14*(2-3), 139–169. doi:10.1080/0022250X.1989.9990048

Martin, R. M. (1964). On atomic sentential forms and theory construction. In R. Cox, W. Alderson & S. J. Shapiro (Eds.), Theory in marketing (pp. 68-83). Richard D. Irwin, Inc.

Yin, R. (2003). *Case study research: Design and methods* (3rd ed.). Sage Publications.

ENDNOTES

1 The Ministry's name is that of when the interview was conducted.

2 The Ministry's name is that of when the interview was conducted.

Section 2

Regional System to Promote Competitive Industries Through Cross-Sectoral Collaborations: How to Build and Operate

Chapter 4
Review of Literature and a Conceptual Model

ABSTRACT

Initiated by regional governments and economic associations, etc., many regions are trying to promote new and competitive industries through cross-sectoral collaborations. The purpose of Section 2 is to consider the research question (R.Q.) 1 introduced in Chapter 1 of Section 1, that is, to elucidate the management approaches to build and operate a regional system for facilitating the self-organization process of cross-sectoral collaborations to promote competitive regional industries. This chapter reviews the literature concerning the structure and approach to building and operating the regional system. First, "Why region?" is considered, and the concept of constructing regional advantage is introduced. Then, a platform policy through building a "Regional Innovation System" based on the "Triple-Helix Model" is examined. The key is to combine top-down public and bottom-up creative forces to facilitate cross-sectoral collaborations by providing a platform. Finally, a conceptual model of the management approach above is proposed based on these arguments.*

REGION AND COMPETITIVENESS

Why Are Regions Focused?

The region is conceptually regarded as under the country's level but above the local or municipal level (Cooke & Leydesdorff, 2006). Today, the region is increasingly recognized as a critical component of economic development (Kitson et al., 2004; Pessoa, 2013). In other words, it is regarded as a locus for processes and patterns of

DOI: 10.4018/978-1-6684-8494-4.ch004

innovation and competitiveness in globalization (Fiore et al., 2011). This is because regions, as stated by European Commission (1995), are "the best level for contacting enterprises and providing them with the necessary support for the external skills they need (resources in terms of manpower, technology, management, and finance). It is also the basic level at which there is natural solidarity and where relations are easily forged" (p.45). In this trend, Cooke et al. (2006) also indicate that the region is strategically important for constructing its advantage; however, at the same time, since regional innovation systems are open, socially constructed, and linked to global, national, and other regional systems of innovation, it is necessary to employ a multi-level approach to innovation and governance.

What Is the Competitiveness of Regional Industries?

Concerning the competitive advantage of regions, Cellini and Soci (2002) show that regional competitiveness is "more than the potential ability to export or the surplus in trade balance" (p.89) and includes "different economic elements, as well as demographic and social aspects" (p.90), therefore, the concept is complex and elusive. It is also indicated that there is no unanimous agreement concerning the definition and the framework to consider regional competitiveness (Borseková et al., 2012).

Based upon the complexity of the definition of regional competitiveness, on the premise of promoting regions' industrial and economic development, some studies show the "drivers" and the "goals" for regional competitiveness. First, regarding the drivers, based on the argument by Camagni (2002) and European Commission, Directorate-General for Regional and Urban Policy (1999), Kitson et al. (2004) indicate that regions, which have competitive advantages, have common features in terms of superior assets which are external to individual firms but benefit to them for higher productivity. Furthermore, they show dimensions of the regional socio-economy, such as human capital, social/institutional capital, cultural capital, knowledge/creative capital, and infrastructural capital. Second, Pessoa (2013) also shows the drivers of regional competitiveness, such as environmental resources, local milieu, factor market, the global market, legal infrastructure, and physical infrastructure. In addition to these factors, Viassone (2008) stresses a well-functioning financial system for economic growth. Therefore, these authors conclude that these drivers support and strengthen the regional economy's productive basis.

In contrast, concerning the goal, first, Kitson et al. (2004) show that the drivers above contribute to regional productivity, employment, and standard of living. Pessoa (2013) also indicates that looking merely at productivity is misleading because there are problems with measurement accuracy and theoretical concerns about the interpretation to consider real regional productivity. Instead, he proposes to recognize

regional competitive advantage in the dynamics of "i) sales of local products in contested external markets, ii) use of local assets (people and other endogenous resources) in an efficient way, iii) adding value to its firms and workers which means to maintain or increase employment" (p.107). Moreover, with reference to Porter (1998)'s argument about the industrial cluster, Pessoa (2013) concludes that improving innovation capacity through the productive use of inputs is essential for regional competitive advantage. In other words, the fundamental question is, "how can the innovation capacity be improved in a regional context ?" (p.108). The drivers and the goals for regional competitiveness are summarized as follows (Table 1).

Table 1. Drivers and the goals for regional competitiveness

Drivers	Superior Assets: • Human capital • Social (including network)/institutional capital • Cultural capital • Knowledge/creative capital • Infrastructural capital (Kitson et al., 2004)	• Environmental resources • The local milieu • Factor market • Global market • Legal infrastructure • Physical infrastructure (Pessoa, 2008, 2013) • Well-functioning financial system (Viassone, 2008)
Goals	• Regional productivity, employment, and standard of living (Kitson et al., 2004) • Regional competitiveness (dynamics in sales, efficiency, employment) (Pessoa, 2013) • Improvement of innovation capacity (Pessoa, 2013)	

Source: Drawn up by author with reference to Kitson et al. (2004), Pessoa (2008, 2013), and Viassone (2008).

HOW TO PROMOTE REGIONAL COMPETITIVE INDUSTRIES?

The Concept of "Constructed Advantage"

Concerning how to promote competitive regional industries, first, Porter (1990) indicates that competitive advantage is created and sustained through a highly localized process. Moreover, with reference to Brioschi et al. (2005), Maskell (1998), and Pinch et al. (2003), Viassone (2008) indicates that the localized process for knowledge creation is critical for regional competitiveness wherein new technology and trust are learned and information is exchanged and shared by people and firms.

Based on these ideas, the concept of "Constructed Advantage" is introduced as an approach to constructing regional competitive advantage. Cooke and Leydesdorff (2006) define Constructed Advantage as "both a means of understanding the noted metamorphosis in economic growth activity and a strategic policy perspective of practical use to business firms, associations, academics, and policy makers (p.10)".

Cooke et al. (2006) recognize Constructed Advantage "as the next evolutionary step in regional economic development" (p.12), and discuss some critical elements for Constructing Regional Advantage (CRA) as follows.

First, understanding the initial conditions of a region is necessary to consider policy options often limited by a region's historical trajectory. Here they indicate regional endowments such as historical and geographical background and economic, socio-institutional, and political conditions should be considered. More concretely, as initial conditions to be considered, it introduces a typology of regions, as well as individual factors such as access to natural resources, the degree of centrality and connectivity concerning its geographical location, the size of its population, the quality of regional communication infrastructures, the knowledge base strengths of the region, and evolutionary processes based on path-dependent technological trajectories. Here, it is presumed that "true regional innovation system connectivity is not complete in most regions" (Cooke et al., 2006, p.14). Regarding the methodology to analyze the initial condition, Borseková et al. (2012) propose to conduct a SWOT analysis that clarifies the internal environment (strengths and weaknesses) and the external environment (opportunities and threats). This is to identify the region's unique or potential competitive advantages to consider strategies for CRA.

Second, Cooke et al. (2006) propose the following basic approaches for creating CRA:

1. Own solutions for a particular region or needs of regional firms must be provided because each region has different economic and socio-institutional environments. On this point, Asheim et al. (2011) also indicate that one-size-fits-all regional policy models do not work.
2. They call the more innovative behavior of firms and the public sector more dynamic. Therefore, they suggest promoting public-private partnerships, policy intervention for reducing interaction or connectivity deficit, and co-occurring business interactions and knowledge flows need to be encouraged. On this point, Cooke and Leydesdorff (2006) propose that CRA must embrace new dynamics of innovation and the capacity to exploit them, so it requires interfacing developments in various directions such as economy, governance, knowledge infrastructure, and community and culture (Table 2).
3. Finally, Cooke et al. (2006) indicate that regional policy has to be considered in a mosaic and needs to be built with pieces that are not pre-determined. Therefore, as key importance, they stress recognizing institutional and governance capabilities in regions, which enable them to consider variations

Table 2. Various directions

Economy	• Regionalization of economic development • "Open systems" inter-firm interactions • Integration of knowledge generation and commercialization • Smart infrastructures; strong local and global business networks
Governance	• Multi-level governance of associational and stakeholder interests • Strong policy support for innovators • Enhanced budgets for research • Vision-led policy leadership • Global positioning of local assets
Knowledge Infrastructure	• Active involvement of universities, public sector research, mediating agencies, professional consultancy, etc., as structural puzzle-solving capacities
Community and Culture	• Cosmopolitanism • Sustainability • Talented human capital • Creative cultural environments • Social tolerance (Providing a background for the dynamics in a Triple Helix of university–industry–government relations)

Source: Cooke and Leydesdorff (2006, p.10).

of critical elements, then find their own solutions. Based on the idea, three key dimensions composed of related variety, differentiated knowledge bases, and distributed knowledge networks are proposed as requirements for the policy model of CRA (Asheim et al., 2011; Cooke et al., 2006). Table 3 describes the details of the key dimensions.

Table 3. Key dimensions for the policy model of CRA

Dimensions	Contents
Related variety	• Allowing higher absorptive capacity and more rapid diffusion of innovations (through spillover effect, e.g., knowledge spillover) (Cooke et al., 2006). • CRA based on related variety "may combine the advantages of regional specialization in complementary sectors" (Cooke et al., 2006, p.46).
Differentiated knowledge bases	• Comes from the recognition that "the innovation process of firms and industries is strongly shaped by their specific knowledge base" (Cooke et al., 2006, p.45). • Three types of knowledge bases, "analytical" (pursuing natural science/know-why), "synthetic" (integrative knowledge creation and pursuing engineering science/know-how), and "symbolic" (pursuing aesthetic attributes of product) (Asheim et al., 2011).
Distributed knowledge networks	• Oriented to the transition from an internal knowledge base of firms to globally distributed knowledge networks and open innovation (Chesbrough, 2003). • Importance to understand the effectiveness of "how different knowledge bases are combined and intertwined in a dynamic manner between firms and industries of related variety" (Asheim et al., 2011, p.899).

Source: Drawn up by the author with reference to Asheim et al. (2011), Chesbrough (2003), and Cooke et al. (2006).

Platform Policy for CRA: Building "Regional Innovation System (RIS)" Based on Triple-Helix Helix Model

Platform Policy for Promoting CRA

As a policy for promoting CRA, which is based on the dimensions above, a cross-sectoral platform policy is proposed. Asheim et al. (2011) explain that the essence of a platform policy "represents a strategy based on related variety, which is defined on the basis of shared and complementary knowledge bases and competences. Moreover, this approach also clearly illustrates that knowledge is distributed across traditionally defined sectors in distributed knowledge networks" (p.901). Cooke et al. (2006) also indicate the effectiveness of platform policy for learning to aim for behavioral value-added such as the role of knowledge creation, absorption, and diffusion under well-structured local and global knowledge flows. They explain that platform policies create more scope and flexibility while needing connectivity and the creation of systems. Therefore, the policies must include various actors, agencies, and structures for strengthening territorial competence bases, including people, business climates, regional knowledge infrastructures, SME and entrepreneurship policies, and governance dimensions of upgrading and building regional innovation systems as creative knowledge environments. Based on the recognition, they propose "the need for more platform and system oriented as well as more pro-active innovation based regional policy in order to construct regional advantage" (Cooke et al., 2006, p.69).

Triple-Helix Model and Its Evolution

Concerning how to promote CRA through platform policy, Cooke et al. (2006) show the concept of Triple Helix where university, industry, and government collaborate and pose the key question of how the collaboration is organized externally and how knowledge creation and innovation-oriented work are organized internally among different parties. Triple Helix is the model proposed by Etzkowitz and Leydesdorff (1997) as an innovative dynamic model which is "to capture multiple reciprocal linkages at different stages of the capitalization of knowledge" (p.1) through technology transfer, collaboration, and conflict moderation among the three actors. Ivanova (2014) explains that "these three sub-dynamics... exchange among themselves functions of knowledge production, wealth creation, and normative control" (p.359). Ranga and Etzkowitz (2013) explain the functions described as processes taking place in "Triple-Helix spaces" where knowledge, innovation, and consensus are performed.

As an advanced model of Triple Helix, Yawson (2009) proposes the concept of Quadruple-Helix, which includes the public as the fourth helix. European Committee of the Regions et al. (2016) indicate that the public is equivalent to "Citizens or users" in Arnkil, Järvensivu, Koski, & Piirainen (2010) and "media-based and culture-based public" and "civil society" in Carayannis and Campbell (2012). Here, European Committee of the Regions et al. (2016) explain that "civil society not only uses and applies knowledge, and demand for innovation, but also becomes an active part of the innovation system…in terms of knowledge, inventiveness, and creativity" (p.7, 18). Arnkil et al. (2010) indicate that while Triple Helix is a systematic way of pursuing research/technology-driven innovations, Quadruple-Helix is a systematic way of pursuing demand or user-oriented innovation. Therefore, the Quadruple-Helix perspective enables "territories to follow non-traditional innovation paths, such as those related to non-technological improvements, service creation and creativity exploitation" (European Committee of the Regions et al., 2016, p.14) and secure "better conditions to commercialize R&D efforts" (Foray et al., 2012, p.37).

RIS Based on Triple-Helix Model

Regarding the system to implement the policy, Cooke et al. (2006) propose the importance of building and promoting a RIS, which is the institutional infrastructure supporting innovation within the production structure of a region (Ashheim & Coenen, 2005), for strengthening territorial competence bases. First, for considering an innovation-based learning economy, Asheim and Coenen (2005) explain that RIS's underlying idea is an interactive learning process. Here, it is indicated that territorial agglomeration gives the best context because knowledge is sticky and grounded in social interaction (with interactive learning processes) at a localized level. Second, concerning the relationship with clusters, Asheim and Coenen (2005) explain that clusters are sector-specific, and RIS is a more generic sector orientation in a policy context. Since both concepts are closely related, clusters and RIS can and often co-exist in the same territory. Third, Cooke and Leydesdorff (2006) explain paradigm of RIS sees regions with a systems perspective, which is generated by the "recombination of the economic dynamics of the market, the dynamics of knowledge-based innovation, and governance" (p.8). They also see that "the trajectory of a region can be the subject of evolution" (p.5). Finally, Cooke et al. (2006) sum up the element for creating RIS as follows:

1. Understanding initial conditions: On this point, Asheim and Coenen (2005) indicate that regional innovation policy should not be formulated based on the best practice of successful regions or expert manuals. Therefore, the regionalization of innovation policy is necessary. They propose that "more

accurate consideration can be paid to the region's specific context and circumstances in terms of the industrial structure, institutional set-up and knowledge base" (p.1187).

2. Increasing the territorial competence bases of the region: These are about the competence bases in terms of human resources and knowledge infrastructure, such as universities and public R&D institutions. Cooke et al. (2006) also stress to strengthen the "absorptive capacity" for acquiring external knowledge and for diffusing knowledge, which are dependent on the level of knowledge of the firms (Giuliani & Bell, 2005). Related to this argument, based on the findings by Tödtling and Trippl (2005), Asheim and Coenen (2005) propose the necessity "to combine both local and non-local skills and competence in order to go beyond the limits of the region" (p.1179).
3. Developing, attracting, and retaining talented and creative people: This is to strengthen intangible assets, which are more important than physical resources today, and to promote innovation and technological development. Therefore, institutional supports are necessary to be open to creativity of all sorts to attract different knowledge bases and address the issue of people's climate. Florida (2002) also stresses that, to attract creative people and accelerate economic growth, not only the business climate but also the people's climate play a vital role in attracting a creative class that initiates the creation of new ideas, technology, and content.
4. Promoting a "learning to innovate framework" for SMEs and providing scarce resources: These are required under the trend of increasing externalization of knowledge exploration. Moreover, Feldman et al. (2005) explain the importance of providing the opportunity to support entrepreneurship activity. Here, they point out that the policy question is "how to translate latent entrepreneurship (individuals who desire to become entrepreneurs but who do not act) into active entrepreneurs" (p.132) and propose to show technological and market opportunities and incentives in order to induce and entrepreneurial response from individuals.
5. Building social capital for increased cooperation and interaction: This aims to promote collaboration, which is essential for RIS. Related to this argument, Cooke and Leydesdorff (2006) indicate that networking becomes systematic from the regional perspective. Moreover, they stress effective communication between parties. In order to promote the interaction, with reference to Triple-Helix methodology, Kerry and Danson (2016) indicate the importance of the role of intermediaries, which "act as sponsors, brokers and boundary-spanners in the expansion of the domain of activities in the three helixes and by blurring boundaries following interactions between their actors" (p.70), therefore, facilitate to form a network for collaboration. In addition, as the institutions

which facilitate collaboration between the three helixes, Ranga and Etzkowitz (2013) explain the role of multi-sphere (hybrid) institutions, which "operate at the intersection of the university, industry and government institutional spheres and synthesize elements of each sphere in their institutional design" (p.244), in a balanced Triple-Helix regime. Regarding cultural factors, Asheim and Coenen (2005) stress to generate informal institutional contexts, such as norms, trust, and routines, therefore, "regional culture," for accelerating interactive learning among organizations.

Concerning the relationship between RIS and Triple Helix, Kerry and Danson (2016) indicate that RIS often involves organizations from differing backgrounds working together to enhance innovation efforts. The Triple-Helix model is the prominent theory that depicts the interaction. They also indicate that both the Triple-Helix stream and RIS stream are rooted in open innovation thinking which is "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough, 2006, p.1). Considering the essence of this argument, the relationship is also applicable to the relationship between RIS and Quadruple-Helix.

BUILDING RIS FOR PLATFORM POLICY

In order to promote competitive regional industries, the arguments above suggest that each region is required to seek its own solution with consideration of initial conditions and interfacing of various directions. Here the public sector is expected to play a dynamic role and firms to behave more innovatively. A platform policy should be deployed by building RIS based on the Triple (Quadruple)-Helix model. In this section, first, the actors who compose RIS and their role in building and operating RIS are clarified. Then, the process for building RIS is considered.

Actors of RIS and Their Role

First, Cooke et al. (2006) propose the components to build RIS and show the importance of promoting public-private partnerships. They explain that RIS has two subsystems of actors systematically engaged in interactive learning. These subsystems are: "(1) The regional production structure or knowledge exploitation subsystem which consists mainly of firms, often displaying clustering tendencies, and (2) The regional supportive infrastructure or knowledge generation subsystem which consists of public and private research laboratories, universities and colleges, technology transfer agencies, vocational training organisations, etc." (Cooke et al., 2006, p.65, 79).

Second, Feldman et al. (2005) examine the role of private-sector entrepreneurship and how innovative clusters take hold and transform regional economies. They explain that entrepreneurs play as economic-change agents in the genesis process of industrial clusters, which is path-dependent and idiosyncratic. Here, entrepreneurs shape local environments and build institutions through adaptive, self-organizing behavior as well as shaped by the environment.

Role of the Government

Concerning the role played by the government in building RIS, first, Kerry and Danson (2016) stress the importance of public policies, which aims to ensure the full deployment of RIS development factors. Fiore et al. (2011, p.1401) list the following factors that are essential for emerging and sustaining the competitive RIS:

- The presence of high-tech industries, potentially oriented towards international markets
- Relationships between firms and the university system
- A specialized labor market and labor force with readily available, highly skilled human capital
- Local traditions of cooperation and entrepreneurial approaches
- Supporting agencies and organizations (Asheim & Isaksen, 2002)
- The presence of social capital: shared norms, values, and trust, which facilitate relationships and mutual understanding and learning (Landry et al., 2002; Lorenzen, 1998)
- Financial capacity

Second, Charles et al., eds. (2004, p.13) show that three key roles are attributed to regional governments:

- Setting regional priorities for research on the basis of small units of excellence not necessarily recognized at the national scale.
- Negotiating with central actors to shape central policies for the benefits of their regions.
- Building linkages from all elements of the regional science system into innovation, commercialization, and technology transfer.

Finally, the concept of the catalytic approach is introduced by Koschatzky and Kroll (2009). They propose that "the role of a (regional) government should be confined to the setting of a favorable legal and institutional environment, and should stimulate but not govern processes" (p.49). They also point out that a high degree of experimentalism in policymaking is required "due to different approaches and the non-linearity of policy input and the intended output" (p.50).

Management Approach on How to Build and Operate RIS

Based on the arguments, it is clarified that in building and operating RIS, the business environment is created by involving actors, which include the two subsystems above and are feed-backed by the environment for further development. These cycles occur as a self-organization process. In contrast, public policies by the government are implemented to create a regional environment for facilitating these cycles. These should be implemented as "more platform and system-oriented as well as more pro-active innovation based regional policy" (Cooke et al., 2006, p.69). Therefore, the process is promoted through interaction between top-down public and bottom-up creative forces. The former provides a policy to facilitate the latter's self-organization process.

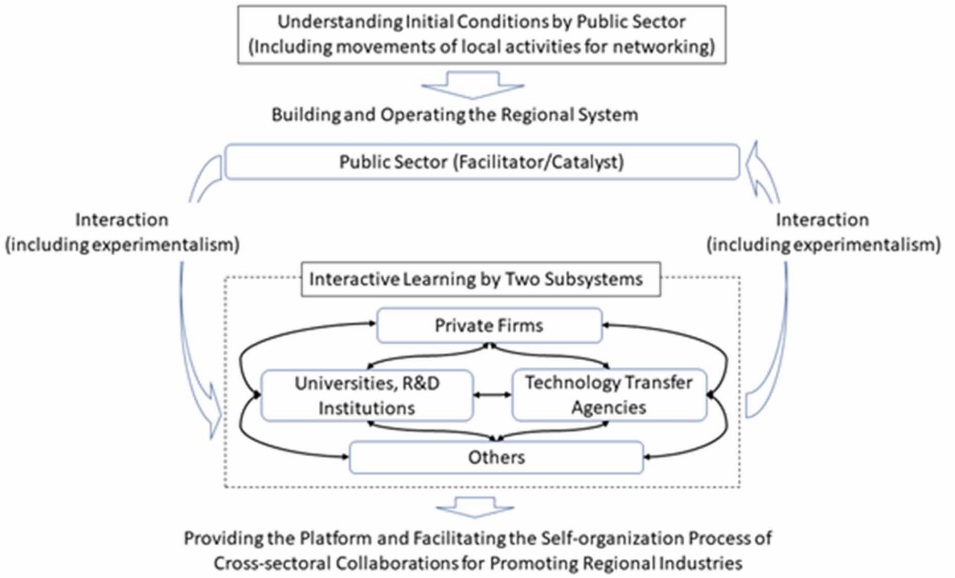
Several arguments support this view. First, a "regionally networked innovation system" characterized by planned involvement of public-private cooperation by policy intervention is proposed by Asheim and Coenen (2005) as the ideal type of RIS. The system allows firms and organizations to deploy localized interactive learning, and the region's institutional infrastructure supports them. The infrastructure comprises regionally based R&D institutes, vocational training organizations, and other local organizations involved in the innovation process of firms. They also explain that the cluster is market-driven, and firms gain access to wider pools of analytical and synthetic knowledge and avoid technological and cognitive "lock-ins."

Moreover, Stewart and Ayres (2001) also give a supportable and useful view that proposes that public policies should be viewed as interventions into self-organizing social systems. Here, the aim of a policy intervention should not be to reach a pre-determined goal but to enable the capacity of the target system to enhance its self-steering capacity. Morcol (2014) explains that self-organizational, emergent, and co-evolutionary processes of complex governance networks arise under the increase of complex and dynamic social problems. In this situation, no governmental or private actor can solve it by itself, and governance networks become multi-centered. As a solution, he proposes that a variety of autonomous individuals and organizations are involved in policymaking. However, at the same time, they need to be directed, controlled, and coordinated.

DISCUSSION AND CONCLUSION: THE CONCEPTUAL MODEL

In this chapter, to examine a management approach to build and operate a regional system to promote competitive regional industries through cross-sectoral collaboration, first, "Why are regions focused?" is considered, and literature about the goals and the drivers for competitive regional industries are reviewed. Then, based on the concept of "constructed advantage," approaches and key dimensions of CRA are discussed. Moreover, "platform policy" is considered and argued that it aims to build a "regional innovation system (RIS)" based on the "Triple (Quadruple) - Helix model" by promoting cross-sectoral collaboration. Finally, actors and their roles are clarified, then policy elements are examined to more concretely consider the platform policy for promoting competitive regional industries.

Figure 1. Conceptual model: Management approach to build and operate a regional system for promoting competitive regional industries through cross-sectoral collaborations
Source: Kawabata (2019).



Based on the literature review, the research theme to examine "management approaches to build and operate a regional system for facilitating self-organization process of cross-sectoral collaborations which aim to promote competitive regional industries" can be described as a conceptual model (Figure 1). First, initial

conditions, which include the movement of local actions toward networking for industrial promotion, should be understood by policymakers of the public sector. Then, in addition to the decision-making about which sector (industry) to promote, policymakers also have to approach and involve the local stakeholders through interaction in order to seek their own solution and to implement a "Platform Policy" through building RIS based on Triple (Quadruple)-Helix model. The goal of the regional system is to create the structure (or the environment) where the former provides a policy to facilitate the latter's self-organization process toward cross-sectoral collaborations. Moreover, the regional system is built and operated through interaction between top-down public forces, composed of the public sector, and bottom-up creative forces, two subsystems composed of firms and R&D institutions, etc. The building process also includes experimentalism for evolution.

REFERENCES

Ache, P. (2002). North-Rhine Westphalia. In P. Raines (Ed.), *Cluster development and policy* (pp. 71–89). Routledge.

Arnkil, R., Järvensivu, A., Koski, P., & Piirainen, T. (2010). *Exploring quadruple helix: Outlining user-oriented innovation models, final report on quadruple helix research for the CLIQ project.* Työraportteja 85/2010 Working Papers, University of Tampere, Institute for Social Research, Work Research Centre.

Asheim, B. T., Boschma, R., & Cooke, P. (2011). Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases. *Regional Studies*, *45*(7), 893–904. doi:10.1080/00343404.2010.543126

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Research Policy*, *34*(8), 1173–1190. doi:10.1016/j.respol.2005.03.013

Asheim, B. T., & Isaksen, A. (2002). Regional innovation systems: The integration of local "sticky" and global "ubiquitous" knowledge. *The Journal of Technology Transfer*, *27*(1), 77–86. doi:10.1023/A:1013100704794

Borseková, K., Petríková, K., & Vaňová, K. (2012). The methodology of use and building competitive advantage on the regional level. *Journal of Security and Sustainability Issues*, *2*(1), 41–50. doi:10.9770/jssi/2012.2.1(4)

Brioschi, M. S., Cassio, L., & Colombelli, A. (2005). *Common frameworks for regional competitiveness: Insight from a number of local knowledge economics* [Paper presentation]. ERSA 2005 45th Congress of the European Regional Science Association, Amsterdam, Netherlands.

Camagni, R. (2002). On the concept of territorial competitiveness: Sound or misleading? *Urban Studies (Edinburgh, Scotland)*, *39*(13), 2395–2411. doi:10.1080/0042098022000027022

Carayannis, E. G., & Campbell, D. F. J. (2012). *Mode 3 knowledge production in quadruple helix innovation systems: Twenty-first-century democracy, innovation, and entrepreneurship for development*. Springer-Verlag. doi:10.1007/978-1-4614-2062-0

Cellini, R., & Soci, A. (2002). Pop competitiveness. *BNL Quarterly Review*, *55*(220), 71–101.

Charles, D., Perry, B., & Benneworth, P. (Eds.). (2004). *Towards a multi-level science policy: Regional science policy in a European context*. Regional Studies Association.

Chesborough, H. (2003). *Open Innovation*. Harvard Business School Press.

Chesbrough, H. (2006). Open innovation: A new paradigm for understanding industrial innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), Open innovation: Researching a new paradigm (pp. 1-14). Oxford University Press.

Cooke, P. (1992). Regional innovation systems: Competitive regulation in the new Europe. *Geoforum*, *23*(3), 365–382. doi:10.1016/0016-7185(92)90048-9

Cooke, P. (2002). Regional innovation systems: General findings and some new evidence from biotechnology clusters. *The Journal of Technology Transfer*, *27*(1), 133–145. doi:10.1023/A:1013160923450

Cooke, P., Asheim, B., Annerstedt, J., Blazek, J., Boschma, R., Brzica, D., Lindholm Dahlstrand, Å., Del Castillo Hermosa, J., Laredo, P., Moula, M., & Piccaluga, A. (2006). *Constructing regional advantage: Principles, perspectives, policies*. European Commission.

Cooke, P., & Leydesdorff, L. (2006). Regional development in the knowledge-based economy: The construction of advantage. *The Journal of Technology Transfer*, *31*(1), 5–15. doi:10.100710961-005-5009-3

Etzkowitz, H., & Leydesdorff, L. (1997). *Universities and the global knowledge economy: A triple helix of university-industry-government relations*. Pinter.

European Commission. (1995). *Green paper on innovation.* European Commission. https://op.europa.eu/en/publication-detail/-/publication/ad1d6f21-0b2e-423f-9301-c608035e906f

European Commission. Directorate-General for Regional and Urban Policy. (1999). *Sixth periodic report on the social and economic situation and development of the regions of the European Union*. Office for Official Publications of the European Communities. https://op.europa.eu/en/publication-detail/-/publication/b47f2f5b-5538-4475-acac-9f0c56da62c0

European Committee of the Regions, Volpe, M., Friedl, J., Cavallini, S., & Soldi, R. (2016). *Using the quadruple helix approach to accelerate the transfer of research and innovation results to regional growth*. Committee of the Regions. https://op.europa.eu/en/publication-detail/-/publication/6e54c161-36a9-11e6-a825-01aa75ed71a1

Feldman, M. P., Francis, J., & Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, *39*(1), 129–141. doi:10.1080/0034340052000320888

Fiore, A., Grisorio, M. J., & Prota, F. (2011). Regional innovation systems: Which role for public policies and innovation agencies? Some insights from the experience of an Italian region. *European Planning Studies*, *19*(8), 1399–1422. doi:10.1080/09654313.2011.586173

Florida, R. (2002). *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. Basic Books.

Foray, D., Goddard, J., Goenaga Beldarrain, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., & Ortega-Argilés, R. (2012). *Guide to research and innovation strategies for smart specialisation (RIS 3).* European Commission, Smart Specialisation Platform. https://s3platform.jrc.ec.europa.eu/en/w/guide-on-research-and-innovation-strategies-for-smart-specialisation-ris3-guide-

Giuliani, E., & Bell, M. (2005). The micro-determinants of meso-level learning and innovation: Evidence from a Chilean wine cluster. *Research Policy*, *34*(1), 47–68. doi:10.1016/j.respol.2004.10.008

Ivanova, I. (2014). Quadruple helix systems and symmetry: A step towards helix innovation system classification. *Journal of the Knowledge Economy*, *5*(2), 357–369. doi:10.100713132-014-0201-z

Kawabata, Y. (2019). Building and operating a system to promote regional competitive industries through cross-sectoral collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *9*(1), 42–63.

Kerry, C., & Danson, M. (2016). Open innovation, Triple helix and regional innovation systems: Exploring CATAPULT centres in the U.K. *Industry and Higher Education*, *30*(1), 67–78. doi:10.5367/ihe.2016.0292

Kitson, M., Martin, R., & Tyler, P. (2004). Regional competitiveness: An elusive yet key concept? *Regional Studies*, *38*(9), 991–999. doi:10.1080/0034340042000320816

Koschatzky, K., & Kroll, H. (2009). Multi-level governance in regional innovation systems. *EKONOMIAZ. Revista vasca de Economía, Gobierno Vasco / Eusko Jaurlaritza / Basque Government, 70*(1), 132-149.

Landry, R., Amara, N., & Lamari, M. (2002). Does social capital determine innovation? To what extent? *Technological Forecasting and Social Change*, *69*(7), 681–701. doi:10.1016/S0040-1625(01)00170-6

Lorenzen, M. (Ed.). (1998). *Specialization and localized learning: Six studies on the European furniture industry*. Copenhagen Business School Press.

Maskell, P. (1998). Successful low-tech industries in high-cost environments: The case of the Danish furniture industry. *European Urban and Regional Studies*, *5*(2), 99–118. doi:10.1177/096977649800500201

Morçöl, G. (2014). Complex governance networks: An assessment of the advances and prospects. *Complexity Governance & Networks*, *1*(1), 5–16. doi:10.7564/14-CGN5

Pessoa, A. (2008). *Tourism and regional competitiveness: The case of the Portuguese Douro Valley.* FEP Working Papers 299, Universidade do Porto, Faculdade de Economia do Porto.

Pessoa, A. (2013). Competitiveness, clusters, and policy at the regional level: Rhetoric vs. practice in designing policy for depressed regions. *Regional Science Inquiry Journal*, *5*(1), 101–116.

Pinch, S., Henry, N., Jenkins, M., & Tallman, S. (2003). From "industrial districts" to "knowledge clusters": A model of knowledge dissemination and competition in industrial agglomerations. *Journal of Economic Geography*, *3*(4), 73–88. doi:10.1093/jeg/lbg019

Porter, M. (1990). *The competitive advantage of nations*. Macmillan. doi:10.1007/978-1-349-11336-1

Porter, M. (1998). Clusters and the new economics of competitiveness. *Harvard Business Review*, *76*(6), 77–90. PMID:10187248

Ranga, M., & Etzkowitz, H. (2013). Triple Helix systems: An analytical framework for innovation policy and practice in the knowledge society. *Industry and Higher Education*, *27*(4), 237–262. doi:10.5367/ihe.2013.0165

Stewart, J., & Ayres, R. (2001). Systems theory and policy practice: An exploration. *Policy Sciences*, *34*(1), 79–94. doi:10.1023/A:1010334804878

Tödtling, F., Trippl, M., & Brathl, H. (2005). Networking and project organisation in the Styrian automotive industry. In A. Lagendijk & P. Oinas (Eds.), *Proximity, distance and diversity: Issues on economic interaction and local development* (pp. 89–107). Ashgate.

Viassone, M. (2008). Regional Competitive Index as a tool to improve regional foresight: Theory and evidence from two Western-Europe Regions. In *Proceedings of the 8th Global Conference on Business & Economics*. Association for Business & Economics Research (ABER).

Yawson, R. M. (2009). *The ecological system of innovation: A new architectural framework for a functional evidence-based platform for science and innovation policy* [Paper presentation]. The Future of Innovation Proceedings of XX ISPIM 2009 Conference, Vienna, Austria.

ENDNOTE

* Section 2 is modified and expanded the following article: Kawabata, Y. (2019). Building and operating a system to promote regional competitive industries through cross-sectoral collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering, 9* (1), 42-63.

Chapter 5
The Case of the Three States in Germany

ABSTRACT

This chapter scrutinizes the cases on the management approaches to build and operate a regional system toward promoting competitive regional industries through cross-sectoral collaborations. The regions subject to this case study are the following three states in Germany: (1) North Rhine-Westphalia (NRW), (2) Bavaria, and (3) Baden-Württemberg (BW). Regional systems have been built and operated in all states with trial and error. Today, cluster policies are implemented toward strengthening innovation capability and promoting regional industries through facilitating cross-sectoral collaborations. The medical technology industry is one of the targets to promote. Based on the arguments in Chapter 4, the main focus of this chapter is to examine how the systems that support the self-organization process toward cross-sectoral collaborations were built and operated through the involvement of regional stakeholders.

INTRODUCTION

Aiming to realize the resurgence of the economy, which had stagnated since the 1990s, the state governments initiated the policy for industrial promotion. They pursued their location-based competition as introduced in Chapter 2 of Section 1. From the mid-1990s, they paid attention to the success of Silicon Valley and the argument by Michel Porter, etc., then launched the policy to develop industrial clusters in their regions. Although they studied and referred to the successful experience, they pursued their own approach and built the regional system to support accelerating innovation and new business through cross-sectoral collaborations.

DOI: 10.4018/978-1-6684-8494-4.ch005

The case study of this chapter focuses on the experiences of how the regional systems were built and operated in the three states in Germany: North Rhine-Westphalia (hereafter "NRW"), Bavaria, and Baden-Wuerttemberg (hereafter "BW") by focusing on the effort to promote medical technology industry in their region. The state governments of these regions have been working on building and operating regional systems to promote regional industries through cross-sectoral collaborations.

In the following, the background and process of building the state-wide regional system of the three states are examined. Then, focusing on the medical technology field, more specifically, how the system is built through interaction between industry-academia-government and how the system is operated through the interaction between the state government and the cluster organizations are explored.

OVERVIEW: ECONOMIC AND INDUSTRY BACKGROUND

As discussed in Chapter 2 of Section 1, one of the goals of the policies to overcome the stagnation was strengthening innovation capability and increasing the competitiveness of industry by promoting cross-sectoral collaborations called "cluster program." Toward the introduction of the program, studies about excellent precedents, such as Silicon Valley, and surveys about the economy/industry of their region were conducted by the state governments. Considering the result of the study/survey and the approach to the program, they concluded that the program should not imitate the precedents but pursue their own solution to build and operate the regional system by targeting prospective industries. The medical technology industry, which increased its market size (36 billion Euros in 2021, a 2.5% annual increase on average from 2014 to 2020) and continues to display a high export ratio (66.5% in 2021), was one of them (SPECTARIS, 2021, 2022).

The following are economic and industry backgrounds before each state started a full-fledged cluster program. The details are described based on the SWOT framework in Tables 1, 2, and 3.

North Rhine-Westphalia (NRW)

Regarding strength, NRW had many firms (including SMEs), R&D institutions, and universities, which were essential for innovation through cross-sectoral collaborations. Although all states, subjects of the case study, had weaknesses caused by the problem concerning the traditional sectors, NRW faced the most apparent problem by the decline of leading industries (mining, metal, and steel) accompanied by severe job loss (600,000 from 1964 to 1992) (Ache, 2002). Moreover, like the other two states, NRW had opportunities with large populations, huge markets inside/outside the state, and threats from outside.

Table 1. Economic and industry background (NRW)

Strength	• Heavy industry: Mechanical, chemical, metal. • Many research institutions: Universities, Fraunhofer, etc. • Thousands of excellent SMEs (many hidden champions).
Weakness	• Old linkage in mining and steel sector and lack of absorptive capacity as barriers to innovation. • Decline of core (metal and steel) industries and job loss.
Opportunity	• Largest population (approximately 18 million), GDP (20% in Germany), and large market in the surrounding areas. • Economic integration in E.U., globalization (locational advantage).
Threat	• Downturn of metal and steel industry (core industry), but the region still highly specialized in it after 2000. • Competition with the U.S., other E.U., and Japan. • Competitive pressure from emerging countries (including East Europe; low cost & qualified labor).

Source: Drawn up by the author with reference to Ache (2002), Data Commons (n.d.-a), Hilbert et al. (2004), and Kawabata (2019).

Bavaria

The state of Bavaria also had the strength of having many firms (including SMEs), R&D institutions, and universities. These play an essential role in innovation through cross-sectoral collaborations today. Although Bavaria had strong traditional manufacturing sectors, it was required to promote new and competitive industries to overcome high production costs. The state also had opportunities with large populations, huge markets inside/outside the state, and threats from outside.

Table 2. Economic and industry background (Bavaria)

Strength	• Manufacturing (machinery, electrical engineering, automobile, medical instrument, etc.). • Research institutions: Universities, Fraunhofer, etc. • Many large companies and suppliers (SMEs: Hidden champions).
Weakness	• High production cost (job losses by outsourcing in conventional industries). • Lack of raw materials (no heavy industry).
Opportunity	• Large population (second in Germany: Approximately 12.5 million), a large market in surrounding areas. • Economic integration in E.U., globalization (locational advantage).
Threat	• Competition with the U.S., other E.U., and Japan. • Competitive pressure from emerging countries (including East Europe; low cost & qualified labor).

Source: Drawn up by the author with reference to Data Commons (n.d.-b), Kawabata (2019), and Plesnila-Frank and Vogler-Ludwig (2003).

Baden-Wuerttemberg (BW)

The state of BW had strength in many firms (including SMEs) in high-tech engineering and other fields and R&D institutions and universities. However, BW also had to promote new and competitive industries to overcome high production costs. Like the other two states, the state had opportunities with large populations and huge markets inside/outside the state; however, it faced a threat from outside.

Table 3. Economic and industry background (BW)

Strength	• Manufacturing, high-tech engineering, light industries. • SMEs: Especially middle-sized (for innovation and export). • Highest amount for R&D, 30.2% of German patent applications. • Educational and research infrastructure: Universities, Fraunhofer, etc.
Weakness	• Lack of raw materials (no heavy industry). • Traditional cross-industry linkage and inertia of established production structures, unequally distributed R&D (to core industries). • Weak in new areas (e.g., ICT, Bio).
Opportunity	• Large population (third in Germany: Approximately 10.7 million), a large market in surrounding areas. • Economic integration in E.U., globalization, high export ratio.
Threat	• Competition with the U.S., other E.U., and Japan. • Competitive pressure from emerging countries (including East Europe; low cost & qualified labor).

Source: Drawn up by the author with reference to Data Commons (n.d.-c), Heidenreich and Krauss (2004), and Kawabata (2019), and Plesnila-Frank and Vogler-Ludwig (2003).

MOVEMENT TOWARD BUILDING THE REGIONAL SYSTEM

The motivation to work on constructing regional advantage of the three states was to cope with declining conventional industries and develop new areas of industries. All the states recognized the concept of industrial cluster in the 1990s and pursued their own solution toward building the present regional system. They promoted the effort by reflecting on the experience of the precedent programs (e.g., Objective 2 programme in NRW) or introducing measures gradually. These processes were accompanied by a survey, the interaction between regional stakeholders from industries, universities, local governments, etc., and experimentalism which allowed them to pursue their own solutions.

The followings are the details on the movement toward building the regional system of each state before introducing a full-fledged cluster program. These are described by focusing on the situation, goal, key concepts, and policies (Tables 4, 5, 6).

NRW

Facing the decline of conventional industries, which caused mass unemployment, measures were implemented to overcome the situation. In 2000, Objective 2 programme was introduced to restructure the economy and create new industries. However, the initiatives were criticized because they were insufficient in interrelating the state and local initiatives, network formation, and structuring activities (Ache, 2002). The lesson of the results is reflected in the cluster program launched in 2007.

Table 4. Movements toward building a regional system (NRW)

Situation	• Decline of major industries (coal mining and steel), political awareness, and made industrial policy a top priority.
Goal	• Changing economic structure, creating new/competitive industries, compensating for the loss of employment, and renewing the firm base.
Key Concepts	• Field of competence, innovation core (technology and labor market policies), public-private partnership.
Policy	(From 2000 to 2006) • Objective 2 programme: Programs for increasing regional competitiveness by focusing on the concept of "competence economy." • Criticism/reflection: Not enough to interrelate/complement between the state and local initiatives, uncoordinated between project targeting and network formation, not enough in the evaluation and its reflection, too many activities, and not structuralized as a whole.

Source: Drawn up by the author with reference to Ache (2002), Hilbert et al. (2004), and Kawabata (2019).

Bavaria

The state government of Bavaria focused on and considered the development of industrial clusters for the sophistication of economic/industrial structure in the 1990s. With the participation of business and science, the state government established Bayern Innovativ to promote industries under the policy of Future Bavaria Initiative. Moreover, it conducted a survey to grasp the existence of industrial networks in the region and supported them.

BW

With the recognition that the industrial structure in BW fell behind in its sophistication, the state government initiated industrial promotion by supporting the bottom-up movements of industrial networks and establishing the supporting institution. Moreover, the state government surveyed to grasp the growth potential of the region that was utilized for implementing the full-fledged cluster program and the building of the regional system in the next phase.

Table 5. Movements toward building a regional system (Bavaria)

Situation	• Recognition of the necessity to promote new competitive industries. • Focusing on the industrial cluster by the state government in the 1990s.
Goal	• Modernizing economic structure, attracting firms, higher-order production activities, and creating new jobs.
Key Concepts	• Strengthening the local strength and self-initiative, supporting networking.
Policy	(From 1995 to 2006) • Started financial support to the industrial network. • 1994: "Offensive Zukunft Bayern (Future Bavaria Initiative)." • 1995: Foundation of Bayern Innovativ GmbH (limited company): Founded jointly by politics, business, and science (A unit responsible for Bayern Innovativ was established in the state government. Budget: Financed by the state government, project fund from E.U., service fee, etc.). • Survey and grasp industrial networks in the state, promotion, and provide financial support for industrial networks (with Trial and Error).

Source: Drawn up by the author with reference to Kawabata (2019).

Table 6. Movements toward building a regional system (BW)

Situation	• Economic downturn in the 1990s and recognition of failing to stake out a more significant share in new areas of industries.
Goal	• Diversification and systematic development of a new range of products and services.
Key Concepts	• Bottom-up, promoting innovation, development of entrepreneurship, and cooperation between scientific research centers and the private sector.
Policy	(From the 1990s to 2006) • Bottom-up movements for establishing industrial networks in sub-regional areas. • 1990: Society for International Economic Cooperation BW (founded by the BW state government). • 2000: "Strategies for the Baden-Württemberg Research Policy": A 100-page report of the state government about analysis of strengths and weaknesses of the research sector in BW and identification of the most critical areas of action for the state.

Source: Drawn up by the author with reference to Heidenreich and Krauss (2004), Kawabata (2019), and Plesnila-Frank and Vogler-Ludwig (2003).

ESTABLISHED REGIONAL SYSTEM

As is introduced above, the three states employed their way to launch and build the regional systems for implementing their cluster programs. The goal of the regional system was to increase innovation capability and promote competitive industries through cross-sectoral collaborations. The following describes the process of policymaking and goal (Tables 7, 8, 9) and the structure of the established regional system of each state when the full-fledged cluster programs were launched (Figures 1, 2, 3).

NRW

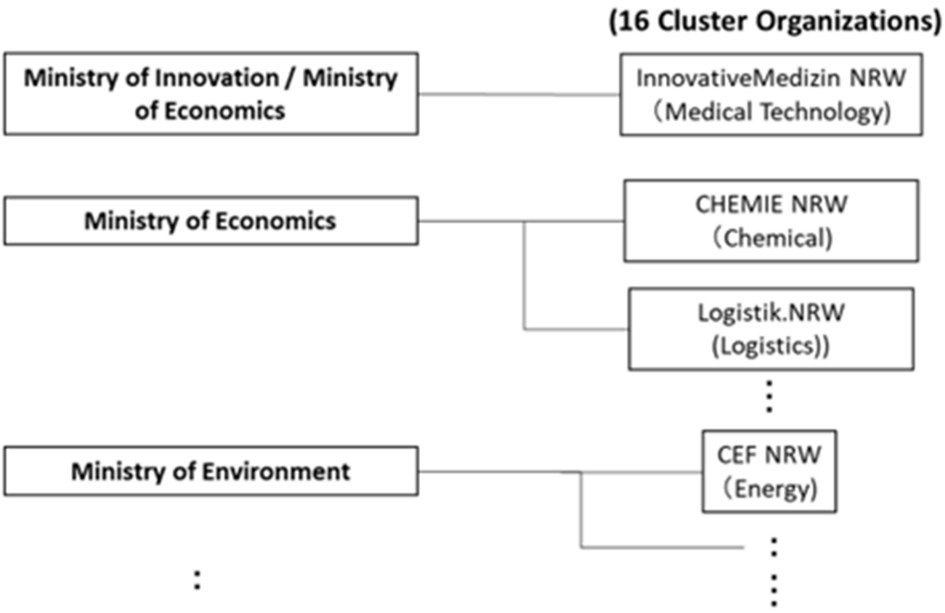
The regional system in NRW was launched by the agreement of several ministries in 2007. With the vision of "strengthening the strength," the system aimed to increase innovation capability and competitiveness by providing the ideal environment and promoting cross-sectoral collaborations.

Table 7. Process of policy making toward the regional system and its goal (NRW)

Process of Policy Making	• Basic principle for cluster policy was approved in a Cabinet meeting in March 2007 (through dialog between the several Ministries and Cabinet).
Goal	• Supporting leading market (Leitmarkt) with high potential. • Strengthening the strength, enhancing competitiveness, innovation, sustainability, and promotion of SMEs. • Creating an ideal environment for innovation, building a competence center capable of adapting to demand by the global economy/society. • Generating innovation and sustainable development through NRW-wide networking & collaboration between firms, research institutions, universities, and the public sector.

Source: Drawn up by the author with reference to Kawabata (2019) and Mieki (2016).

Figure 1. Regional system in NRW
Source: Drawn up by the author with reference to Kawabata (2019) and Mieki (2016).



Regarding the structure of the regional system, 8 leading markets and 16 clusters (less than that at the starting period in 2007) were designated to promote. Here, similar to the structure of the regional system in Bavaria, a relatively small number of cluster organizations were targeted to support compared to those of BW. The five ministries (including the Cabinet) supervised some clusters among the 16, and the ministry's officials were responsible for each cluster. A cluster manager (e.g., managing director), a veteran in the field, manages each cluster organization. In addition, professional staff were employed to facilitate and manage collaborative projects. The cluster organizations receive financial support from the state government for the operating cost of the organizations. In addition, they can access the competitive fund for R&D projects from the state government, the federal government, and E.U.

Bavaria

With the vision to build an ecosystem with dynamic networks for accelerating the innovation process, the present regional system in Bavaria was established in 2006 after the survey of the regional industries and industrial networks in the region. The performances of the designated clusters are reviewed and evaluated at the end of each stage of the cluster program to determine the continuity of support in the next stage. In Bavaria, the state government supervises the cluster program, and Bayern Innovativ GmbH supports cluster organizations.

Table 8. Process of policy making toward the regional system and its goal (Bavaria)

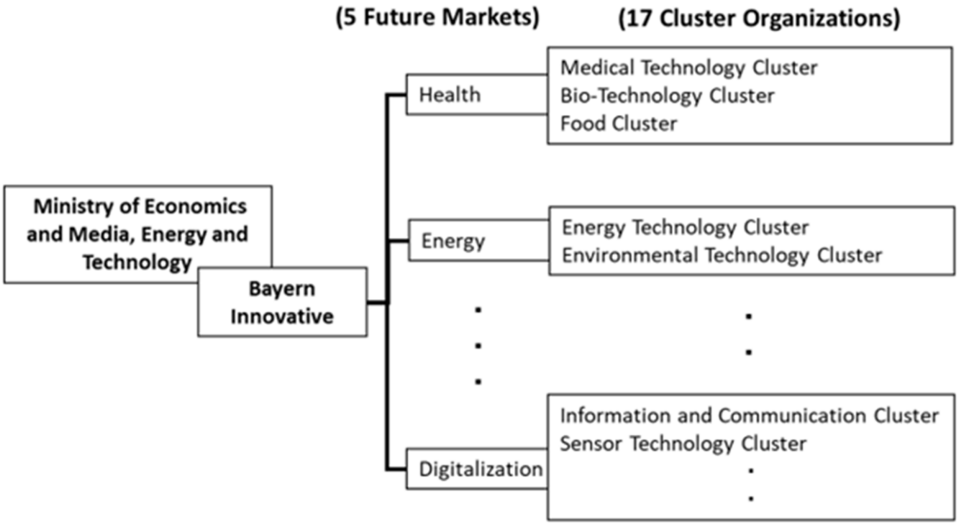
Process of policymaking	• Study about Silicon Valley. Survey on the economic, industry, and industrial distribution and network. (–2006): Identifying the target industries/cluster and establishing its model. Defining "A cluster is a network of companies and research institutions in a particular field managed by a cluster organization." • Launched "Cluster Offensive Bayern (Cluster Initiative Bavaria)" in 2006: 1st stage (2006–2011), 2nd stage (2012–2015), 3rd stage (2016–2019), 4th stage (2020–2023).
Goal	• Building an ecosystem with dynamic networks for accelerating the innovation process. • Identifying development opportunities close to the market and gaining cooperation partners for innovations across all technologies and sectors (with knowledge/technology transfer). • Utilizing local strength, building network, supporting R&D of SMEs (not interfering with activities of each cluster organization).

Source: Drawn up by the author with reference to Kawabata (2019) and Tayama (2016).

As for the structure, 5 future markets (health, energy, materials, mobility, and digitization) and 17 clusters were targeted, and the specialized unit in the state government for each cluster was launched to supervise. Similar to the structure of the regional system in NRW, a relatively small number of cluster organizations

were targeted to support compared to those of BW. On each cluster organization, the state government selected the cluster spokesman who plays the role of chairperson emeritus. The board members, who regularly review the strategy, the scope of business, and the progress, are elected from business persons and scientists. The managing director of the cluster organization, who heads the organization, is selected by the cluster spokesman, and the managing director recruits the staff. The cluster organizations receive financial support from the state government for the operating cost of the organizations. Moreover, they can access the competitive fund for R&D projects from the state government, the federal government, and E.U.

Figure 2. Regional system in Bavaria
Source: Drawn up by the author with reference to Bavarian Ministry of Economic Affairs, Regional Development and Energy (2019), Kawabata (2019), and Tayama (2016). The Ministry's name is that of today (May 2023).



BW

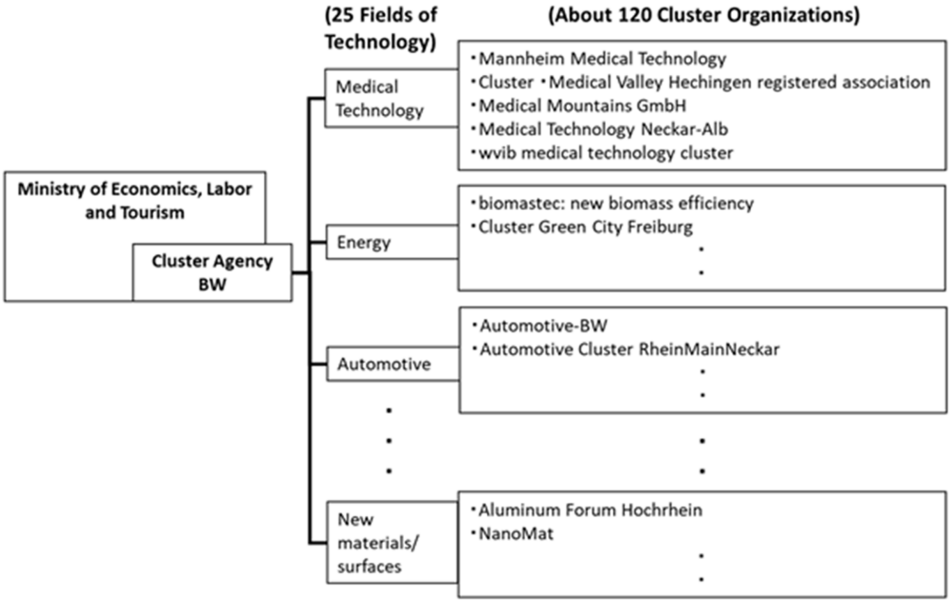
In BW, after launching a cluster program, the structure of the regional system was built step by step. The state government supervises the structure, and Cluster Agency BW provides the service for strengthening the management capability of cluster organizations. The notable point is that supporting strengthening the management capability of cluster organizations is strongly stressed in BW. This is due to the fact that the average scale of cluster organizations in BW is smaller (therefore, the smaller number of staff) than those of other regions.

Table 9. Process of policy making toward the regional system and its goal (BW)

Process of policymaking	• Understand Clusters (2006–): Cluster Dialogue (2006). • Identify Clusters (2008–): Start of cluster funding (2008), Regional Cluster Atlas (2008), Cluster Data Base (2010), Cluster Portal BW (2013). • Cluster Excellence (2011–): The accreditation program for cluster organization by the BW state government, called Quality Label BW (2012). • Develop Clusters (2013–): Establishment of Cluster Agency BW (2014).
Goal	• Targeting professionalization of cluster/network management, increasing innovation and competitiveness. • Bottom-up & needs-based services: Policies are developed with cluster stakeholders from different regions (Cluster Dialogue, etc.). • Promoting cooperative projects, internationalization, SMEs, training for cluster management (e.g., strategic development, demand analysis, service for members), qualification offers, etc.

Source: Drawn up by the author with reference to Atmanagara and Deckers (2017), Kawabata (2019), and Ministry of Economic Affairs, Labor and Housing, Baden-Württemberg (2016).

Figure 3. Regional system in BW
Source: Drawn up by the author with reference to Clusterportal Baden-Württemberg (n.d.-a) and Kawabata (2019). The Ministry's name is that of today (May 2023).



Regarding the regional system in BW, 25 fields of technology were identified to be promoted. Moreover, the notable difference from the cases of NRW and Bavaria is that a large number of (approximately 120) cluster organizations were listed and received support services from Cluster Agency BW. This is the result of reflecting

the dispersed structure of the distribution of industries in the state (Therefore, the scale of cluster organization is smaller as above). Here, the bottom-up movements of clusters in sub-regional areas were identified by the BW state government and listed in the Cluster Portal BW.

The state government appoints the top manager of Cluster Agency BW, and the staff is dispatched from partner organizations (VDI/VDE Innovation + Technik GmbH, the Steinbeis-Beratungszentrum GmbH, BW International GmbH). The state government and the European Regional Development Fund co-financed the agency. There is no financial support from the state government for the operating cost of cluster organizations. However, they can access the competitive fund for R&D projects from the state government, the federal government, and E.U.

MOVEMENTS IN THE MEDICAL TECHNOLOGY FIELD

In the following, more specifically, the movements in the medical technology field in the three states are examined by focusing on (1) the industrial background, (2) the features of the cluster organizations, and (3) the process of building the cluster organizations and direction by the state government to operate.

Industrial Background

The followings are the industrial background of medical technology around the period when the full-fledged cluster program on the industry was launched in each state. The details are described based on the SWOT framework in Tables 10, 11, and 12.

NRW

The state of NRW had many medical-related institutions, research institutions, and SMEs, which were essential for promoting innovations through cross-sectoral collaborations in the medical technology field. However, NRW faced the problem of a lack of coordination between different sectors, which prevented innovations through collaborations. Moreover, unlike the other two states, NRW did not have traditional strength and did not have notable large companies in the field. In contrast, regarding the opportunities, the industry was growing, and they had a large market inside and outside the region. In addition, there were many potential entrants (supplier firms). Finally, the industry faced competition from outside and regulatory reform.

Table 10. Industrial background in medical technology (NRW)

Strength	• Many medical/health institutions (hospitals, rehabilitation facilities, etc., 20% in Germany). • Research institutions, patents and R&D projects in medical technology. • Many SMEs in medical technology (many "hidden champions"). • High export ratio.
Weakness	• Lack of coordination between sectors (e.g., research and industry, industry and hospitals). • Not having traditional strength (compared to BW and Bavaria). • Few large companies (therefore fewer spin-offs) compared to Bavaria and BW.
Opportunity	• Large internal/external growth market (largest in healthcare spending, number of medical institutes, high export ratio). • High growth in export. • Supplier industries (as potential entrants) for metal/plastic processing.
Threat	• Competition from overseas. • Regulatory reform (certification process) that increases the hurdle to enter into the market.

Source: Drawn up by the author with reference to Kawabata (2019).

Bavaria

The state also had many medical-related institutions, research institutions, and large companies and SMEs with strength in medical technology. However, it faced problems of lack of coordination between different sectors. The high growth of a huge market inside/outside of the state and the existence of potential entrants were opportunities to expand the industry. It also faced the threat of competition from outside and regulatory reform.

Table 11. Industrial background in medical technology (Bavaria)

Strength	• Centre for medical technology. • Large companies (Siemens Healthcare, G.E. Healthcare, etc.). • Many SMEs in medical technology (many "hidden champions"). • Medical-related universities (supply of engineers). • High export ratio.
Weakness	• Lack of coordination between sectors (e.g., research and industry, industry and hospitals).
Opportunity	• Large internal/external growth market (high export ratio), number of medical-related institutions. • Supplier industries (as potential entrants).
Threat	• Competition from overseas. • Regulatory reform (certification process) that increases the hurdle to enter into the market.

Source: Drawn up by the author with reference to Invest in Bavaria & Bavarian Ministry of Economic Affairs and Media, Energy, and Technology (2020), Kawabata (2019), and Plesnila-Frank and Vogler-Ludwig (2003).

BW

There were also many medical-related institutions, research institutions, and SMEs with strength in medical technology in BW. However, the state faced problems of lack of coordination between different sectors. Moreover, regarding the opportunities, in addition to the high growth huge market inside/outside of the state and the existence of potential entrants, it had popular ICT companies that are advantageous for developing future products in medical technology. Finally, it also had the threat of competition from outside and regulatory reform. In addition, it was also recognized as a threat that they faced severe competition in their products of traditional strength.

Table 12. Industrial background in medical technology (BW)

Strength	• Centre for medical technology: Surgical instruments, etc. • Many SMEs (many middle-sized companies as global players). • Research institutions and universities, and related programs. • High export ratio.
Weakness	• Lack of coordination between sectors (e.g., research and industry, industry and hospitals).
Opportunity	• Large internal/external growth market (high export ratio), number of medical-related institutions. • Supplier industries (as potential entrants). • Potentiality to collaborate with large ICT companies in BW (such as SAP).
Threat	• Competition from overseas. • Regulatory reform (certification process) that increases the hurdle to enter into the market. • Competition from worldwide cheaper production sites in traditional BW medical devices (such as surgical instruments).

Source: Drawn up by the author with reference to BIOPRO (2016), Kawabata (2019), and Plesnila-Frank and Vogler-Ludwig (2003).

Features of the Medical Technology Cluster

Each state built its own structure for promoting the medical technology industry. Although there are some differences in detail, the cluster organizations commonly provide supporting services to the members, such as networking and matching opportunities for collaborations, assisting the application for competitive funds, consulting for projects, and training opportunities.

Following the outline of the established cluster organization of each state in the text, the details are described by focusing on service and structure in Tables 13, 14, and 15.

NRW

In NRW, InnovativeMedizin NRW, which covered state, national, and international activities, was established in 2011 as an additional field (i.e., medical technology) of the cluster initiatives under the regional system already built in 2007. With the support of the state government, InnovativeMedizin NRW was founded by the three local cluster organizations of the medical technology field in the state, which focus on their region (e.g., Koln and Bonn in the state). It receives financial support for the operating cost and follows the mandate from the state government for its scope of activities.

Table 13. Features of medical technology clusters (NRW)

Overview of Cluster Organization	• InnovativeMedizin NRW: Founded in 2011, with more than 300 members (members of the three local cluster organizations which founded InnovativeMedizin NRW).
Service	• Creating network between industry, government, academia, and users (e.g., medical institutions). • Promoting innovations. • Supporting young companies and research associations for transferring innovations to the market. • Offering a wide range of events for transferring knowledge and exchanging expertise.
Structure	• Founded by local cluster organizations for promoting medical technology (Health Region Cologne/Bonn, MedEcon Ruhr, and MedLife) as an association (GBR). The three organizations are employers and decide employment of InnovativeMedizin NRW. • Scope of activities is mandated by the state government. • Budget: The fund from the state government for operating costs. • Number of staff: 5 (full-time equivalent) and 3 (part-time).

Source: Drawn up by the author with reference to Kawabata (2019).

Bavaria

In 2006, Cluster Medizintechnik was launched as a project organization of the cluster program. The organization is operated by Forum MedTech Pharma e. V. and The Medical Valley EMN e.V. The former focuses on state, national, and international level activities, and the latter focuses on local activities, and the two cooperate. In addition, Bayern Innovativ GmbH supports the clusters' activities (e.g., providing facilities, coordinating cross-cluster cooperation, etc.). The cluster organizations receive financial support from the state government for the operating cost.

Table 14. Features of medical technology clusters (Bavaria)

Overview of Cluster Organization	• Cluster Medizintechnik: Founded in 2006, operated by Forum MedTech Pharma e.V. (492 members in March 2023) and The Medical Valley EMN e.V. (more than 250 members).
Service	• Strengthening the trans-disciplinary networking. • Networking with the Bavarian cluster landscape. • Promoting start-ups. • Use of cross-cluster and cross-industry innovation potential. • Advice on funding programs.
Structure	• Operated by Forum MedTech Pharma and Medical Valley. • The two organizations are independent but closely cooperate (The former focuses on state/federal/international activities, the latter focuses on local activities. cooperation for holding conferences, trade fairs, etc.). • Management and facility support by Bayern Innovativ. • Budget: The fund from the state government for operating costs. • Number of staff: 8 (full time) in Forum MedTech Pharma (2022) and 22 in Medical Valley (2023).

Source: Drawn up by the author with reference to Cluster Medizintechnik (n.d.), Forum MedTech Pharma e.V. (n.d.), Kawabata (2019), and The Medical Valley EMN e.V. (n.d.).

BW

In BW, five cluster organizations, which operate in different areas in the state, are listed in the Cluster Portal BW as medical technology clusters. However, they are relatively smaller scale compared to NRW and Bavaria and do not receive financial support from the government for operating costs.

Table 15. Features of medical technology clusters (BW)

Overview of Cluster Organization	• Medical Technology Clusters: Five clusters are enrolled (as of 2023) in Cluster Portal BW in medical technology, entitled to apply for the public fund and Quality Label (explained below). • Mannheim Medical Technology Cluster (Member: 100, founded in 2011). • Medical Valley Hechingen registered association (Member: 40, founded in 2009). • Medical Mountains GmbH (Member: 260, founded in 2011). • Medical Technology Neckar-Alb (Member: 70, founded in 2009). • wvib medical technology cluster (Member: 60, founded in 2009).
Service	• (e.g.) Mannheim Medical Technology Cluster: Networking through events, specialist seminars, trade fair appearances, etc. / Individual consulting for Mannheim companies / Joint projects in research and development/Construction of innovation infrastructure and settlement of companies / Start-up support.
Structure	• The five clusters are listed and operate in different areas in BW. • No financial support by the state government for operating costs. • Number of staff: 0.3–7 (full-time equivalent).

Source: Drawn up by the author with reference to Clusterportal Baden-Württemberg (n.d.-b), Kawabata (2019).

The Process of Building and the Direction by the State Government to Operate the Regional System

The paths of building a structure to support the medical technology field varied between the three states. However, it is commonly observed that the state governments (or the affiliated organizations for supporting cluster organizations) supported the bottom-up movement of industry-academia (some cases include local authority) to build the networks in the foundation phase or in the phase to structure as cluster organizations of the states. In contrast, concerning the operation of the regional system, the measures to direct the cluster organizations by the state governments are different between the three states. Tables 16, 17, and 18 describe the details of the process of building and the direction.

NRW

Before being structured as an organization for state-wide activities, local cluster organizations, which aimed to promote cross-sectoral collaborations in the medical technology field, were built by industry, universities, city government, etc., in several different areas in the state. Then the organizations of three areas interacted and agreed to build a state-wide structure, and the state government agreed to support it.

The direction of the activities and the field to focus on are discussed by the committee in the state government, then InnovativeMedizin NRW formulates projects within the scope of the field. Moreover, the two continually communicate every two weeks and draft a protocol for the next step. Then, the protocol is shared with the three local cluster organizations.

Bavaria

The bottom-up movement of industry-academia to establish an association in the medical technology field was supported by Bayern Innovativ in the late 1990s. In this trend, Form MedTech Pharma and Medical Valley were founded as cluster organizations in this field. Then, in 2006 when the state's cluster program was launched, Cluster Medizintechnik was structured as a project organization for state-wide activities in the medical technology field. The organization has been operated by the cooperation between Forum MedTech Pharma and Medical Valley.

Concerning the direction, the state government conducts annual monitoring based on each cluster's performance. Moreover, an evaluation of the performance of the cluster organization is conducted at the end of each stage by inviting the third party, and the continuity of the support by the state government is determined. Close communication between the state government, Bayern Innovativ, and each cluster organization are maintained in the daily operation.

Table 16. Process of building and direction by the state government (NRW)

The process of building the structure to promote the medical technology field	• Bottom-up movements to establish associations (later, local cluster organizations) to promote the medical technology field in several local areas. (Example 1) Health Region Cologne/Bonn: Founded in 2009 with a bottom-up initiative of clinics, hospitals, medical technology companies, etc., aiming to establish a platform for area-wide interaction for collaborative business. (Example 2) MedEcon Ruhr: Several informal associations for business creation in medical technology were integrated in 2007 by the city governments with the participation of business associations, universities, and hospitals. • Through interaction at places such as trade fairs, staff of the local cluster organizations knew each other and agreed to build a state-wide network (around 2010). Then, three local associations requested the state government for support. • Survey the situation and potentiality of the medical technology industry in NRW by the state government (–2011). • Contract between the state government and the three local cluster organizations for promoting the state-wide promotion of medical technology (2011). • Foundation of InnovativeMedizin NRW by the three local cluster organizations with the support for budget from the state government in 2011.
Direction by the state government	• The direction by the committee in the state government and the fields of innovation to focus on (e.g., digitalization) are determined. Then, collaborative projects are formed/implemented within the scope. • Keeping the regular exchange between the state government and InnovativeMedizin NRW every two weeks. Then, the mandated protocol is shared between InnovativeMedizin NRW and the local associations.

Source: Drawn up by the author with reference to Kawabata (2019).

Table 17. Process of building and direction by the state government (Bavaria)

The process of building the structure to promote the medical technology field	• Financial and founding support to industrial networks by the state government. • Medical technology was already recognized as an essential field before 1998, and the state government conducted a survey. • The state government concluded to support more for technological transfer/innovation and determined to establish a cluster organization. • In 1998, Forum MedTech Pharma was founded with the support of Bayern Innovativ (with the participation of 55 members: Companies, universities, hospitals, insurance companies, etc., who had already been networked through the meetings/events held by Bayern Innovativ). • In 2003, facing the cutbacks by Siemens, the city government, universities, and local companies established a center (former body of Medical Valley) to promote start-ups. • In 2006, the cluster program called Cluster Offensive Bayern (Cluster Initiative Bavaria) was launched. Cluster Medizin Technik was established in the same year. • Medical Valley was reorganized as a cluster organization (an association) in 2007 with funding support from the state government.
Direction by the state government	• The state government does not interfere with the activities of the cluster organizations (With the idea to entrust the experts of cluster organizations who are close to the industry and stay in contact with companies). However, it keeps close communication with the managing director of the cluster organization (by phone, email, and meetings twice a year). • Annual monitoring: To evaluate the progress and consider/share the next step with reference to networking activities, general services, acquisition of funds, number and scale of an R&D project, etc. • Total evaluation at the end of each stage by external experts and submit the result to the parliament to consider continuity of the support.

Source: Drawn up by the author with reference to Kawabata (2019).

BW

Among the five cluster organizations listed in Cluster Portal BW (See Table 15), some had already started their activities as industrial networks before 2006, when the state's cluster program was launched. These cluster organizations were established or reorganized as associations or as limited companies in the different areas of the state through the cooperation between industry, academia, and local government. Then, they are recognized by the state government and listed in Cluster Portal BW as clusters of the state.

Concerning the direction, an accreditation program called "Quality Label" is implemented by the state government. For the certificated cluster organizations, it is beneficial in terms of gaining popularity, collecting members, expanding their activities, etc. Moreover, the list of cluster organizations in Cluster Portal BW is re-examined every two years (wherein being enrolled in the portal is the requirement to apply for competitive funds by the state government and for Quality Label). In addition, cluster organizations have opportunities to voice and share their directions with the state government in Cluster Dialogue, etc.

Table 18. Process of building and direction by the state government (BW)

The process of building the structure to promote the medical technology field	• Industrial networks were established to promote medical technology in several areas in the state (e.g., the establishment of "the competence network Medical Valley Hechingen" in 2003). • The five cluster organizations were established/reorganized as associations or as limited companies with the initiative of local industry, university, local government, etc. (2009–2011). • These organizations were recognized by the state government through investigation of industrial network or approach of cluster organizations to Cluster Agency BW for requesting supporting service, then listed in Cluster Portal BW as clusters of the state.
Direction by the state government	• Quality Label is implemented by the state government (Ministry of Economics, Labor and Tourism*) for systematic development and quality improvement of cluster initiatives, providing incentives for satisfying quality standards, reviewing activities and management services, and playing as an effective tool for acquiring new cluster partners (valid for two years, assessed by 34 quality indicators in the categories of structures, processes, activities, and strategies). • Re-examination of the list of Cluster Portal BW by the state government every two years (implemented based on the performance of each cluster). • Interaction and information sharing beyond the field of industries (including requests from cluster organizations to the state government and sharing direction between the two) through Cluster Dialogue, Cluster Manager Meeting, and Cluster Forum.

Source: Drawn up by the author with reference to Clusterportal Baden-Württemberg (n.d.-c), Kawabata (2019). * The Ministry's name is that of today (May 2023).

REFERENCES

Ache, P. (2002). North-Rhine Westphalia. In P. Raines (Ed.), *Cluster development and policy* (pp. 71–89). Routledge.

Atmanagara, J., & Deckers, E. (2017). *New ways for cooperation with German Southwest: The Baden-Württemberg cluster and networks*. In Australian – German Networking Research Symposium, Stuttgart, Germany.

Bavarian Ministry of Economic Affairs, Regional Development and Energy. (2019). *Cluster initiative Bavaria: In the network to success.* Bavarian Ministry of Economic Affairs, Regional Development and Energy. https://www.cluster-bayern.de/fileadmin/user_upload/stmwi/Publikationen/2019/2019-01-30_Cluster-Initiative_Bavaria_2018.pdf

BIOPRO. (2016). *Medical technology 2016 facts and figures for Baden-Württemberg*. https://www.gesundheitsindustrie-bw.de/application/files/8814/7859/1864/Biopro-Flyer-Medtech-EN-2016.pdf

Cluster Medizintechnik. (n.d.). https://www.cluster-medizintechnik.de/de/home.aspx

Clusterportal Baden-Württemberg. (n.d.-a). *Cluster data.* https://www.clusterportal-bw.de/clusterdaten/

Clusterportal Baden-Württemberg. (n.d.-b). *Medical technology.* https://www.clusterportal-bw.de/clusterdaten/technologiefelder/technologiefelder-detailseite/medizintechnik/clusterdb/Innovationsfeld/show/

Clusterportal Baden-Württemberg. (n.d.-c). *Quality indicators.* https://www.clusterportal-bw.de/cluster-exzellenz/qualitaetsindikatoren/

Data Commons. (n.d.-a). *North Rhine-Westphalia.* https://datacommons.org/place/nuts/DEA

Data Commons. (n.d.-b). *Bavaria.* https://datacommons.org/place/nuts/DE2

Data Commons. (n.d.-c). *Baden-Württemberg.* https://datacommons.org/place/nuts/DE1

Forum MedTech Pharma e. V. (n.d.). https://medtech-pharma.de/

Heidenreich, M., & Krauss, G. (2004). The Baden-Württemberg production and innovation regime: Past successes and new challenges. In P. Cooke, M. Heidenreich, & H. J. Braczyk (Eds.), *Regional Innovation Systems: The role of governance in a globalized world* (2nd ed., pp. 186–213). Routledge.

Hilbert, J., Nordhause-Janz, J., Rehfeld, D., & Heinze, R. G. (2004). Industrial clusters and the governance of change: Lessons from North Rhine-Westphalia. In P. Cooke, M. Heidenreich, & H. J. Braczyk (Eds.), *Regional innovation systems: The role of governance in a globalized world* (2nd ed., pp. 234–258). Routledge.

Invest in Bavaria & Bavarian Ministry of Economic Affairs and Media. Energy and Technology. (2020). *Life sciences in Bavaria.* Munich: Invest in Bavaria & Bavarian Ministry of Economic Affairs and Media, Energy and Technology. https://cms.invest-in-bavaria.com/fileadmin/media/documents/Flyer_broshures/Life_Sciences_in_Bavaria_2020.pdf

Kawabata, Y. (2019). Building and operating a system to promote regional competitive industries through cross-sectoral collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *9*(1), 42–63.

Mieki, H. (2016) Doitsu NRW shu no kurasuta seisaku (Cluster policy in NRW, Germany). In Institute for International Trade and Investment (Ed.), *Chiikikeizai no hatten ni koken suru Doitsu no kurasuta* [German industrial cluster which contributes to the development of regional economy] (pp. 48-62). Institute for International Trade and Investment. https://www.iti.or.jp/report_24.pdf

Ministry of Economic Affairs. Labor and Housing, Baden-Württemberg. (2016). *Regional cluster atlas Baden-Württemberg 2016: Overview of cluster-related networks and initiatives*. Ministry of Economic Affairs, Labor and Housing, Baden-Württemberg. https://www.clusterportal-bw.de/fileadmin/_migrated/news_uploads/Clusteratlas_2016_englisch.pdf

Plesnila-Frank, C., & Vogler-Ludwig, K. (2003). *Medical technologies benchmarking report for Germany*. ECONOMIX Research & Consulting. https://economix.org/a55ets/publications/Medical%20Technologies%20-%20Benchmarking%20Report.pdf

SPECTARIS. (2021). *Industry profile: Medical technology*. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Steckbrief_Medical_Technology_2021.pdf

SPECTARIS. (2022). *Die Deutsche medizintechnik-industrie: SPECTARIS jahrbuch 2022/2023 (The German medical technology industry: SPECTARIS yearbook 2022/2023)*. SPECTARIS. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Zahlen-Fakten-Publikationen/SPECTARIS_Jahrbuch_2022-2023_01-2023_Lesezeichen_3.pdf

Tayama, R. (2016) Baierun shu no kurasuta seisaku [Cluster policy in Bavaria]. In Institute for International Trade and Investment (Ed.), *Chiikikeizai no hatten ni koken suru Doitsu no kurasuta* [German industrial cluster which contributes to the development of regional economy] (pp. 34-47). Institute for International Trade and Investment. https://www.iti.or.jp/report_24.pdf

The Medical Valley EMN e. V. (n.d.). https://www.medical-valley-emn.de/en/

Chapter 6
Discussion and Conclusion

ABSTRACT

The purpose of Section 2 is to consider management approaches to build and operate a regional system for facilitating the self-organization process of cross-sectoral collaborations to promote competitive regional industries. The review of the theoretical study in Chapter 4 derives the conceptual model. The case study in Chapter 5 examines the cases of building and operating a regional system toward promoting competitive regional industries in the three states in Germany. In this chapter, based on the conceptual model, the result of the case study is comparatively analyzed and clarifies the similarities and differences between the cases. Then, focusing on each case with a process tracing approach, events observed in understanding the initial condition and building/operating the regional system are chronologically clarified, and the causal mechanism is examined. Finally, the validity of the conceptual model is considered based on the findings, and implications are discussed.

COMPARATIVE ANALYSIS OF THE THREE CASES

The case study about the three states in Chapter 5 shows the difference in paths to build the regional systems, their structures, and manners of operations between the states.

However, it is commonly found in all cases that the self-organization process for cross-sectoral collaboration is initiated by industry and academia; then, the cluster organization supports the process by providing the platform and services. Moreover, the public sector (i.e., the state government) takes the lead in understanding the initial conditions, builds/strengthens the regional system, then supports and directs cluster organizations.

DOI: 10.4018/978-1-6684-8494-4.ch006

In the following section, by focusing on the similarities and differences, the results of the case study are discussed based on the conceptual model.

Understanding Initial Conditions and Exploring Own Solutions

Similarity Between the Cases

In the 1990s, all the state governments recognized the concept of "cluster." They pursued strengthening innovation capability and increasing the competitiveness of regional industry by facilitating cross-sectoral collaborations. They considered their own approach to implementing the cluster program by conducting a survey and learning from the regional stakeholders. In other words, the process for understanding initial conditions and exploring their own solution was not only played by the government but also by the involvement of regional stakeholders in industry and academia, etc. (the two subsystems).

Difference Between the Cases

Although the commonality was found as above, the process of interaction between the state government and regional stakeholders for understanding the initial conditions differs between the cases. These were promoted by experiencing a precedent program (NRW) or gradually/experimentally implementing policies (Bavaria, BW).

In NRW, reflecting and learning from the precedent experience of Objective 2 programme was the basis for launching the cluster program in 2007. Turning to the movement of medical technology, the survey was conducted by the state government with the participation of the local cluster organizations, then building and operating state-wide structure was considered through the interaction among them.

In contrast, in Bavaria, after the foundation of Bayern Innovativ in 1995, policies were implemented gradually with trial and error and learning through dialog with regional stakeholders (including learning about activities of the industrial networks in the state). Moreover, a study/survey was conducted to consider how their cluster program should be in the state. Then, a full-fledged cluster program was launched in 2006. In BW, the state government surveyed the strength and weakness of the state, and the cluster program was launched in 2006. Considering the state's dispersed structure of industrial distribution, the policy was started by recognizing the activities of local clusters. Measures were gradually introduced through interaction between the state government and regional stakeholders. Then, the present structure was established with the foundation of Cluster Agency BW in 2014.

Building and Strengthening the Regional System (Self-Organization Process for Setting Up Platform)

Similarity Between the Cases

Regarding the similarity, by building the regional systems, all the cases have the common goal of creating an ideal environment to strengthen innovation capability and increase the industry's competitiveness through cross-sectoral collaborations. As described above, these were realized through experiencing precedent programs or gradually introducing and experimentally implementing policies through interaction and learning between the state government and regional stakeholders. Moreover, turning to the movement toward building the system in the medical technology field, it is found that the state governments supported for self-organization process of regional stakeholders to found the cluster organizations, which aimed to provide a platform for promoting cross-sectoral collaborations. In addition, the state governments also support strengthening the management capability of these organizations. Therefore, it is concluded that the regional systems are built (including foundation and strengthening cluster organizations) through interaction between public sectors and regional stakeholders.

Difference Between the Cases

The differences between the cases are observed in the path toward building the regional systems and their structure to support the cluster organizations.

In NRW, the regional system (cluster program) was launched with the agreement of several ministries. In the medical technology field, the local cluster organizations agreed to found a state-wide cluster organization through interaction as above. Then, in response to the request from these local cluster organizations, the state government supported the foundation of the state-wide cluster organization (InnovativeMedizin NRW). Moreover, the state government also supported strengthening their management capability by funding operating costs.

In Bavaria, Bayern Innovativ was founded by the state government with the participation of business and science to promote industries. Then, the present regional system (cluster program) was launched after the survey by the state government. In medical technology, movements of companies, universities, hospitals, insurance companies, etc., were coordinated by Bayern Innovativ, then Forum MedTech Pharma was founded. Medical Valley was also reorganized to be an association (e.V.) with funding support from the state government. The two cluster organizations

also obtained fund and management support from the state government and Bayern Innovativ to strengthen their management capability to operate as a state-wide cluster organization (Cluster Medizintechnik).

In BW, the regional system was gradually structured after launching the cluster program. Similar to the other industrial fields, in medical technology, the cluster organizations were launched through the bottom-up movements of the stakeholder in sub-regional areas under the dispersed structure of industries in the state. Therefore, the structure was not integrated as a state-wide structure. The state government and Cluster Agency BW have been providing the service to strengthen the management capability of the cluster organizations which were listed in the Cluster Portal BW.

Direction by the State Government to Operate the Regional System (Supporting to Facilitate the Self-Organization Process of Cross-sectoral Collaborations)

Similarity Between the Cases

It is commonly observed in all cases that the primary goal of cluster organizations is to facilitate the self-organization process of cross-sectoral collaborations for promoting industries through developing innovative products and services. The state governments in the three states do not directly intervene in the self-organization process but try to direct and enhance their self-steering capacity for achieving regional priorities by influencing cluster organizations.

Difference Between the Cases

The case study on the cluster program implemented for the medical technology field shows that the manner of directing the self-organization process differs between the cases.

In NRW, cluster organizations try to form and support cross-sectoral collaborations in the scope of the field directed by the state government, and progress management between the two is implemented.

In Bavaria, annual monitoring and evaluation between the different stages of the cluster program are implemented based on the performance of cluster organizations. Moreover, business communications between the state government, Bayern Innovativ, and cluster organizations are sustained.

In BW, re-examining the list of cluster organizations in Cluster Portal BW is conducted every two years. In addition, an accreditation program called "Quality Label" is implemented to verify the excellence of management capability of cluster organizations. Moreover, the interaction between the state government and cluster organizations is sustained through "Cluster Dialogue," etc.

ANALYSIS AND INTERPRETATION OF EACH CASE

Focusing on the individual case, this part analyzes and interprets the causal relationship between events to deepen the understanding of how and why the regional system is built and operated. Figures 1, 2, and 3 depict the result of the analysis.

North Rhine-Westphalia (NRW)

Understanding Initial Conditions and Exploring Own Solutions

The state of NRW faced the sharp decline of the conventional leading industries from the 1960s to the 1970s and the threat from outside. In order to overcome the situation and to grasp the growth opportunities of the state, which had a large population, a huge market inside/outside, many firms (including SMEs), and R&D institutions/universities, the state government tried to promote new industries. In this context, in 2000, Objective 2 programme was introduced to restructure the economy and create new industries. However, while the policy had some outcomes and enabled the state government to understand more deeply about the economy, industry, and movements within the region, the parties concerned had reflection because the program lacked to interrelate the state and local initiatives, network formation toward the project targeting, and structured activities with adequate evaluation through the implementation period.

Turning to the movement in the medical technology field, although NRW did not have traditional strengths, it had potential strengths in many medical/health institutions and SMEs and a substantial basis for research. Therefore, the state could develop the industry by utilizing the strengths/opportunities and overcoming weaknesses/threats. Through interacting at a trade fair etc., the local cluster organizations of the medical technology field understood the necessity for state-wide activities. They shared the recognition of the need to build the new structure around 2010. Then, they approached the state government to share their understanding and recognition, which were reinforced by the survey on medical technology in NRW conducted by the state government.

Building and Strengthening the Regional System

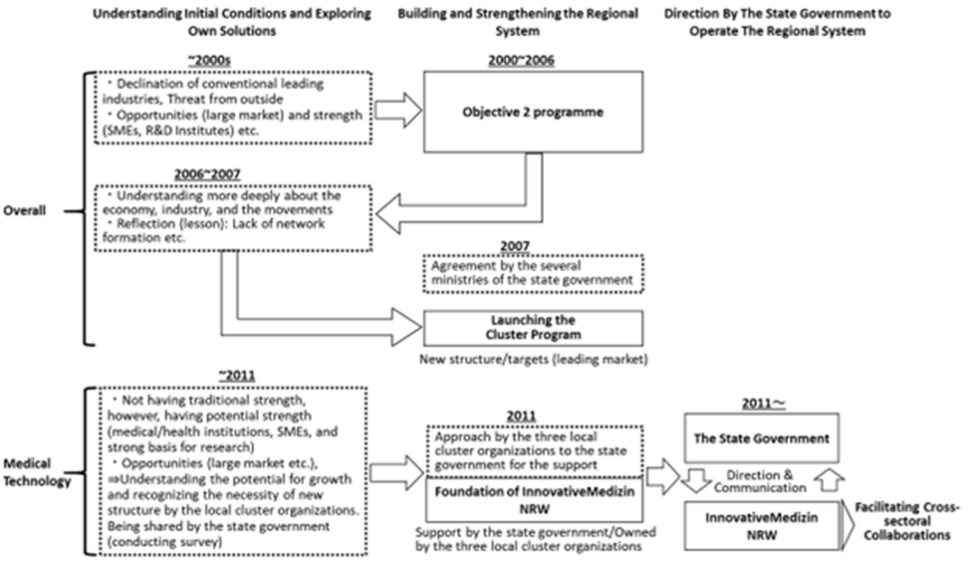
Understanding the initial conditions through the experience of Objective 2 programme and the reflection clarified as lessons enabled the state government to swiftly move toward the next step for building the present regional system. In 2007, with the agreement of several state government ministries, the cluster program and its structure were launched to increase innovation capability and competitiveness in the leading market by providing the ideal environment and facilitating cross-sectoral collaborations with the vision of "strengthening the strength."

In the medical technology field, with the shared understandings and recognition above, the three local cluster organizations requested support from the state government for launching the cluster organization, which deploys the state-wide activities within the framework of the cluster program of NRW. Then, in 2011, InnovativeMedizin NRW was founded to expand the field of activities and strengthen the structure of cluster initiatives of the state.

Direction by the State Government to Operate the Regional System

The operation of the regional system has been implemented through the interaction between the state government and the cluster organization.

Figure 1. Understanding the initial condition, building, and operating the regional system (NRW)
Source: Drawn up by the author.



In medical technology, the industry and academia interact, learn, and promote cross-sectoral collaborations self-organizationally. In contrast, the field of innovation to focus on is reviewed and directed by the state government's committee. The progress is shared and monitored through the periodical meeting between the cluster organization (InnovativeMedizin NRW) and the state government (also, the protocol determined after the meeting is shared with the local cluster organizations, which are the owner of InnovativeMedizin NRW). The direction is realized through the service and the facilitation of cross-sectoral collaboration, which InnovativeMedizin NRW implements.

Bavaria

Understanding Initial Conditions and Exploring Own Solutions

To promote new competitive industries which can overcome the high production cost and the threat from outside, Bavaria aimed to grasp the opportunities utilizing its large population, huge market inside/outside, and many firms (including SMEs) and R&D institutions/universities. In this context, from the 1990s, the state government focused on promoting industrial clusters and conducted surveys to grasp the activities of industrial networks in the region. Moreover, the precedents (e.g., Silicon Valley) were studied. Then, it was recognized that the own definition of cluster and solution was required to pursue an industrial promotion in the region.

In the medical technology field, Bavaria had strength in many medical/health institutions, large companies, SMEs, and research institutions. However, it had a weakness of lack of coordination between these sectors. Therefore, by utilizing the strengths/opportunities and overcoming weaknesses/threats, the state could acquire further opportunities from the demand of large internal/external markets and their supply potential. The stakeholders from industry and academia were summoned and provided a platform to interact by Bayern Innovativ. They discussed continually and shared their understanding of the initial conditions. Then, with the result of the survey by the state government, these stakeholders and the state government reached the recognition that they needed cluster organization to promote the industry.

Building and Strengthening the Regional System

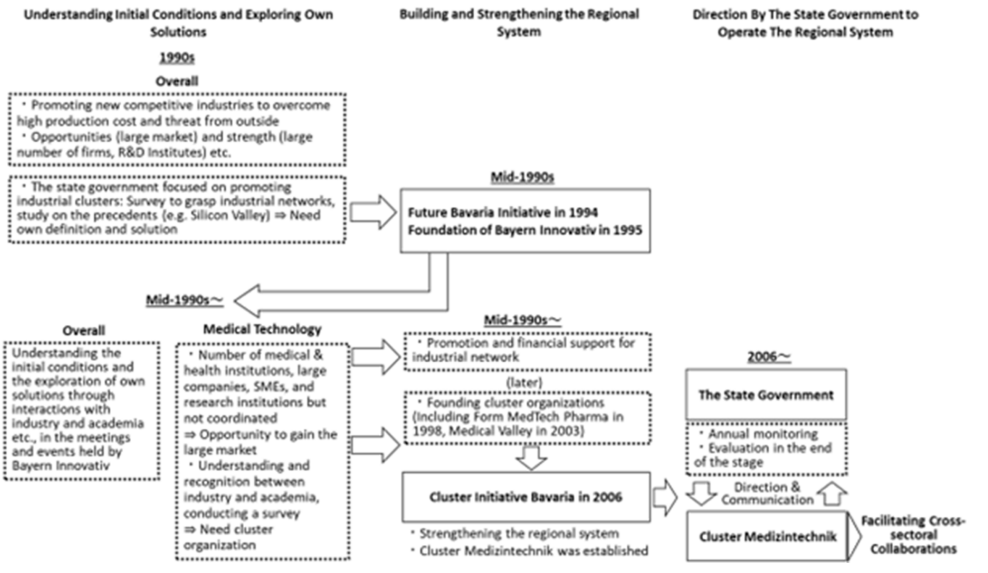
The movements toward building the regional system were launched by the declaration of Future Bavaria Initiative in 1994 and the foundation of Bayern Innovativ in 1995. After that, the exploration of their own solutions and networking were promoted through interactions with industry and academia in the region at the meetings and events held by Bayern Innovativ. Furthermore, since the state government aimed

to increase the local strength and self-initiative toward the sophistication of the economy in the region, it supported the promotion of industrial networks and provided financial support from the mid-1990s. In this context, cluster organizations were founded with the support of the state government and Bayern Innovativ to expand the activities and increase the capability to promote the industry.

One of the cluster organizations founded in this movement was Forum MedTech Pharma. It launched in 1998 with 55 members who had already been networked through the meeting and events held by Bayern Innovativ as above. They shared the understanding, recognition, and goal of promoting medical technology. Moreover, in 2003, through the bottom-up movement by local government, industry, and academia, the former body of Medical Valley was founded (which was reorganized as a cluster organization with support from the state government in 2007).

Cluster Initiative Bavaria was launched in 2006 and strengthened the structure of the regional system to support the promotion of industries. In the medical technology field, with cooperation between Form MedTech Pharma and Medical Valley, Cluster Medizintechnik was established.

Figure 2. Understanding the initial condition, building and operating the regional system (Bavaria)
Source: Drawn up by the author.



Direction by the State Government to Operate the Regional System

The operation of the regional system has been implemented with the policy of not interfering but entrusting to the expert of cluster organizations. Therefore, looking at medical technology, the cluster organization is entrusted to decide where they focus and how they facilitate industry and academia to interact and learn toward the self-organization process of cross-sectoral collaborations. The direction is shared through constant communications between the state government and the cluster organization, and annual monitoring is implemented. Moreover, a total evaluation of the performance of the cluster organization is conducted at the end of the stage of the cluster program, and the continuity of support under the program is determined. The evaluation contributes to keeping the cluster organization active, dynamic, and changing to create business innovations.

Baden-Wuerttemberg (BW)

Understanding Initial Conditions and Exploring Own Solutions

Facing the economic downturn and competition from outside in the 1990s, the state government of BW recognized that the industrial structure in BW fell behind in its sophistication. Therefore, diversification and systematic development of industries were pursued to grasp the opportunities from the huge market inside/outside and utilize its strong industrial base and SMEs, patent, and R&D institutions and universities. As a solution, the state government recognized that it was required to support the bottom-up movements of industrial networks and cross-sectoral collaboration to promote innovation and entrepreneurship. Moreover, through the survey, the strengths/weaknesses of the research sector and the most critical areas of action were clarified by the report in 2000.

In medical technology, BW had traditionally had strength in the industry and had a large number of SMEs, research institutions, universities in this field, and IT companies, which would bring advantages for developing future products. However, it also had a weakness of lack of coordination between these sectors. Moreover, it faced severe competition with overseas' cheaper production sites for its traditional products. Therefore, utilizing the strengths/opportunities and overcoming the weaknesses/threats, the state was required to promote innovation, acquire further opportunities of the demand from large internal/external markets, and facilitate the potential suppliers to enter the industry. With this recognition, the state government worked on identifying and supporting the cluster organizations in the medical technology field, which were established in the bottom-up movements to develop industrial networks in sub-regional areas.

Building and Strengthening the Regional System

The state government led the process of building the regional system in a stepwise manner, wherein the state government provided the platform for industry, academia, and government to discuss/voice and reflect them for structuring the system.

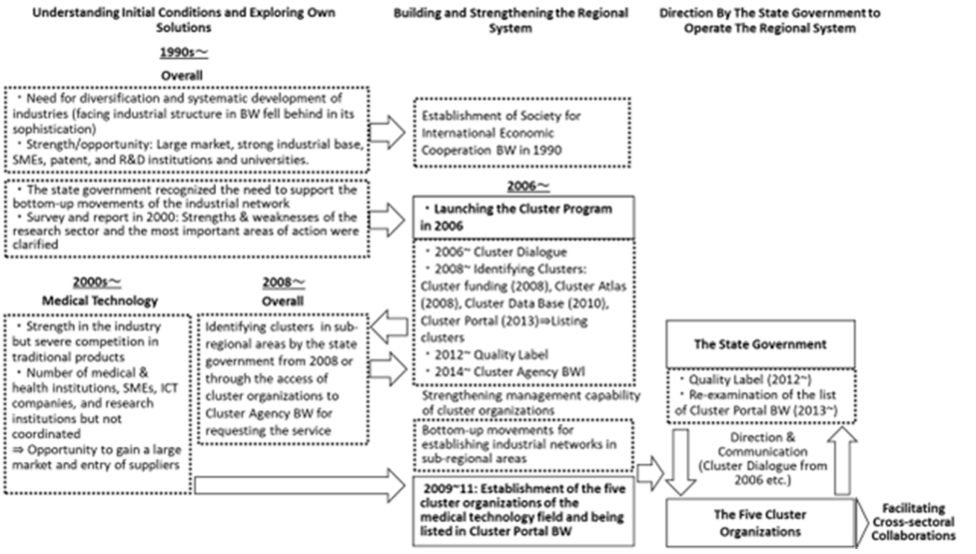
The cluster program was launched in 2006 by setting up "Cluster Dialogue," which provided the platform above. Then, identifying clusters in the region was worked on by providing cluster funding in 2008, making Regional Cluster Atlas in 2008, building Cluster Data Base in 2010, and creating Cluster Portal BW in 2013. In this process, under the dispersed structure of industrial distribution, many cluster organizations established in the bottom-up movements in sub-regional areas were identified and listed in the cluster portal. Since the state government weighs on strengthening the management capability of cluster organizations, the accreditation program (Quality Label BW) was introduced in 2012, and Cluster Agency BW was established to promote the goal in 2014. Then, the present regional system was built entirely.

In the medical technology field, the bottom-up movements to establish industrial networks had started before 2006, when the cluster program in BW was launched. Five of those listed in Cluster Portal BW today were established/reorganized as cluster organizations in the period between 2009 to 2011. These cluster organizations (also those in other fields) have been established/reorganized and listed through the identification process from 2008 above or through their access to Cluster Agency BW for requesting the service.

Direction by the State Government to Operate the Regional System

The operation of the regional system of BW, first, has been implemented through the communication in the Cluster Dialogue, etc., which provides the platform for stakeholders from industry, academia, and the government to discuss and exchange/share the information and the goal that is promoted beyond the field of industries. Moreover, the state government launched Quality Label BW in 2012 and re-examination of cluster organizations listed in Cluster Portal BW every two years since 2013. These enable the state government to facilitate the bottom-up movements of many clusters (compared to the other two cases) in sub-regional areas. They also direct the cluster organizations on how they structure and manage themselves to display better performance toward facilitating cross-sectoral collaborations.

Figure 3. Understanding the initial condition, building and operating the regional system (BW)
Source: Drawn up by the author.



CONCLUSION

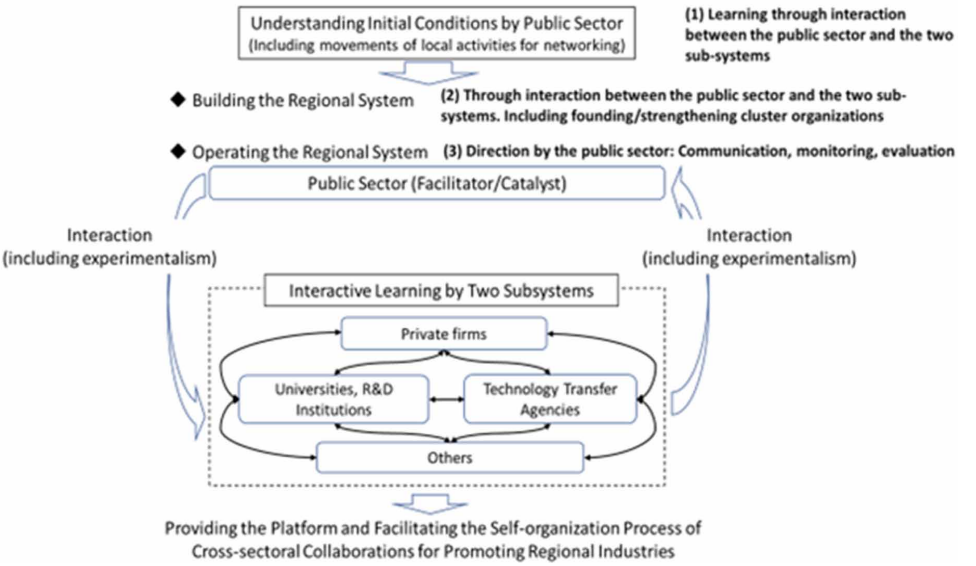
The aim of Section 2 is to consider the management approach to building and operating the regional system for promoting competitive regional industries through cross-sectoral collaborations.

In the literature review in Chapter 4, first, "why regions" is considered. Then, based on the concept of "Constructed Advantage," approaches and key dimensions of "Constructing Regional Advantage (CRA)" are discussed. The view of CRA suggests understanding the initial conditions, then seeking own solutions for a region through public-private partnership and creating institutional and governance capabilities of regions for taking the variation of key elements into account (Cooke et al., 2006). For that goal, "Platform Policy" is introduced, and a "Regional Innovation System (RIS)" based on the "Triple (Quadruple)-Helix model" is proposed to build and operate the regional system. The approach is characterized by "more platform and system oriented as well as more pro-active innovation-based regional policy" (Cooke et al., 2006, p.69), which is implemented by facilitating cross-sectoral collaborations for promoting competitive regional industries. Finally, based on the argument, a management approach to building and operating the regional system is considered, and a conceptual model is proposed. In the model, first, it is shown that there are two subsystems (1) the knowledge generation subsystem, which is

composed of university and R&D institutions, etc., and (2) the knowledge exploiting subsystem, which is composed of firms. Second, the public sector must play as a facilitator or catalyst by directing, facilitating cross-sectoral linkage, and creating a regional environment.

Second, the result of the case study in Chapter 5 shows differences in the path to building the regional systems and their structures between the states. Concerning the similarities, first, all three states focused on the concept of "industrial cluster" for their goal, then understood initial conditions and pursued their own solutions to build and operate the regional system. Second, regarding building the regional system, experimentalism is observed in the interaction between the state government and regional stakeholders, either by experiencing a precedent program or by gradually implementing policies with trial and error. Moreover, the state governments support the self-organization process of industry and academia, etc., to establish and strengthen the structure of cluster organizations that aim to provide the platform for facilitating cross-sectoral collaborations. Third, concerning the operation of the regional system, it is found that the state governments try to direct the self-organization process of cross-sectoral collaborations toward regional priorities by influencing on activities of cluster organizations.

Figure 4. Modified conceptual model (with findings): Management approach to build and operate a regional system for promoting competitive regional industries through cross-sectoral collaborations
Source: Kawabata (2019).



The findings from the case study show a certain validity of the conceptual model. Figure 4 depicts the modified conceptual model by adding the findings from (1) to (3).

Through the case study, a certain result could be achieved by extracting some findings on the management approaches to build and operate a regional system for facilitating the self-organization process of cross-sectoral collaborations to promote competitive regional industries. Moreover, the study also provides practical insights for policymakers, such as officials of the regional government, who consider promoting industries through collaborations.

The literature about CRA, RIS, and Triple (Quadruple)-Helix helps us consider the overall framework for promoting competitive regional industries through cross-sectoral collaborations. Concerning how the result of this study can be developed for further studies, as is shown by Cooke et al. (2006), the key question for realizing the goal is how the collaboration is organized externally and how knowledge creation and innovation-oriented work are organized internally among different parties. This has to be promoted through a more platform, system-oriented, and proactive innovation-based regional policy where the public sector plays a dynamic role. However, Razak and White (2015) introduce criticisms of the Triple-Helix model on its theoretical validity because "no studies have holistically examined the overall barriers and enablers when implementing and attempting to operationalize the Triple Helix model" (p.279). Cooke et al. (2006) also indicate that the perspective "does not give much guidance concerning how a Triple Helix-based collaboration could be functional, operational, and implemented in concrete policy settings" (p.88). To elaborate the arguments and construct theory, the key questions above should be discussed and deepened by exploring further studies concerning cross-sectoral collaborations. This requires examining the studies such as network organization, complexity, self-organization, field, intervention, and change management, which help us to find clues for elaborating theoretical framework by focusing on meso/micro-level mechanisms. These will be explored in Section 3.

REFERENCES

Cooke, P., Asheim, B., Annerstedt, J., Blazek, J., Boschma, R., Brzica, D., Lindholm Dahlstrand, Å., Del Castillo Hermosa, J., Laredo, P., Moula, M., & Piccaluga, A. (2006). *Constructing regional advantage: Principles, perspectives, policies*. European Commission.

Razak, A. A., & White, G. (2015). The Triple Helix model for innovation: A holistic exploration of barriers and enablers. *International Journal of Business Performance and Supply Chain Modelling*, *7*(3), 278–291. doi:10.1504/IJBPSCM.2015.071600

Section 3

Managing the Facilitation of Cross-Sectoral Collaborations: The Intervention in Complex Self-Organization Processes

Chapter 7
Review of Literature and a Conceptual Model

ABSTRACT

Many regions in the world are tackling promoting new and competitive industries through cross-sectoral collaborations to adapt, compete, and survive in dynamic, complex, and interconnected environments. Section 3 explores the research question (R.Q.) 2 introduced in Chapter 1 of Section 1 to elucidate the management approach to facilitate the self-organization process toward the collaborations. The literature review in this chapter first discusses that inter-organizational collaborations, a type of network organization, are formed through a self-organization process characterized by complexity and require intervention. Second, the planned approach to change based on change management theory is examined. Here, the initial conditions, field, and emerging interaction are identified as the key elements to be targeted in management through intervention. Finally, a conceptual model is proposed, and the method of intervention in the key elements is considered.*

INTRODUCTION

Economic and industrial environments are becoming increasingly dynamic, complex, and interconnected. These developments have made it more challenging for industrial districts to adapt and compete. In this context, to promote regional industries, inter-organizational collaborations, which are often cross-sectoral, are getting more attention for promoting innovation and increasing competitiveness. Bryson et al. (2006) define cross-sectoral collaboration as "the linking or sharing of information, resources, activities, and capabilities by organizations in two or more

DOI: 10.4018/978-1-6684-8494-4.ch007

sectors to achieve jointly an outcome that could not be achieved by organizations in one sector separately" (p.44). This implies that cross-sectoral collaboration is characterized by diversity, wherein a number of actors interact in its formation. Here, inter-organizational collaboration is a network organization that displays flexibility and innovativeness through the self-organization process (Baker, 1992; Imada, 2008; Knoke, 2001; Miles & Snow, 1995). However, the process is also characterized by complexity (Fuchs, 2003; Heylighen, 2013; Plowman et al., 2007). Complex systems consist of many autonomous and mutually dependent agents (Heylighen, 2008, 2013). This premise corresponds to the aspect of this study wherein a number of autonomous actors interact in creating cross-sectoral collaborations to promote regional industries. Concerning the facilitation of complex self-organization processes toward certain paths, Imada (2008) introduces the concept of goal-directionality and proposes intentional self-organization that is implemented by means of intervention.

These arguments suggest that the "intervention" in a number of diversified actors is required to facilitate the complex self-organization process toward cross-sectoral collaborations. Considering the implementation of such intervention, it is necessary to clarify the targets of the interventions and find out how to implement the facilitation of the self-organization process of diversified organizations characterized by complexity. Concerning the former argument, several studies have identified such factors called "initial conditions," "antecedent conditions," and "preconditions." These factors positively and negatively affect the process of establishing and promoting collaborations (Bryson et al., 2006; Bryson et al., 2015; Chen, 2008; Gray, 2008; Whetten, 1981).). In addition, a "field" is argued to cause behavioral changes (Cartwright, 1952) and works as a device for facilitating interactions that enable people to attain mutual understanding and self-organization toward a new order (Itami, 1999). "Emerging interaction" is also key to the self-organization process (Monge & Contractor, 2001; Nicotera, 2013; Schachter, 1951; Turner, 1962). Regarding the implementation of interventions, several studies discuss the intervener, the party that facilitates the formation of collaborations (Ring et al., 2005; Thomson & Perry, 2006). The role of the intervener was first proposed by Gray (2008).

However, few studies have previously synthesized these arguments and comprehensively addressed how cross-sectoral collaboration can and should be managed by fully considering its self-organizational and complex characteristics wherein a number of diversified actors interact. In response, this study aims to provide a comprehensive model that addresses this gap in the literature.

To clarify this study's themes, in the following section, first, this chapter reviews the above literature about inter-organizational collaboration, specifically in terms of its nature as a type of network organization and its importance and features as a management subject. It has been argued that the strength of collaboration is derived from its formation through self-organization; however, it is characterized

by complexity. Therefore, exploring a new approach to managing complex self-organization processes through intervention is proposed. Second, in reviewing the arguments regarding complexity, complexity theory and Lewin's planned approach to change are identified as having common ground (Burnes, 2004a, 2005). Then, to further consider how complex self-organization processes can be facilitated, Lewin's "planned approach to change" theory is scrutinized. Action research-based intervention is proposed for performing leadership under conditions of complexity.

Moreover, the initial conditions, fields, and emerging interactions are identified as the targets of management through intervention. Each target is clarified and considered in terms of intervening in targets to facilitate collaboration. Based on these arguments, the conceptual model is proposed as a comprehensive management framework to facilitate complex self-organization processes of cross-sectoral collaboration.

INTER-ORGANIZATIONAL COLLABORATION: ITS IMPORTANCE AND FEATURES

Inter-Organizational Collaboration: A Type of Network Organization and Its Importance

Under globalization and radical change in the business environment, which pressure organizations to accelerate innovation, the potency of inter-organizational collaboration, a typical network organization form, is increasingly recognized. Firstly, concerning the types of collaborations, focusing on business alliances, Sheth and Parvatiyar (1992) categorize them based on two dimensions: strategic vs. operational and competitors vs. non-competitors. The former is an alliance for strategically and intentionally pursuing growth, while the latter promotes efficient resource allocation and asset utilization. Secondly, Podolny and Page (1998) explain that networked forms of organizations are created through the coordination of horizontal and continuous exchanges between a number of entities and form a decentralized order. Toffler (1980) also explains that network organizations employ decentralized decision-making structures based on information networks and feature autonomous and creative organizations. Powell (1990) shows that coordination in network organizations is reciprocal, preferential, and mutually supportive.

Considering these studies, since this study focuses on cross-sectoral collaborations, collaboration can be explained, as discussed in Chapter 1:

(1) A horizontal relationship between partners who are on an equal footing with each other.

(2) Pursuing value creation and growth opportunities with strategic intent by creating new business.
(3) Being composed of non-competitors that complement each other.

Concerning the importance of network organization, firstly, Sroka and Hittmar (2013) identify the reasons underlying the creation of network organizations as (1) effectiveness, (2) competition, and (3) assets. Secondly, Knoke (2001) demonstrates the high organizational capability of network organizations in dealing with changes. First, he explains the flat and decentralized structures that weigh on the judgment of the job site wherein decisions are made and implemented. Baker (1992) also asserts that network organizations have flat and flexible linkages, enabling flexibility and adaptability. This feature contributes to competitiveness by mobilizing personnel, resources, and information through the network (Miles & Snow, 1995) and spanning the boundaries of organizations. Therefore, as Schotter et al. (2017) explain, this facilitates knowledge flows and is crucial for creating innovation capabilities by bridging ties. Second, Knoke shows that network organizations employ external market principles and trade based on them; therefore, it has a high response capacity to market, customer, and change in the external environment. Third, Knoke indicates that network organization is oriented toward the short-term and formulates an organization set up, rebuilt, and dissolved based on the project. This is enabled by a loosely coupled organizational structure that is the source of strength through a flexible transformation through self-organization (Imada, 2008). Wakabayashi (2009) attributes these advantages to the flexibility and innovativeness of the network mechanisms and points out that network organizations can adapt to and learn from the environment through loose coupling and self-organization, enabling competitive advantage through innovation.

The Formation of Inter-Organizational Collaboration and Its Features

Self-Organization and Complexity

Wachhaus (2012) indicates that networks emerge reactionarily out of contextual events. In addition, Wakabayashi (2009) explains that because of high diversity and fluctuations in network organizations, networks can voluntarily create new organizational structures with reference to the external environment by means of self-organization. Joham et al. (2014) explain that "self-organization is defined as the ability of a non-centralized system to emerge a strategic response to a change in its environment and it only occurs in systems where multiple interactions among individuals are possible" (p.2,376). Wolf and Holvoet (2005) define "Self-organization

as a dynamical and adaptive process where systems acquire and maintain structure themselves" (p.7). They explain the essence of self-organization as an adaptable behavior that autonomously acquires and maintains increased order. Gilbert et al. (2015) point out self-organization's common factors as pattern formation, autonomy, resilience and robustness, and dynamics.

Concerning the process of self-organization, Fuchs (2003) explains that the self-reproduction of social systems is based on a dialectic between actors that are conscious, reasonable, creative, and knowledgeable agents. He explained that these actors construct the social world through their actions, and simultaneously, their actions are also conditioned and constrained by the world of their creation. Pyka and Windrum (2003) also point out that "small-scale interactions produce a 'field' at the macro level that in turn influences and modifies activity at the small-scale" (p.248). Finally, Heylighen (2013) concludes that "Self-organization establishes a relation between the behavior of the individual components and the structure and functionality of the system as a whole...This phenomenon is called emergence" (p.121).

However, Fuchs (2003) indicates, first, that self-organizing systems have complex and circular causality and that the system is determined by the dialectic between chance and necessity. Regarding complex systems, Heylighen (2008) shows that systems are neither regular and predictable nor random and chaotic. Second, he says the system consists of many autonomous and mutually dependent parts connected through interaction that react to a specific condition perceived in the environment. Here, parts are described as "agents" by Heylighen (2013), who explains that agents are goal-directed or intend to achieve a particular purpose or objective in terms of maximizing their individual fitness, utility, or preference. Third, processes in complex systems are often non-linear.

Regarding the non-linearity of a complex system, Plowman et al. (2007) describe the effects as larger than the causes through positive feedback. However, Heylighen (2013) shows negative feedback also affects the process. Therefore, certain changes are amplified (by positive feedback), and others are dampened (by negative feedback), which makes the system's overall behavior both unpredictable and uncontrollable (Plowman et al., 2007). Here, Fuchs (2003) points out that historical development is relatively open and dependent on subjective factors such as human intervention, which increases the possibility that certain paths will be taken and others avoided.

Directing the Complex Self-Organization Process

The approach to facilitating a complex self-organization process is further scrutinized by Imada (2008) in his introduction of the concept of goal-directionality. He proposes that the self-organization process might be facilitated intentionally

through intervention and implemented by the self-organization layer (hereafter, the "management layer") using reflexive control. The management layer's role is to support the facilitation of the bottom-up movements of structural changes in social systems that appear equivalent to the field. Imada explained that bottom-up movement is activated by changes in the environment and changes in the need for and value of members of the social system. To support it, the management layer is required "to read new values and desires in fluctuations, distinguish order parameters" (Imada, 2008, p.30) by means of adaptive control and, then, to review and assess whether the structural reform fulfills the functional requirements. Moreover, the management layer also influences the social system to determine the direction in which to employ and accelerate the synergy of the members. This aims to create an environment for facilitating spontaneous order formation by accelerating the interactions between people.

These arguments suggest that "intervention" is required to facilitate the self-organization process of inter-organizational collaboration in a certain direction that can be directed by the management layer. The key is in managing the complexity. A more systematic approach to managing complex self-organization processes is explored in the following section.

PLANNED APPROACH TO CHANGE AND SELF-ORGANIZATION

As discussed above, complexity is neither regular and predictable nor random and chaotic, is characterized by non-linearity, and the system is composed of many autonomous and mutually dependent parts. Burnes (2004a) demonstrates the similarity between the "order-disorder" perspective of complexity theorists and the "quasi-stationary equilibrium" view of Lewin. The two have common ground in their focus on "democracy and power equalization," "a third kind of change," and "order-generating rules" (Burnes, 2004a, 2005). He concludes that planned change (called the "planned approach to change" in the following), as proposed by Lewin, provides a vehicle for implementing a complexity approach.

Regarding the planned approach to change, Burnes (2004b) proposes "field theory," "group dynamics," "action research," and "the stage model (3-step model)" with a unified view that provides a robust approach to managing change. He posited that all four elements are "necessary to understand and bring about Planned change, whether it be at the level of the individual, group, organization or even society" (p.981). Among the four elements, field theory and group dynamics are concerned with the environment that affects individual behavior, and action research and the stage model provide a process/method for changing the behavior of social groups.

Field, Group Dynamics, and Change Through Self-Organization

Lewin (1951) defines a field as "the totality of coexisting facts which are conceived of as mutually interdependent" (p.240) and applies the concept to studying emerging phenomena regarding group activities. Concerning group dynamics, Burnes (2004b) introduces the view that the focus of change must be on the group level because an individual in isolation is constrained by group pressure to conform. In a recent development of this study, Fligstein and McAdam (2011) introduce the Strategic Action Field (SAF) concept as a constituent unit of group activities in society. They define the SAF as "a meso-level social order where actors…interact with knowledge of one another under a set of common understandings about the purposes of the field, the relationships in the field (including who has power and why), and the field's rules" (p.3).

Concerning the field and change, Cartwright (1952) explains Lewin's view, which demonstrated that behavioral change arises from changes in psychological forces in the life space (field). According to Burnes and Cooke (2013), field theory and group dynamics explain how particular social groupings are formed, motivated, and maintained. Moreover, Burnes (2004b) shows that behavior and group processes tend to fluctuate according to changes in the force or circumstances.

Regarding how change is promoted in a self-organic way, first, Imada (2008) indicates that "What is required is to incorporate the activities of creative individuals into the logic of the system…not to abandon control, but to depart from the control which crushes fluctuations and think of a control which will guide fluctuations to create a new order" (p.3). Second, Itami (1999) demonstrates field functions as enabling continual and self-organizational informational interactions. He explains interactions that lead to the formation of mutual understanding in self-organization processes as follows. First, some environmental change occurs, and members of the field recognize it; each has its own perception of the change. Then, through interaction, the members attain mutual understanding. Here, mutual understanding is (1) understanding the situation of people who should seek coherence between them, (2) sharing a similar image of the environment/situation, and (3) sharing a common goal for action. He describes information as feedback from various formal and informal channels. Based on the information, the understanding of an individual about the environment/situation is transformed, and then, the formation of mutual understanding through informational interactions recurs. This recurrence of the micro-macro loop process generates self-organization. Burnes and Cooke (2013) also support this self-organic process, which suggests that participative learning is fundamental to field theory for individuals and groups to map out their current life space and construct a new and more desired one.

In considering how to control the self-organization process, these arguments suggest that the field that creates an environment for behavioral change and the interaction of members (hereafter, "emerging interaction") is clarified as the key factors to focus on.

Action Research and the Stage Model for Leadership Under Complexity

Leadership Under Complexity

Concerning the facilitation of the self-organization process of cross-sectoral collaboration, Follet (1918) indicates the importance of a leader who coordinates building relationships between people. Imai and Kaneko (1988) also discuss the importance of an entity that intendedly connects people, builds new relationships, and forms new social contexts. Here, leadership in facilitating complex self-organization process is argued for. First, Plowman et al. (2007) propose that "complex leaders enable rather than control futures by cultivating conditions where others can produce innovations that lead to productive" (p.344). They describe that, to enable emergence, leaders are required to be catalysts for actions and function as tags that accelerate specific behaviors by clarifying what is important and providing meaning to events. They show three mechanisms of how leaders enable emergent self-organization: (1) disrupting existing patterns of behavior, (2) encouraging novelty, and (3) making sense of emerging events. Second, Baker et al. (2011) point out that collaborative difficulties arise from the complex and rapidly evolving business environment and consider how leadership should be enacted. Based on Avery (2004), they introduce the organic paradigm of leadership, characterized by mutual sense-making, emergent leadership, shared values, self-determination, and emergent vision. Moreover, with reference to Gill (2003) and Crosby and Bryson (2010), they propose that integrative change leadership, which fits the complex multi-level structure of their network, is required.

These arguments provide some key concepts for leading the self-organization process of cross-sectoral collaboration, such as enabling emergence, the organic paradigm of leadership, and integrative change leadership. This corresponds to the perspective, as Todnem (2019) suggests, "to see leadership is a verb and being about delivering on purpose together" (p.3).

Action Research and the Stage Model as Bases for Intervention

Action research and the stage model provide insight into how leadership under complexity can be achieved. As Burnes (2004b) explains, these are developed to provide a process/method for changing the behavior of social groups.

First, based on the view on action research by Lewin (1946), Burnes (2004b) explains that "change can only successfully be achieved by helping individuals to reflect on and gain new insights into the totality of their situation" (p.984) and stresses "felt-need." This is what Lewin called "reconceptualization," which is the transformation through the individual and collective reframing of the problem (Dickens & Watkins, 1999), and can be promoted through democratically involving members to learn for improvement through developing practical knowing and bringing together action and reflection, theory and practice (Dickens & Watkins, 1999; Hendry, 1996; Reason & Bradbury, 2001) to increase adaptive capacity, the ability to innovate, and competence in self-design of systems (Elden & Chisholm, 1993). Here, Burnes (2004b) shows that Lewin (1947) developed the stage model to realize permanency at the new (higher) level of group performance by change.

Second, the role of the facilitator is explained to help learners learn from exposure to problems, formulate plans for action and test them through implementation (Mumford, 1985). This is promoted when learners "mutually open themselves up to an inquiry process that seeks to 'unfreeze' the assumptions underlying their actions" (Raelin, 1999, p.117) and testing descriptions and theories in intervention experiments (Argyris & Schon, 1991). Here, Dickens and Watkins (1999) explain that the feedback to the community might act as an intervention and the action researchers might implement more structured actions that create change.

Considering the arguments thus far, it is clear that fostering "felt-need" is a critical factor in considering planned change by facilitating the self-organization process. Moreover, the argument suggests that action research-based interventions can promote leadership under complexity, facilitating the self-organization process by enabling emergence in an organic and integrative manner.

Intervention Targets to Facilitate Complex Self-Organization Processes

The arguments above give us insight into the applicability of Lewin's planned approach to change to a complex system wherein the self-organization of various actors is deployed. This has some implications for developing the argument regarding management that facilitates self-organization processes of cross-sectoral collaboration.

First, as discussed in the action research and stage model above, the importance of group behavior, involvement, and empowerment through learning is emphasized because these enable individuals to understand and restructure their perception of the world around them and foster/share the "felt-need" toward the change.

Second, the field, accompanied by group dynamics, is required to enable various people to come together and accelerate emerging interaction to change self-organizationally toward a certain goal (therefore, toward collaboration). This seems equivalent to the social system and spontaneous order formation through people's performative action (Imada, 2008).

Finally, a process/method is necessary for facilitating the change more systematically, like action research based on the stage model, which corresponds to "intervention" (Fuchs, 2003; Imada, 2008). This requires change leadership forming to support the self-organization process. Considering intervention in cross-sectoral collaboration, Bryson et al. (2006) stressed the importance of combining deliberate and emergent planning. Moreover, with reference to Elden and Chisolm (1993) and Lewin (1951), Gray (2008) also proposes that "the interventions have been tested and refined through practical application in numerous contexts, often using action research methodologies" (p.665).

Based on the view above, management, which facilitates the self-organization process toward cross-sectoral collaboration, is required to consider the following key concepts as targets of management through intervention.

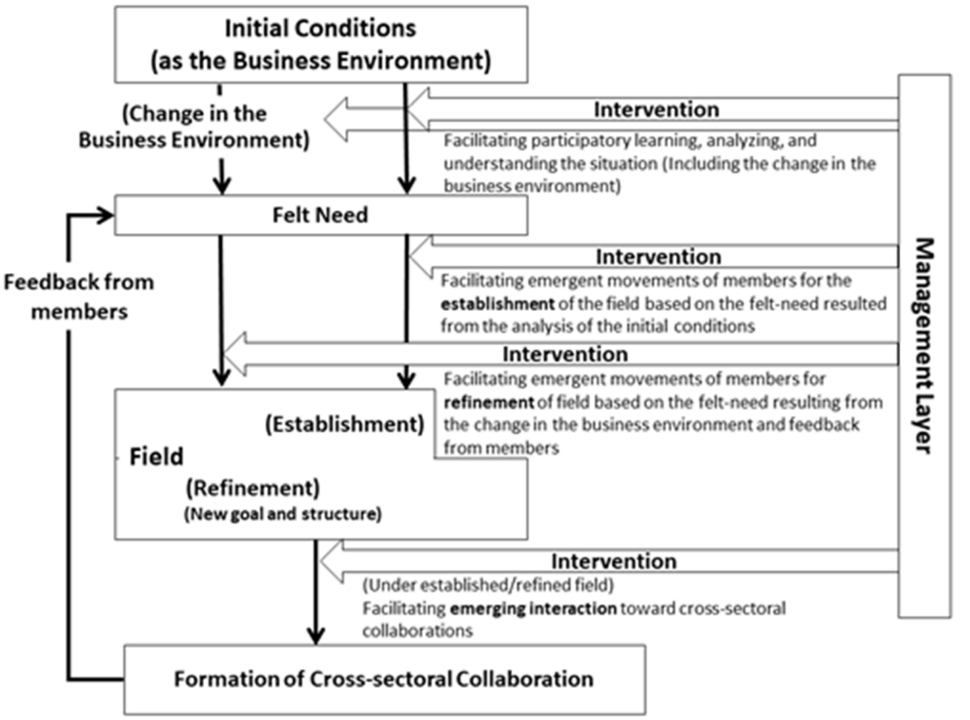
(1) It is necessary to foster the "felt-need," as posited by Burnes (2004b), by helping individuals reflect on and gain new insights into the totality of their situation. For that, it is necessary to facilitate learning the "initial conditions"—which is the business environment that the concerned parties face—and then to read new values and desires in fluctuations (Imada, 2008).
(2) Based on the felt-need, setting up the "field" must be facilitated.
(3) Moreover, under the field is set up, facilitating "emerging interaction" (equivalent to the performative action of people) toward cross-sectoral collaboration is also required.

These processes are facilitated by intervention in the targets implemented by the management layer. This intervention is based on the principle of action research, characterized by learning through interaction with the bottom-up movement of people.

THE TARGET AND ITS MANAGEMENT THROUGH INTERVENTION

Regarding the purpose of the intervention, Gray (2008) explains that the intervention is "to improve the quality and the likelihood of alliance success" (p.665) by exerting an influence on the interactions between alliance partners by "reducing restraining factors or increasing driving factors" (p.668). Moreover, she indicates that intervention is "deliberate actions taken by an alliance partner or a third party to influence the formation, design, or process of interaction among alliance partners" (p.665). Based on the argument, management through intervention to facilitate complex self-organization processes is considered by focusing on cross-sectoral collaborations. The conceptual model, depicted in Figure 1 below, shows a comprehensive management approach to the targets of intervention, which is implemented by the management layer and aimed at facilitating complex self-organization processes toward cross-sectoral collaborations by focusing on the initial conditions, fields, and emerging interactions.

Figure 1. Conceptual model: Management to facilitate self-organization process of cross-sectoral collaborations
Source: Kawabata (2020).



In the following section, to explore how the model was developed and how it can be used, each target is clarified, and how interventions are implemented is considered.

Initial Conditions and Management Through Intervention

Factors Affecting the Formation of Cross-Sectoral Collaborations

Whetten (1981) identifies the preconditions for coordination to build inter-organizational relationships. Similarly, Chen (2008) demonstrates that the preconditions that facilitate the formation of partnerships also affect their outcomes through the collaboration process.

Regarding studies that posited factors contributing to the formation of inter-organizational collaborations as initial conditions, Logsdon (1991) explains the necessity of recognizing both an organization's interests and its interdependence. Gulati (1995) shows that the level of trust in past alliances impacts current alliance participation decisions. In addition, by focusing on the institutional environment, sector failure, and the direct antecedent, Bryson et al. (2006) describe the initial conditions for cross-sectoral collaboration. Moreover, with reference to the study by Sharfman et al. (1991), Gray (2008) summarizes "a driving force" as well as a "restraining force" in collaborations that are built on force fields, as proposed by Levin (1951). Later, based on the review of previous work, Bryson et al. (2015) identify the following two concepts. One is general antecedent, such as "the availability of varied resources, characteristics of the institutional environment, and the need to address complex public issues" (p.648-649). The other is specific initial conditions such as "the significance of preexisting histories and relationships (whether positive or negative), some agreement on collaborative aims and perceived interdependence among members, and the availability of leadership" (p.649). In addition to these studies focusing on embeddedness, the social network concept is also argued as a positive as well as a negative contributor to collaborations (Granovetter,1985; Gulati, 1998; Gulati & Gargiulo, 1999; Lazzarini et al., 2008).

Based on the above discussion, the initial conditions, which have both positive and negative impacts and affect the process of establishing and facilitating cross-sectoral collaboration, can be categorized as follows:

(1) Macro-environmental factors at the institutional and sector level.
(2) Micro-environmental factors of business strategy and organizational level.
(3) Social networks, which are considered as intermediate between (1) and (2) because they can be considered on both sectoral and organizational levels.

Based on the categorization, Tables 1 and 2 summarize the initial conditions.

Table 1. Initial conditions (positive)

	Positive
Macro-Environmental Factors (Institutional and Sector Level)	•Incentive by the government or other interested parties. •Mandate by law and regulation. •Common opportunities arising from changes in institutional environments. •Existence of support to promote collaboration. •Social compound factor. •Unstable environment in competition and institutions. •In case efforts within a single sector cannot achieve their objectives.
	•Social network.
Micro-Environmental Factors (Business Strategy and Organizational Level)	•Commonality of the domain to be solved and a common understanding of the problem. •Need for complementary management resources of partners, including supply capabilities, specific expertise and technologies, geographic scope, access to local knowledge and people, and cultural/linguistic capabilities. •Pursuing efficiency and scale economies. •Awareness of the need for active coordination for building relationships. •Inter-dependency. •Ensuring legitimacy by partnering with reputable partners or meeting the requirements of financing institutions. •History of active communication, information-sharing, knowledge, demonstrated ability and goodwill, and trust through past collaboration. •Realizing that continued rivalry is more damaging than bringing it together. •Organizational capabilities of an individual organization, such as personnel and flexibility, etc., for maintaining the relationships.

Source: Drawn up by the author with reference to Kawabata (2020).

Table 2. Initial conditions (negative)

	Negative
Macro-Environmental Factors (Institutional and Sector Level)	•Conflict and mutual distrust. •Impediments by the economy and the government. •Difference in power between partners. •Cultural and commercial practices.
	•Social network.
Micro-Environmental Factors (Business Strategy and Organizational Level)	•The poor vision of the domain. •Perceiving the loss of dominance (by each of the entities). •Awareness of the loss of support of constituents. •Internal conflict between partners.

Source: Drawn up by the author with reference to Kawabata (2020).

Management 1: Intervention for Learning/ Analyzing the Initial Conditions

The purpose of intervening in initial conditions is to facilitate participatory learning, analysis, and understanding of the situation (including the change in the business environment) and foster and share the "felt-need" among people. This enables them to recognize the necessity for change and consider how to achieve cross-sectoral collaboration.

This seems to be enabled by learning initial conditions by "helping individuals to reflect on and gain new insights into the totality of their situation" (Burnes, 2004b, p.984). According to Imada (2008), "to read new values and desires in fluctuations, distinguish order parameters, and accelerate the synergy of component members" (p.30) is required for the intervener to lead the fostering process. Moreover, as proposed by Dickens and Watkins (1999), facilitation should employ the action research approach characterized by working collaboratively to observe, understand and then reach "felt-need," which enables people to take action in promoting collaboration.

It is practically possible that intervention in the initial conditions is implemented through an analytical survey that aims to understand and share them. The management layer can initiate this or, if the layer was not structured during the early period, by core parties, e.g., people from the industry group, the public sector, universities, etc., who will initiate the foundation of the layer. The survey should be accompanied by the interaction and involvement of key stakeholders from industry and academia, etc., who are potential contributors to the collaborations. This is facilitated by meetings that enable them to participate in the discussion and the learning of the initial conditions. Then, to share the "felt-need" for exploring new domains, which has the potential advantage of collaboration, these meetings can direct further activities for managing the field and emerging interactions.

Field and Management Through Intervention

The discussion above about the planned approach to change shows that the field is one of the key factors for facilitating self-organization because the field is the environment in which behavioral change occurs and works as a device for promoting the self-organization process. So then, the issue is, how can the field be formed? Here, the approach to setting up the field is clarified by focusing on the establishment and refinement of the field and then considering how the intervention should be implemented in the establishment and refinement.

Establishment and Refinement of the Field

Regarding the establishment of the field, Fjeldstad et al. (2012) propose that to adapt to a complex and dynamic environment, a new mode for controlling and coordinating, called an "actor-oriented architectural scheme," is required. This mode is composed of "(1) actors who have the capabilities and values to self-organize; (2) commons where the actors accumulate and share resources; and (3) protocols, processes, and infrastructures that enable multi-actor collaboration" (Fjeldstad et al., 2012, p.734). They explain that the mode is efficient and effective for facilitating interaction among actors and self-organization in a complex and dynamic environment. The scheme shown by Fjeldstad et al. (2012) has similarities to the field that functions as a device for facilitating interactions and collaboration. Then, concerning the approach to forming a field, Itami (1999) explains that there are two approaches to forming the field: "autonomous/emerging" and "heteronomous/setting up"; a mixture of the two approaches is the source of dynamism. The latter is the approach of intentional field formation through intervention.

Regarding the refinement of the established field, Itami (1999) points out that combining both approaches—the autonomous/emerging and the heteronomous/setting up—is required. Therefore, the field should be marked off by a boundary but also be open externally because it facilitates the self-organization process of the field formation itself. This implies a cyclical process in which an established field provides behavioral direction to individuals/groups, and their behavior reconfigures the meaning of the field with reference to environmental factors. Burnes (2004b) indicates that Lewin (1946) believed a field was in a continuous state of adaptation and introduced Lewin's description: "Change and constancy are relative concepts; group life is never without change, merely differences in the amount and type of change exist" (Lewin, 1947, p.199). Burnes explained that this is the reason why Lewin used the term "quasi-stationary equilibrium" and described, "whilst there might be a rhythm and pattern to the behavior and processes of a group, these tended to fluctuate constantly owing to changes in the forces or circumstances that impinge on the group" (p.981). Considering this with the argument by Imada (2008), the refinement of the field corresponds to the self-organization process of setting a new goal and introducing the required functions to restructure the "social system." Here, the self-organization layer (in this study, called the "management layer") plays the role of supporting the process through "adaptive control" of bottom-up interactions (i.e., synergetic self-organization) of the members and changes in the external environment.

Management 2: Intervention for the Establishment/Refinement of the Field

The arguments above suggest that intervention for facilitating the establishment and refinement of the field is implemented using the heteronomous/setting-up approach.

First, the purpose of intervening in the establishment of the field is to facilitate emergent movements of members for an establishment based on the "felt-need" resulting from the analysis of the initial conditions. Regarding the manner for intervening, with the view that people's behavior fluctuates according to changes in the force or circumstances, Burnes (2004b) suggests factors such as group norms, roles, interactions, and socialization processes should be concentrated for change and explained that, if the potency of the force is identified and established, "what forces would need to be diminished or strengthened in order to bring about change" (p.982) can be understood. Itami (1999) explains that the requisites of field formation are (1) the selection of members, (2) the setting of basic elements of the field: agenda, code for interpretation, information career (media), desire for solidarity, (3) working on members to share the basic elements and (4) designing for the micro-macro loop, such as who should communicate with whom. Itami also shows convening as an example of establishing the field, and, related to this argument, Gray (1989) lists the following functions of the convener.

(1) Having the power to convene stakeholders.
(2) Legitimacy, authority, and fairness should be maintained.
(3) The purpose of collaboration should be clarified to understand the potential value of collaboration and organize the collaboration area.
(4) Skill for carrying out a cooperative process and forming its details is required.
(5) Appropriate stakeholders should be specified.

Gray suggests that involving key stakeholders with a strong interest is important to establish social norms and put them into practice. Moreover, Bryson et al. (2006) stress the necessity of establishing the legitimacy of the body for obtaining internal/external support, resource, recognition, and trusted interaction.

The above arguments imply that it is practically possible to implement the intervention in the establishment of the field by the management layer through (1) not only openly calling members but also approaching potential members considering the composition of members' sectors or inviting the key stakeholders to assure legitimacy, etc., (2) constructing a list/database of members and stakeholders for communicating with each other smoothly, (3) introducing the concepts/areas upon which members and stakeholders should focus and guiding them to understand the potential benefit by collaboratively pursuing the domain, (4) holding a general

meeting for sharing trends (agenda), setting up workshops and events for a specific topic, etc., and (5) developing the ICT infrastructure and building a physical space to encourage information-sharing and interaction (Itami, 1999).

Second, the purpose of intervening in the refinement of the field is to facilitate emergent movements of members for refinement based on the "felt-need" resulting from changes in the business environment and feedback from members. Concerning the refinement of the field, Imada (2008)'s argument regarding the role of the self-organization layer in facilitating the bottom-up process of self-organization by influencing the social system provides valuable insights.

(1) "to induce social development is to receive the information on changes in value and/or needs of members and their speed, identify development vector and create a future image of society" (p.66). This includes clarifying the value change for the members and accelerating value formation by acquiring knowledge in advance.
(2) "to modify or change the existing social goals to a new one along the track of development vector and input it into social system" (p.67).
(3) "to differentiate the role required for the attainment of a new social goal, clarify role prescription and institutionalizing allocation rule to ensure the personnel and social resources required for role performance" (p.68). This includes the development of ability and the exploitation of resources.
(4) "to control structural incongruence caused by new role formation and institutionalization of allocation rule and to direct social system toward structural harmonization" (p.70). This includes the modification of role prescription, the abolition of unnecessary roles, and the adjustment of allocation rules.
(5) "not to constantly stabilize the system by goal attainment, but to input a new goal along the track of development vector and trigger amplifying feedback for goal attainment" (p.71). This amplifies feedback shifts in the social system from a structurally stable state to instability and accumulates the force in causing new structural changes.

These roles of the self-organization layer can be considered in drawing implications on how to refine the field to facilitate the self-organization process of cross-sectoral collaboration, in which a number of various actors interact in a new direction. Imada concluded that, for social development, refining the system structure as a control system is required. Based on his argument, it is implied that the refinement of the field is implemented with new vectors and goals brought by the reflection based on the changes in the business environment and feedback from members. It is followed by clarifying the roles and allocation of personnel/social resources,

structural incongruence, and fluctuations in the system for continually steering it in a new direction. This process is cycled through the feedback.

This view is supported by a case study of cross-sectoral collaborations in promoting medical technology industries in several areas in Japan (Kawabata, 2016, 2017). It was found that the refinement of the field was initiated by the management layer (e.g., an association) to facilitate collaboration. The refinement reflected the business environment and demands from members and key stakeholders. Considering Imada (2008)'s argument, it is practically possible that the management layer implements intervention in field refinement by searching for changes in the business environment and communicating with members and key stakeholders by grasping new trends and values/needs, then setting new goals. The layer must also approach new members with different backgrounds, reconstruct lists/databases of members and stakeholders, set up workshops and events on new topics, and introduce new concepts/areas on which to focus to members.

Emerging Interaction and Management Through Intervention

Emerging Interaction

Regarding emerging interaction toward cross-sectoral collaborations, first, Follett (1927) describes the process of inter-organizational cooperation in terms of personal interactions and relationships. Second, focusing on cross-sector partnerships, Koschmann et al. (2012) show that partnership emerged from a "communication processes involving a reflexive relationship between text and conversations" (p.337). Here, texts (e.g., mission statements and white papers, etc.) are "the inputs to and outcomes of conversation forming a self-organizing loop" (p.336). Moreover, they demonstrate additional communication processes composed of (1) "intertextuality" (here, the key question is "how diverse participants compete conversationally to insert texts that will shape the content and direction of an XSP (cross-sector partnership)" (p.336-7)) and, with reference to Taylor et al. (1996), (2) "distanciation" (that is "a process whereby organizational texts become 'distanced' and expand their influence beyond situated conversational circumstances" (p.337)). They pointed out that the text-conversation dialectic in additional communication generates "authoritative text" that influences subsequent conversational and textual practices and the formation of higher-order systems for marshaling consent and securing capital. It then performs as a collective agency for creating value. The process is further scrutinized by Nicotera (2013), who shows the phasic model of the organizing process by introducing the concept of the communicative constitution of an organization. In the first phase, the interaction between individuals begins, and each individual (I) is embedded in social/organizational or previous interactions. Through the interaction between (I)

s, a social group (we), which has inter-subjective meaning, is formed as a basis for constructing an organization. Then, a common goal is set, and interaction to achieve the goal starts. In this phase, the group becomes the entity (it) that is distinctively different from others. Each role is defined. Moreover, a certain project is established, and its form is disseminated to the broader public and audiences, thus reifying the organization's existence and activities. Nicotera also mentions that the "I," "we," and "it" process is not linear but continually defined recursively; therefore, it implies the recursive nature of the organizing and reorganizing process.

The following arguments corroborate the view above. First, Turner (1962) explains that role-making occurs when people interact. Regarding promoting and sharing role-making, Schachter (1951) shows that uniformity of behavior and group member attitudes result from the interactions between them. Moreover, Monge and Contractor (2001) suggest that the linkages between people create common interpretations and understandings, such as the organization's goal, slogan, etc. Finally, Hartman and Johnson (1990) state that "once individuals are grouped based on similar communication patterning, they will have a tendency to share information about expected role behaviors and the consequences of alternative behaviors" (p.132).

These arguments describe the recursive process of self-organization toward cross-sectoral collaboration wherein emerging interactions between individuals (I) bring coherence of attitude and action. Then, the social group (we) is generated, and the group sets a common goal and starts interacting to achieve it. Finally, the entity (it) is established along with a defined role. Therefore, the collaboration is established, and its form is disseminated to the broader public and audiences.

Management 3: Intervention in Emerging Interaction

The purpose of intervention in emerging interactions is to facilitate the movement of the interaction toward the formation of cross-sectoral collaboration.

First, regarding the concepts related to interveners in emerging interaction, Thomson and Perry (2006) introduce a "public manager" who facilitates the formation of cooperation between entities from different organizations. Ring et al. (2005) explain that "triggering entities" perform to make clear to potential partners the benefits of collaboration, to support the formation process (of collaboration), to ensure various contributions in a timely and harmonious manner, and to reassure each incentive. Crosby and Bryson (2005) explain that interveners, such as powerful sponsors or intermediary organizations, make stakeholders pay attention to important public issues and lead them to agree on legitimacy. Bryson et al. (2006) also indicate that the powerful sponsor and effective champion lead people to be more successful in cross-sectoral collaborations. Here, they explain that "sponsors" have prestige,

authority, and access to resources, and "champions" perform to keep the collaboration going and use process skills to accomplish the goal of the collaboration.

Second, concerning the role of these interveners, Gray (2008) points out the following elements that make partnerships between organizations more effective: Visioning, Convening, Reflective Intervening, Process Design, Problem Structuring, Internal Brokering, Conflict Handling, and Institutional Entrepreneurship. Kaats and Opheji (2014) emphasize employing a comprehensive approach toward collaboration. They proposed considering a coherent view by focusing on shared ambition, justice to the interests of each partner, constructive group dynamics, organizing professionally, and a sense-making process. Moreover, Koschmann et al. (2012) indicate that the authoritative text generated by the text-conversation dialectic can enhance the value potential of cross-sectoral collaboration by: (1) increasing meaningful participation in the distribution of member deliberations and inclusion in diverse interests, (2) managing centripetal and centrifugal forces that are realized by avoiding premature closure in conversations and being flexible with member interests and identities and (3) creating a distinct and stable identity by naming and narrative construction. Related to the third practice proposed by Koschmann et al., Hogg et al. (2012) discuss the importance of creating "intergroup relational identity" with intergroup leadership. They explained that identity is defined by members themselves in the context of intergroup relationships. Here, "leader rhetoric," which expresses the complementary relationship between members, should be proposed and boundary-spanning leadership displayed. This approach effectively avoids the resistance caused by losing a group's identity and value. These arguments show that role of the intervener covers a broad range, which is summarized in Table 3 below.

Table 3. Role of the intervener in facilitating cross-sectoral collaboration

Role of the Intervener
• Visioning and shared ambition • Convening, meaningful participation, and creating the intergroup relational identity • Reflective intervening • Doing justice to the interest of each of the partners and managing centripetal and centrifugal forces • Process design, constructive group dynamics, and sense-making process • Problem structuring • Internal brokering • Institutional entrepreneurship (shared rule and agreement) • Organizing professionally • Conflict handling

Source: Drawn up by the author with reference to Kawabata (2020).

Third, regarding the issue of "who intervenes?" according to Radin et al. (1996), the expansion of boundaries may be achieved by several people and does not have to be achieved by a single person. Moreover, Davis and Eisenhardt (2011) illustrate "rotating leadership" in which the main leader is changed from phase to phase, and the rotation contributes to mobilizing more diverse participants and, as a result, generates more innovation. Finally, Gray (2008) asserts that normal intervention should be performed by alliance partners or third parties. She also mentions that since intervention requires the intervener to have substantial knowledge, training, and skills, third parties often implement the intervention.

Finally, considering leadership under complexity, examined in the planned approach to change in self-organization, intervention is implemented to lead the complex self-organization process of cross-sectoral collaboration by enabling organic and integrative leadership (Baker et al., 2011; Plowman et al., 2007). To practically implement the approach, Imada (2008) proposes the "support" concept, consisting of an approach to others, understanding the intention of others, the maintenance and improvement of the quality of others' actions, empowerment, and mutual relation. Then, he shows the conditions required for support as follows: (1) do not bring the supporter's intention to the fore, (2) do not impose the supporter's intention on the supportee, (3) duly account for time and cost and (4) do not impair the supportee's self-reliance efforts. Combined with the action research perspective, intervention supports facilitating interaction and building relationships in a participative way.

Based on the arguments above, intervention in emerging interaction appears to be implemented by the management layer based on the direction of the established and refined fields. These can be implemented, first, by identifying and sharing the domain of the collaborations (e.g., clarifying and providing information about the demand for the product, facilitating the sharing of an idea for a collaborative business proposed by a member or by an external actor, etc.) and making potential partners aware of their interdependencies (Ring et al., 2005). Moreover, the layer can also facilitate the interactive process toward collaboration through support for (1) networking/matching by convening, (2) coordinating between partners, e.g., moderating to bridge the gap of the viewpoint, translating to help communications (Thomson & Perry, 2006) and solving difference or conflicts (Ring et al., 2005), (3) approaching to potential partners and persuading them to participate in collaborative projects (Ring et al., 2005; Wood & Gray, 1991), (4) clarifying the agreement as "text" (Koschmann et al., 2012) and (5) designing the structure and governance process toward reaching agreements on collaboration (Ring et al., 2005; Thomson & Perry, 2006), etc.

CONCLUSION

The importance of cross-sectoral collaboration is increasing in a dynamic, complex, and interconnected economic and industrial environment. As a result, many regions in the world try to promote collaboration for industrial development. However, as discussed in the introduction, precedent studies have not successfully synthesized the related literature and comprehensively addressed how cross-sectoral collaboration can and should be managed. In response, this study proposed a comprehensive model that addresses management for facilitating the complex self-organization process of cross-sectoral collaboration—assuming that a number of autonomous and mutually dependent entities exist and connect in the interactions toward collaboration to promote regional industries.

To consider this goal, collaboration is examined as a network organization. This type of organization has various advantages stemming from its flexibility and innovativeness. However, the formation of collaboration depends on self-organization characterized by complexity. Here, management assumes that a hierarchical organization cannot be applied and, therefore, management toward complexity through directing and facilitating self-organization processes of network organizations must be considered. Imada (2008) explores the concept of goal-directionality and proposes intentional self-organization by the management layer to facilitate the self-organization process. These arguments suggest that "intervention" is required to facilitate the self-organization process of collaboration in a certain direction, which can be led by the management layer.

Moreover, the literature tells us that complexity theories and Lewin's planned approach to change theory have a common ground (Burnes, 2004a). Therefore, it is argued that the planned approach to change perspective is applicable for considering the management of facilitating complex self-organization processes. Then, based on this view, this study explored a more systematic approach to considering the targets of intervention and how the intervention should be implemented in complexity. Here, the applicability of the change management theory, which targets complex self-organization processes, is examined by focusing on the concept of a planned approach to change. Moreover, focusing on leadership under complexity, action research-based intervention is clarified as a suitable approach for the management layer.

Based on the arguments above, the targets of intervention, composed of initial conditions, the field, and emerging interactions, are identified. Moreover, how to facilitate the complex self-organization process toward cross-sectoral collaboration through intervention is considered in terms of each target. These are, first, interventions on the initial conditions aimed at facilitating participatory learning of the situation and then fostering the "felt-need" toward collaborations. Second, the

goal of intervention in the field is to facilitate emergent movements of members for the establishment/refinement of the field, which is the environment and works as a device to facilitate emerging interaction toward collaboration. Third, intervention is also implemented to facilitate emerging interaction toward collaborations. Finally, these interventions are implemented by the management layer. Based on this view, the conceptual model for the management of facilitating complex self-organization processes of cross-sectoral collaborations is depicted in Figure 1 above.

The conceptual model illustrates the self-organization process from learning the initial conditions and fostering/sharing the "felt-need" to the emerging interaction toward collaboration under the established/refined field and shows that the process is cycled based on the felt-need by the change in the business environment and feedback from members. The intervention is implemented to facilitate the process with an action research-based approach. As Elden and Chisholm (1993) explain, the approach enables concerned parties to increase their adaptive capacity, ability to innovate, and competence in the system's self-design. Gray (2008) proposes that the process is accompanied by experimentalism, and intervention is implemented by being tested and refined. As the stage model proposes, this comprehensive management approach to the self-organization process cycle enables members to unfreeze the assumption of actions, move toward field refinement, and then refreeze the emerging interaction toward forming collaborations under a new direction. This displays adaptability and robustness in a dynamic environment. As discussed in the introduction, considering the management to facilitate collaboration, the literature is fragmented and has not yet established a comprehensive framework. This study synthesizes previous studies, assuming the goal to promote regional industries through cross-sectoral collaborations wherein diversified actors exist. The conceptual model comprehensively addresses how collaboration can and should be managed to facilitate the complex self-organization process.

For the further development of this study, the case studies are conducted in Chapter 8 by focusing on the efforts of the three states in Germany, which are the cases of facilitating the cross-sectoral collaboration aimed at regional industrial development. Then, the validity of the conceptual model is examined in Chapter 9.

REFERENCES

Argyris, C., & Schone, D. (1991). Participatory action research and action science compared. In W. F. Whyte (Ed.), *Participatory action research* (pp. 85–96). Sage. doi:10.4135/9781412985383.n6

Avery, G. C. (2004). Understanding leadership. *Sage (Atlanta, Ga.)*.

Baker, E., Kan, M., & Teo, S. T. T. (2011). Developing a collaborative network organization: Leadership challenges at multiple levels. *Journal of Organizational Change Management*, *24*(6), 853–875. doi:10.1108/09534811111175797

Baker, W. E. (1992). The network organization in theory and practice. In N. Nohria & R. G. Eccles (Eds.), *Network and organizations: Structure, form, and action* (pp. 397–429). Harvard Business School Press.

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, *66*(s1), 44–55. doi:10.1111/j.1540-6210.2006.00665.x

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2015). Designing and implementing cross-sector collaborations: Needed and challenging. *Public Administration Review*, *75*(5), 647–663. doi:10.1111/puar.12432

Burnes, B. (2004a). Kurt Lewin and complexity theories: Back to the future? *Journal of Change Management*, *4*(4), 309–325. doi:10.1080/1469701042000303811

Burnes, B. (2004b). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, *41*(6), 977–1002. doi:10.1111/j.1467-6486.2004.00463.x

Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, *7*(2), 73–90. doi:10.1111/j.1468-2370.2005.00107.x

Burnes, B., & Cooke, B. (2013). Kurt Lewin's field theory: A review and re-evaluation. *International Journal of Management Reviews*, *15*(4), 408–425.

Cartwright, D. (Ed.). (1952). *Field theory in social science: Selected theoretical papers*. Tavistock Publications.

Chen, B. (2008). Managing inter-organizational partnerships: Preconditions, processes and perceived outcomes. In *Academy of Management Annual Meeting Proceedings.* Academy of Management.

Crosby, B. C., & Bryson, J. M. (2005). *Leadership for the common good: Tackling public problems in a shared-power world* (2nd ed.). Jossey-Bass.

Crosby, B. C., & Bryson, J. M. (2010). Special issue on public integrative leadership: Multiple turns of the kaleidoscope. *The Leadership Quarterly*, *21*(2), 205–208. doi:10.1016/j.leaqua.2010.01.001

Davis, J. P., & Eisenhardt, K. M. (2011). Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly*, *56*(2), 159–201. doi:10.1177/0001839211428131

Dickens, L., & Watkins, K. (1999). Action research: Rethinking Lewin. *Management Learning*, *30*(2), 127–140. doi:10.1177/1350507699302002

Elden, M., & Chisholm, R. F. (1993). Emerging varieties of action research: Introduction to the special issue. *Human Relations*, *46*(2), 121–142. doi:10.1177/001872679304600201

Fjeldstad, Ø. D., Snow, C. C., Miles, R. E., & Lettl, C. (2012). The architecture of collaboration. *Strategic Management Journal*, *33*(6), 734–750. doi:10.1002mj.1968

Fligstein, N., & McAdam, D. (2011). Toward a general theory of strategic action fields. *Sociological Theory*, *29*(1), 1–26. doi:10.1111/j.1467-9558.2010.01385.x

Follet, M. P. (1918). *The new state: Group organization the solution of popular government*. Longmans, Green and Co.

Follet, M. P. (2013). The psychology of control. In H. C. Metcalf & L. Urwick (Eds.), Dynamic administration: The collected papers of Mary Parker Follett (pp.183-209). Harper & Brothers Publisher. (Original publication 1927)

Fuchs, C. (2003). Structuration theory and social self-organization. *Systemic Practice and Action Research*, *16*(2), 133–167. doi:10.1023/A:1022889627100

Gilbert, N., Anzola, D., Johnson, P., Elsenbroich, C., Balke, T., & Dilaver, O. (2015). Self-organizing dynamical systems. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (pp. 529–534). Elsevier. doi:10.1016/B978-0-08-097086-8.43086-2

Gill, R. (2003). Change management—Or change leadership? *Journal of Change Management*, *3*(4), 307–318. doi:10.1080/714023845

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, *91*(3), 481–510. doi:10.1086/228311

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems*. Jossey-Bass.

Gray, B. (2008). Intervening to improve inter-organizational partnerships. In S. Gropper, M. Ebers, C. Huxham, & P. S. Ring (Eds.), *The Oxford handbook of inter-organizational relations* (pp. 664–690). Oxford University Press.

Gulati, R. (1995). Social structure and alliance formation patterns: A longitudinal analysis. *Administrative Science Quarterly*, *40*(4), 619–652. doi:10.2307/2393756

Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, *19*(4), 293–317. doi:10.1002/(SICI)1097-0266(199804)19:4<293::AID-SMJ982>3.0.CO;2-M

Gulati, R., & Gargiulo, M. (1999). Where do interorganizational networks come from? *American Journal of Sociology*, *104*(5), 1439–1493. doi:10.1086/210179

Hartman, R. L., & Johnson, J. D. (1990). Formal and informal group communication structures: An examination of their relationship to role ambiguity. *Social Networks*, *12*(2), 127–151. doi:10.1016/0378-8733(90)90002-Q

Hendry, C. (1996). Understanding and creating whole organizational change through learning theory. *Human Relations*, *49*(5), 621–641. doi:10.1177/001872679604900505

Heylighen, F. (2008). Complexity and self-organization. In M. J. Bates & M. N. Maack (Eds.), Encyclopedia of Library and Information Science (3rd ed., pp. 1-20). Taylor & Francis.

Heylighen, F. (2013). Self-organization in communicating groups: The emergence of coordination, shared references and collective intelligence. In A. Massip-Bonet & A. Bastardas-Boada (Eds.), *Complexity perspectives on language, communication and society* (pp. 117–149). Springer. doi:10.1007/978-3-642-32817-6_10

Hogg, M. A., Van Knippenberg, D. V., & Rast, D. E. III. (2012). Intergroup leadership in organizations: Leading across group and organizational boundaries. *Academy of Management Review*, *37*(2), 232–255. doi:10.5465/amr.2010.0221

Imada, T. (2008). *Self-organization and society*. Springer.

Imai, K., & Kaneko, I. (1988). *Nettowa-ku soshikiron [Theory of network organization]*. Iwanami Shoten.

Itami, K. (1999). *Ba no manejimento: Keiei no shinparadaimu [Managing "ba": New paradigm for management].* NTT Publishing.

Joham, C., Talukder, M., & Aseeri, M. (2014). Innovation through a self-organization lens. *Journal of Computational Science*, *10*(12), 2374–2382. doi:10.3844/jcssp.2014.2374.2382

Kaats, E., & Opheji, W. (2014). *Creating conditions for promising collaboration: Alliances, networks, chains, strategic partnerships*. Springer. doi:10.1007/978-3-642-41443-5

Kawabata, Y. (2016). Facilitating inter-organizational collaboration initiated by small- and medium-sized enterprises for promoting a medical device industry in Fukushima Prefecture. *Asia Pacific Business & Economics Perspectives*, *4*(1), 51–73.

Kawabata, Y. (2017). *Chiikishinsangyo no shinko ni muketa soshikikanrenkei: Iryoukikikanrenbunya niokeru jigyokasuisin heno torikumi [Inter-organizational collaborations for promoting new regional industry: Creating business in medical technology industry-]*. Nakanishiya Shuppan.

Kawabata, Y. (2020). Managing to facilitate cross-sectoral inter-organizational collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *10*(2), 13–41.

Knoke, D. (2001). *Changing organizations: Business networks in the new political economy*. Westview Press.

Koschmann, M. A., Kuhn, T. R., & Pfarrer, M. D. (2012). A communicative framework of value in cross-sector partnerships. *Academy of Management Review*, *37*(3), 332–354. doi:10.5465/amr.2010.0314

Lazzarini, S. G., Miller, G. J., & Zenger, T. R. (2008). Dealing with the paradox of embeddedness: The role of contracts and trust in facilitating movement out of committed relationships. *Organization Science*, *19*(5), 709–728. doi:10.1287/orsc.1070.0336

Lewin, K. (1946). Action research and minority problems. In G. W. Lewin (Ed.), *Resolving social conflict* (pp. 34–46). Harper & Row.

Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. *Human Relations*, *1*(1), 5–41. doi:10.1177/001872674700100103

Lewin, K. (1951). *Field theory in social science: Selected theoretical papers*. Harper & Brothers.

Logsdon, J. M. (1991). Interests and interdependence in the formation of social problem-solving collaborations. *The Journal of Applied Behavioral Science*, *27*(1), 23–37. doi:10.1177/0021886391271002

Miles, R. E., & Snow, C. C. (1995). The new network firm: A spherical structure built on a human investment philosophy. *Organizational Dynamics*, *23*(4), 5–18. doi:10.1016/0090-2616(95)90013-6

Monge, P. R., & Contractor, N. S. (2001). Emergence of communication networks. In F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research and methods* (pp. 440–502). Sage. doi:10.4135/9781412986243.n12

Mumford, A. (1985). A review of action learning. *Management Development*, *11*(2), 3–18.

Nicotera, A. M. (2013). Organizations as entitative beings: Some ontological implications of communicative constitution. In D. Robichaud & F. Cooren (Eds.), *Organization and organizing: Materiality, agency and discourse* (pp. 66–89). Routledge.

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341–356. doi:10.1016/j.leaqua.2007.04.004

Podolny, J. M., & Page, K. L. (1998). Network forms of organization. *Annual Review of Sociology*, *24*(1), 57–76. doi:10.1146/annurev.soc.24.1.57

Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*, *12*, 295–336.

Pyka, A., & Windrum, P. (2003). The self-organisation of strategic alliances. *Economics of Innovation and New Technology*, *12*(3), 245–268. doi:10.1080/10438590290025561

Radin, B. A., Agranoff, R., Bowman, A., Buntz, C. G., Ott, J. S., Romzek, B. S., & Wilson, R. (1996). *New governance for rural America: Creating intergovernmental partnerships*. University Press of Kansas. doi:10.17161/1808.32697

Raelin, J. (1999). Preface. *Management Learning*, *30*(2), 115–125. doi:10.1177/1350507699302001

Reason, P., & Bradbury, H. (2001). Introduction. In P. Reason & H. Bradbury (Eds.), *The Sage handbook of action research: Participative inquiry and practice* (pp. 1–10). Sage.

Ring, P. S., Doz, Y. L., & Olk, P. M. (2005). Managing formation processes in R&D consortia. *California Management Review*, *47*(4), 137–156. doi:10.2307/41166320

Schachter, S. (1951). Deviation, rejection, and communication. *Journal of Abnormal and Social Psychology*, *46*(2), 190–207. doi:10.1037/h0062326 PMID:14841000

Schotter, A. P. J., Mudambi, R., Doz, Y. L., & Gaur, A. (2017). Boundary spanning in global organizations. *Journal of Management Studies*, *54*(4), 403–421. doi:10.1111/joms.12256

Sharfman, M. P., Gray, B., & Yan, A. (1991). The context of interorganizational collaboration in the garment industry: An institutional perspective. *The Journal of Applied Behavioral Science*, *27*(2), 181–208. doi:10.1177/0021886391272003

Sheth, J. N., & Parvatiyar, A. (1992). Towards a theory of business alliance formation. *Scandinavian International Business Review*, *1*(3), 71–87. doi:10.1016/0962-9262(92)90012-U

Sroka, W., & Hittmár, Š. (2013). *Management of alliance networks: Formation, functionality, and post operational strategies*. Springer. doi:10.1007/978-3-642-34246-2

Taylor, J. R., Cooren, F. A., Giroux, N., & Robichaud, D. (1996). The communicational basis of organization: Between the conversation and the text. *Communication Theory*, *6*(1), 1–39. doi:10.1111/j.1468-2885.1996.tb00118.x

Thomson, A. M., & Perry, J. L. (2006). Collaboration processes: Inside the black box. *Public Administration Review*, *66*(s1), 20–32. doi:10.1111/j.1540-6210.2006.00663.x

Todnem, R. (2019). New year's resolution. *Journal of Change Management*, *19*(1), 1–5. doi:10.1080/14697017.2019.1565125

Toffler, A. (1980). *The third wave*. William Morrow & Company.

Turner, R. H. (1962). Role-taking: Process versus conformity. In A. M. Rose (Ed.), *Human behavior and social processes: An interactionist approach* (pp. 20–40). Routledge and Kegan Paul.

Wachhaus, T. A. (2012). Anarchy as a model for network governance. *Public Administration Review*, *72*(1), 33–42. doi:10.1111/j.1540-6210.2011.02481.x

Wakabayashi, N. (2009). *Nettowa-ku soshiki: Shakainettowa-kuron karano aratana soshikizou [Network organization: New vision from social network perspective]*. Yuhikaku.

Whetten, D. A. (1981). Interorganizational relations: A review of the field. *The Journal of Higher Education*, *52*(1), 1–28. doi:10.2307/1981150

Wolf, T. D., & Holvoet, T. (2005). Emergence versus self-organisation: Different concepts but promising when combined. In S. A. Brueckner, G. Di Marzo Serugendo, A. Karageorgos, & R. Nagpal (Eds.), *Engineering self-organising systems: Methodologies and applications* (pp. 1–15). Springer. doi:10.1007/11494676_1

Wood, D. J., & Gray, B. (1991). Toward a comprehensive theory of collaboration. *The Journal of Applied Behavioral Science*, *27*(2), 139–162. doi:10.1177/0021886391272001

ENDNOTE

* Section 3 is modified and expanded the following article: Kawabata, Y. (2020). Managing to facilitate cross-sectoral inter-organizational collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering, 10*(2), 13-41.

Chapter 8
The Case of the Three States in Germany

ABSTRACT

This chapter scrutinizes the cases on the management approach of facilitating the self-organization process toward cross-sectoral collaborations. The subjects of this case study are the experiences of the following three cluster organizations: (1) InnovativeMedizin NRW in North Rhine-Westphalia (NRW), (2) Forum MedTech Pharma e.V. in Bavaria, and (3) Mannheim Medical Technology Cluster in Baden-Württemberg (BW). All of the cluster organizations facilitate cross-sectoral collaborations toward promoting medical technology industries in their region and provide the relevant services for that goal. After reviewing the background of the cases, the three cluster organizations are outlined. Then, the experiences of the management of these cluster organizations are examined by focusing on initial conditions, establishment and refinement of field, and emerging interaction, which are the key elements of the conceptual model proposed in Chapter 7.

INTRODUCTION

The stagnation in the 1990s was the driver for the state governments in Germany to tackle policymaking and implementation aimed at strengthening innovation capability and increasing the competitiveness of industries by facilitating cross-sectoral collaborations. The policy was called a "cluster program," in which the state governments (and the affiliated institutions) support the activities of industrial networks managed by cluster organizations. The cluster organizations provide services to facilitate the formation of cross-sectoral collaborations for promoting regional industries. Medical technology was one of the fields to be targeted for the promotion because it had a high growth potential (See Chapter 2 of Section 1 and Chapter 5 of Section 2 for the detail on the cluster program and medical technology).

DOI: 10.4018/978-1-6684-8494-4.ch008

The case study focuses on the experiences of the following three states in Germany: North Rhine-Westphalia (hereafter "NRW"), Bavaria, and Baden-Wuerttemberg (hereafter "BW"). First, the socioeconomic environment, the regional systems that promote the cluster program, and cluster organizations of the medical technology field in the three states are reviewed. Then, the initial conditions the cluster organizations faced are clarified, and how they learn and react are examined. Moreover, the measures of the cluster organization for facilitating cross-sectoral collaborations are described by focusing on the establishment/refinement of the field and the emerging interaction.

Based on the conceptual model proposed in Chapter 7, in the next chapter, the result of this chapter's case study will be analyzed and interpreted to consider how the cluster organizations manage to facilitate cross-sectoral collaborations.

BACKGROUND: SOCIOECONOMIC ENVIRONMENT AND THE REGIONAL SYSTEM

The overview of the socioeconomic environment and the regional systems that promote the cluster program of the three states are as follows (See Chapter 5 of Section 2 for the detail).

Socioeconomic Environment

The scales of the three states are relatively large in Germany. All three states have a population of more than 10 million, and in Germany, the scale of the economy (gross domestic product) places first in NRW, second in Bavaria, and third in BW (deutschland.de, n.d.). They also benefit from locational advantage with the large market in surrounding areas and economic integration in the European Union (E.U.).

On the other hand, they also face competition with other developed economies and emerging countries, especially East Europe, which is close to them and gaining competitiveness due to low cost and qualified labor (Iwamoto, 2015). Among them, NRW faced the most apparent problem of declining leading industries (mining, metal, and steel) and severe job losses (Ache, 2002). This factor still negatively affects the economy, resulting in lower GDP per capita and higher unemployment rates than the other two states (deutschland.de, n.d.; Statista, n.d.). In any case, they faced a decline in conventional industries and met with the necessity to develop industries in new areas.

Regional System

The regional systems of the three states aim to promote the cluster program for increasing innovation capability and promoting competitive industries. They support the activities of the cluster organizations that facilitate cross-sectoral collaborations (See Chapter 5 of Section 2).

First, the present system in NRW was launched based on the agreement of several ministries of the state government in 2007. The state government supervises the cluster organizations. Second, the system in Bavaria was established in 2006. The state government supervises the cluster program. Bayern Innovativ GmbH, the affiliated organization of the state government, provides support to cluster organizations. Lastly, the system in BW was launched in 2006 and is supervised by the state government. Cluster Agency BW, which is the affiliated organization of the state government, provides a program for strengthening the management capability of cluster organizations.

The cluster organizations of the medical technology field are operated under the regional system. In NRW, with the support of the state government, InnovativeMedizin NRW was founded in 2011 as a state-wide cluster organization by the three local cluster organizations of the medical technology field operating in their region (e.g., the Ruhr area in the state). In Bavaria, as a state-wide project organization, Cluster Medizin Technik was launched in 2006. This cluster organization is jointly operated by two independent cluster organizations (Forum MedTech Pharma and The Medical Valley EMN). The former focuses on state, national, and international activities, while the latter focuses on local activities. In BW, five cluster organizations of the medical technology field are officially recognized as cluster organizations of the state. They are listed in the Cluster Portal operated by the state government.

THE MEDICAL TECHNOLOGY CLUSTER ORGANIZATIONS IN THE THREE STATES

With support from the regional systems, cluster organizations in the medical technology field operate in each state. The case study focuses on the following cluster organizations in the three states. Tables 1, 2, and 3 describe the outline of each cluster organization.

InnovativeMedizin NRW

In NRW, InnovativeMedizin NRW was founded in 2011 as a state-wide cluster organization in the medical technology field. The cluster organization receives financial support for the operating cost from the state government. It follows its mandate on its scope of activities (4 fields of innovations in biologization, digitalization, human–technology interaction, and personalization). The primary purpose of InnovativeMedizin NRW is to support collaborative R&D projects composed of industry and academia and to facilitate participation from the region, country, and overseas.

Table 1. Outline: InnovativeMedizin NRW

Innovative Medizin NRW	• Founded in 2011. • More than 300 members (Not its own members but the total amount of those of the three local cluster organizations which founded Innovative Medizin NRW: See below). • Number of staff: 5 (full-time equivalent) and 3 (part-time). • Structure: An association (GBR) founded by the local cluster organizations (Health Region Cologne/Bonn, MedEcon Ruhr, and MedLife) with the support of the state government. The three organizations are employers and decide employment of InnovativeMedizin NRW. • Service (Activities): Mandated by the state government to promote the four fields of innovations (Biologization, Digitalization, Human–Technology Interaction, and Personalization). (1) Creating networks between industry, government, academia, and users. (2) Promoting innovations. (3) Supporting young companies and research associations for transferring innovations to the market. (4) Offering a wide range of events for transferring knowledge and exchanging expertise. • Source of finance: Financial support by the state government (2.5 million Euro/3 years), competitive funds for the project.

Source: Drawn up by the author with reference to Kawabata (2020).

Forum MedTech Pharma in Bavaria

In Bavaria, Forum MedTech Pharma, one of the cluster organizations composing Cluster MedizinTechnik (See Chapter 5 of Section 2 for the detail), was founded in 1998 with the support of Bayern Innovativ GmbH. This cluster organization receives support from the state government for financing its operating costs and from Bayern Innovativ for its management and facility. The cluster organization aims to stimulate new ideas, projects, and partnerships in medical technology by getting people from various sectors together.

Table 2. Outline: Forum MedTech Pharma

Forum MedTech Pharma E.V.	• Founded in 1998. • Nuremberg-based non-profit association. • 492 members (March 2023), including other countries in Europe, Canada, and Japan. • Member structure (March 2023): Companies (manufacturer, suppliers/service provider) (313), research/university (54), clinics/health insurance company (43), startup (65), others (15; law firm, etc.). • Number of staff: 8 full-time staff (2022). • Management and facility support by Bayern Innovativ. • Source of finance: The fund from the state government, members fee, consulting/service fee, competitive funds for the project. • Key Theme: Digitization & Artificial Intelligence, Regulatory Affairs & Approval, Care & Aids, sustainability, Minimally invasive therapy & robotics, Market, Reimbursement & Financing, Manufacturing & Value Creation, Innovative development & mechatronics. • Service (Activities): (1) Consulting and Support (Including Financing Information and Advice). (2) Local industry meetings. (3) Expert working groups. (4) Specialist conferences and workshops. (5) MedTech Summit and various programs. (6) Exhibition in Trade Fair. (7) Cooperation and international market development. (8) Education and training in medical technology.

Source: Drawn up by the author with reference to Forum MedTech Pharma e.V. (n.d.) and Kawabata (2020).

Mannheim Medical Technology Cluster in BW

In BW, Mannheim Medical Technology Cluster was founded as one of the units of the city government of Mannheim in 2011. This is based on the economic strategy

Table 3. Outline: Mannheim Medical Technology Cluster

Mannheim Medical Technology Cluster	• Founded in 2011. • Legal form of the cluster initiative: Department for Economic and Structural Development, City of Mannheim (100% financed by the city). • About 100 members. • Number of staff: 2 (city government employees) (May 2023). The team can be expanded by the staff of other units in the city government. • Member structure: SMEs: 90%, large companies: 3%, universities/colleges: 6%, business development agencies and intermediaries: 1%. • Source of finance: From the City of Mannheim, competitive funds for the project. • Geographical scope: Heidelberg, city district / Mannheim, city district / Neckar-Odenwald / Rhein-Neckar-Kreis, covering a radius of around an hour's drive around Mannheim. • Service (Activities): (1) Networking through events, specialist seminars, trade fair appearances, etc. (2) Individual consulting for companies. (3) Collaborative projects in research and development. (4) Construction of innovation infrastructure and settlement of companies. (5) Startup support.

Source: Drawn up by the author with reference to Clusterportal Baden-Württemberg (n.d.), Kawabata (2020), and Mannheim Medical Technology Cluster (n.d.-a).

of the city. The cluster organization does not receive financial support from the state government for operating costs. However, it is entitled to apply for a competitive fund and accreditation program the state government provides. The main goal of the cluster organization is the efficient integration of research, clinical, and medical technology companies into a network, especially for Mannheim and the Rhine-Neckar metropolitan region.

THE INITIAL CONDITIONS

The followings are the details of the initial conditions the parties concerned with the cluster organizations faced. The initial conditions of each case are clarified, as discussed in Chapter 7, based on the category of positive and negative factors of the macro-environment (Tables 4, 5, 6), social network, and micro-environment (Tables 7, 8, 9).

Macro-Environment

InnovativeMedizin NRW

Regarding the positive macro-environment, under the cluster program, the state government of NRW supported and directed the activities of cluster organizations. In this case, the state government's policy to utilize external partners to promote

Table 4. Macro-environment: InnovativeMedizin NRW

Macro-environment (InnovativeMedizin NRW)	**Positive**	• Cluster program was launched in 2007: Supporting leading market (Leitmarkt) with high potential for growth (including medical technologies), encouraging networking & collaboration between firms, research institutions, universities, and the public sector. • Mandate by the state government to promote the focal topics in medical technology: Four fields of innovation (Biotechnology, Digitalization, Human–Technology Interaction, Personalization), etc. • Progress management and sharing the direction with the state government. • Policy change of the state government toward enhancing collaboration with external partners for implementing measures to promote new industries/ businesses. • Cross-sectoral collaboration is the requirement for application to competitive funds by E.U. and the federal/state governments.
	Negative	• Strict regulations: e.g., The difficulty of approval for reimbursement. • Different regulations between countries. • (Recently) Change of the certification process (new Medical Device Regulation; MDR).

Source: Drawn up by the author with reference to Kawabata (2020).

new industries/businesses was accelerated. Moreover, the competitive funds by E.U. and the federal/state governments mandated to form cross-sectoral collaboration for the application. These also contributed as positive factors. However, on the other hand, the parties concerned faced the challenge of overcoming the hurdle of the regulations on the medical device industry.

Forum MedTech Pharma in Bavaria

Regarding the positive macro-environment, under the cluster program, the support and direction by the state government of Bavaria and the support by Bayern Innovativ encouraged cross-sectoral collaborations. Furthermore, the mandate of competitive funds to form cross-sectoral collaboration for the application was also a positive factor. On the other hand, as in other cases, the parties concerned faced the challenge of overcoming the hurdle of the regulations in the medical device industry.

Table 5. Macro-environment: Forum MedTech Pharma

Macro-environment (Forum MedTech Pharma)	**Positive**	• (1995–) Foundation of Bayern Innovativ. Supporting "Innovation through cooperation." Support to industrial networks for financing and founding. • Cross-sectoral collaboration is the requirement for application to competitive funds by E.U. and the federal/state governments. • (2006–) Cluster Program: Support by the state government on focal areas (17 innovation clusters consistently on the five future markets: Digitization, energy, health, materials, and mobility), encourage cross-sectoral collaborations, and keep close interaction & communications between cluster organization and the state government. • (2006–) Annual monitoring by the state government based on the performance of each cluster's activities. Evaluation by the state government at the end of each stage by inviting the third party and the continuity of the support by the state government is considered.
	Negative	• Strict regulations: e.g., The difficulty of approval for reimbursement. • Different regulations between countries. • (Recently) Change of the certification process (new Medical Device Regulation; MDR).

Source: Drawn up by the author with reference to Kawabata (2020).

Mannheim Medical Technology Cluster in BW

Regarding the positive macro-environment, the cluster program was launched in 2006 by the state government, and the institutional environment to support cluster organization was incrementally consolidated. In this trend, the city government established the cluster organization and promoted the cluster initiative in Mannheim and surrounding areas. Furthermore, the requirement of competitive funds to form

cross-sectoral collaboration for the application was also a positive factor. On the other hand, as in other cases, the parties concerned also faced regulatory barriers that must be overcome to promote the business.

Table 6. Macro-environment: Mannheim Medical Technology Cluster

Macro-environment (Mannheim Medical Technology Cluster)	**Positive**	• Launching Cluster Program in 2006. Targeting professionalization of cluster/ network management, increasing innovation and competitiveness: Cluster Dialogue (2006), Start of cluster funding (2008), Regional Cluster Atlas (2008), Cluster Data Base (2010), Cluster Portal BW (2013), Quality Label BW (2012), Establishment of Cluster Agency BW (2014). • Linked with the direction of the state government through events for information sharing (e.g., Cluster Dialogue), the re-examination of the list in Cluster Portal BW based on the performance of each cluster (which entitles each cluster to apply for project funds by the state government and Quality Label BW). • Structured support by the city government based on the result of the survey in 2009 (Recognition by the city government of the critical mass of the triangle composed of companies, research institutions, and hospitals for developing the medical technology industry). • Cross-sectoral collaboration is the requirement for application to competitive funds by E.U. and the federal/state governments.
	Negative	• Strict regulations: e.g., The difficulty of approval for reimbursement. • Different regulations between countries. • (Recently) Change of the certification process (new Medical Device Regulation; MDR).

Source: Drawn up by the author with reference to Kawabata (2020).

Social Network

Concerned with the social network, prior interactions between industry and academia were observed in some states as a positive factor (i.e., to launch the cluster organizations, etc.). In NRW, before the establishment of InnovativeMedizin NRW, the three local cluster organizations of the medical technology field interacted through events. They fostered their felt-need to facilitate cross-sectoral collaborations at the state-wide level or beyond and to build its structure. In Bavaria, meetings and events held by Bayern Innovativ provided opportunities to interact between government-industry-academia and fostered their felt-need for cross-sectoral collaborations. On the other hand, in the case of Mannheim Medical Technology Cluster, opportunistic industry-academia interactions were observed in the case when research grant calls were offered. However, it did not contribute as a substantive positive element.

On the other hand, although the negative effects of the embeddedness of the social network were not observed in the three cases, they faced the problem of lack of coordination between different sectors (e.g., research and industry, industry and hospitals) to promote collaborations.

Micro-Environment

InnovativeMedizin NRW

NRW had many medical institutions (i.e., hospitals and rehabilitation facilities), research institutions, and small and medium-sized enterprises (SMEs) that were essential for promoting innovation in the medical technology field. Moreover, the state also had large internal/external markets. Therefore, the parties concerned recognized the high potential of the growth of the medical technology industry and the complementarity of various sectors for promoting innovation. Moreover, enlarging the scope of activities (e.g., ICT), promoted after the establishment of InnovativeMedizin NRW, also accelerated the movements toward new forms of collaboration.

However, as shown above, the state faced the problem of a lack of coordination between different sectors. This contributes to the lack of a clear vision of the domain for collaborations in the medical technology field.

Table 7. Micro-environment: InnovativeMedizin NRW

Micro-environment (InnovativeMedizin NRW)	**Positive**	• Large number of medical/health institutions (20% in Germany). • Many research institutions (Universities, Fraunhofer, etc.). • Many SMEs in medical technology (many "hidden champions"). • Patents and R&D projects in medical technology. • Large internal/external growth market (largest in healthcare spending, population, and a number of medical institutes; 1/5 in Germany, High export growth). • Economic integration in E.U., globalization (locational advantage), competition from overseas. • Supplier industries for metal/plastic processing as potential entrants. • (2014–) Shift to enlarge the scope of activities such as ICT to promote innovations in the healthcare sector.
	Negative	• Lack of coordination between different sectors and a clear vision of the domain to collaborate.

Source: Drawn up by the author with reference to Kawabata (2020).

Forum MedTech Pharma in Bavaria

Regarding the positive micro-environment, Bavaria had large companies and many SMEs with strength in medical technology. Many medical institutions, such as hospitals and rehabilitation facilities, and research institutions, which were essential for promoting innovation in the medical technology field, also existed. Moreover, the state had large internal/external markets; however, it faced severe competition from outside, which pushed them to promote the collaborations. Last, recent changes

in the business model under digitalization and the shift of the topics to focus (See the Table below) also required new forms of collaboration. These positive factors made the parties concerned recognize the high potential of the growth of the medical technology industry and the complementarity of various sectors for promoting innovation in the medical technology field.

However, Bavaria also faced the problem of a lack of coordination between different sectors which contributed to the lack of a clear vision of the domain for collaborations in the medical technology field.

Table 8. Micro-environment: Forum MedTech Pharma

Micro-environment (Forum MedTech Pharma)	**Positive**	• Many large companies, SMEs, Universities, and Research Institutions in Medical Technology Field. • Many medical-related institutions (Hospitals etc.). • Supplier industries (as potential entrants). • Recognition of large internal/external growth market (high export ratio), the cost pressure, and the globalization of the markets. • Economic integration in E.U. • (Recently) Dramatically changing business models under digitalization (where the product is only one part of the value chain): Need support, especially for small firms, to be a part of the health care process. • (Recently) Main topic (challenge) shift from technology to regulation, digitalization, and change in business model, therefore, innovation process.
	Negative	• Lack of coordination between different sectors and a clear vision of the domain to collaborate.

Source: Drawn up by the author with reference to Kawabata (2020).

Mannheim Medical Technology Cluster in BW

In the case of BW, it also had the positive factor of many medical institutions such as hospitals and rehabilitation facilities, research institutions, SMEs, and ICT companies, which were essential for promoting innovation in the medical technology field. Although large internal/external markets existed, it faced severe competition from outside, especially in its traditional medical device products. That pushed the parties concerned to promote innovation and achieve further growth in the industry.

However, as in other cases, the problem of a lack of coordination between different sectors was observed in the case of BW. They understood the need to utilize the complementarity of various sectors and to have a clear vision of the domain for collaborations to promote innovation in the medical technology field.

Table 9. Micro-environment: Mannheim Medical Technology Cluster

Micro-environment (Mannheim Medical Technology Cluster)	**Positive**	• Many SMEs, Universities, and Research Institutions in Medical Technology Field. • Many medical-related institutions (Hospitals etc.). • Supplier industries (as potential entrants). • Recognition of large internal/external growth market, the cost pressure, and the globalization of the markets. • Economic integration in E.U. • Large internal/external growth market (high export ratio), number of medical-related institutions. • Competition from overseas, especially from cheaper production sites around the world, to traditional BW medical devices (surgical instruments, etc.). • Potentiality to collaborate with large ICT companies in BW (SAP etc.) for further innovations.
	Negative	• Lack of coordination between different sectors and a clear vision of the domain to collaborate.

Source: Drawn up by the author with reference to Kawabata (2020).

ACTIONS IN THE INITIAL PERIOD

In response to the initial conditions, the cluster organizations took action in the initial period toward the full-fledged launching of their activities.

InnovativeMedizin NRW

In NRW, as is introduced in Chapter 5, members of the local cluster organizations in the medical technology field knew each other through interaction at a trade fair, etc. As a result, they agreed to build a cluster organization that promotes the state-wide promotion of medical technology. Three local associations requested support from the state government, which had already launched the cluster program in 2007.

Then, the state government, the local cluster organizations, and core staff who were recruited to work for InnovativeMedizin NRW jointly surveyed the situation/conditions and potentiality of the medical technology industry in NRW in order to identify the strength in NRW, such as patents, R&D project, publications, students in the field of medical technology. The aim of the survey was also to justify the foundation of InnovativeMedizin NRW.

After the survey, the state government and the three local cluster organizations concluded the contract for promoting the state-wide promotion of medical technology wherein the state government provides financial support under the framework of the cluster program, and three local cluster organizations founded InnovativeMedizin NRW and became the owners of it.

Launching in 2011, first, InnovativeMedizin NRW invited board members from industry, universities, medical institutions, etc. Moreover, it conducted an additional survey to grasp more specifically about companies and their types of business and technology, movements in the community, prosperous areas, and topics in the region. Then, it identified the region's innovation traits, strengths/competencies, and focal points for further support. This contributed to the cluster organization launching its activities.

Forum MedTech Pharma in Bavaria

In Bavaria, before the period of the foundation of Forum MedTech Pharma in 1998, a survey on the medical technology industry was conducted jointly by the state government and Bayern Innovativ. This was to decide whether they should invest more in the industry and establish an association (e.V.) to promote technology transfer and innovation through the involvement of universities, hospitals, insurance companies, etc.

After deciding to promote the industry, Bayern Innovativ repeatedly convened conferences and held meetings/events for interaction between industry, academia, medical institutions, etc. Then, they shared the initial conditions and the necessity to promote the industry, discussed the approach for promoting it through cross-sectoral collaborations, and requested state government support.

With the support of Bayern Innovativ, Forum MedTech Pharma was founded in 1998 with the participation of 55 members, and the board members from industry, academia, medical institutions, etc., were invited.

(The present structure of the medical technology cluster, "Cluster Medizintechnik," composed of Forum MedTech Pharma and Medical Valley EMN, was founded when the state government launched the cluster program in 2006.)

Mannheim Medical Technology Cluster in BW

In the case of Mannheim city in BW, in 2009, a prior survey was conducted by the city government of Mannheim to consider the city's economic strategy, and three industrial fields, which had high growth potential, were identified to be supported for promotion. Medical technology was one of them.

The Committee for Economic Affairs, Labor, and Social Affairs of the Mannheim City Council adopted a corresponding concept for expanding and managing the medical technology cluster in its public meeting in December 2011. The committee approved the establishment of the executive board and invited board members from medical technology companies, universities (including medical faculty), and research institutions (Mannheim Medical Technology Cluster, n.d.-b). Here, Mannheim

Medical Technology Cluster was founded. Moreover, in the initial period, practice advisors were appointed from universities, hospitals, and research institutions, who would give expert advice and support to members and staff.

Later, Mannheim Medical Technology Cluster is listed in Cluster Portal BW as one of the medical technology clusters of the state.

ESTABLISHMENT AND REFINEMENT OF FIELD AND INTERVENTION

Established Field and Refined Field

The following shows fields that are established and refined in the three cases (Tables 10, 11, 12). All the cases experienced the establishment of fields, then the refinement of fields after a certain period of activities.

InnovativeMedizin NRW

The fields established in the case of InnovativeMedizin NRW were databases that enable members and external parties access to the partners, events for all members and external parties to interact and share ideas, and workshops for specific members to interact for the focal topics. These have been reviewed and refined continuously. Moreover, in 2016, a structured way to refine the field called the "structured method" was introduced.

Table 10. Established and refined field: InnovativeMedizin NRW

Established field	• Database: Containing about 700 stakeholders and opening it on the website. • Location marketing: Event for introduction/appeals of thousands of firms and clinics, universities, and infrastructure in the region and participating event for attracting potential partners and customers. • Events and conference: Aiming to make members understand the benefit of participating and increase the possibility of building collaborative projects through interaction and information exchange. • Workshops for building projects: Workshops to build up communities where potential participants of projects interact and start projects in the focal topics (four fields of innovations: Biologization, Digitalization, Human–Technology Interaction, Personalization).
Refined field	• Continuously reviewing and refining field (i.e., events, workshops). • (2016–) Reorganized events, workshops, and meetings (conferences) in accordance with the "structured method" (See "INTERVENTION IN THE EMERGING INTERACTION TOWARD CROSS-SECTORAL COLLABORATIONS" below for the details).

Source: Drawn up by the author with reference to Kawabata (2020).

Forum MedTech Pharma in Bavaria

The databases, events for all members, and events for specific members (like workshops that provide a certain topic) were also established as fields in the case of Forum MedTech Pharma. In the refinement of fields, specific categories of members were additionally invited to keep composition balance or enhance the activities of newly focusing areas. Moreover, fields (events and workshops, etc.) were newly introduced to deal with new topics (e.g., regulations, digitalization and change in business model, market entry), especially after the 2010s. Recently, the digital platform is also utilized to enhance the interaction toward collaborations.

Table 11. Established and refined field: Forum MedTech Pharma

Established field	• Database: Containing members and opening it on the website. • Industry meeting expert working groups (for networking). • Matchmaking events (annual events). • Expert circles: Small group workshop to discuss a topic to identify challenges, benefits, competences, strengths, as well as lags and weak points within the community, then to bring points of interest on the platform. • Branch meeting: A conference is held at a host company where all the participants meet and focus on the competences of that company and its idea for the project. Then, the collaborative project is led by the host company.
Refined field	• Inviting members from clinics, hospitals, academia, and science to increase their ratio. • Events/workshops etc., to deal with the shift in the topic (challenge) from technology to regulation, digitalization, change in business model, and market entry (the 2010s–). • Digital platform showing pictures such as technology and roadmap for particular subjects, which can be visited and viewed by stakeholders, members, and clients. That helps to identify the paths to work on and where they could be involved in this path transparently and efficiently. • Digital platform for interactive Q&A.

Source: Drawn up by the author with reference to Kawabata (2020).

Mannheim Medical Technology Cluster in BW

As the established field in other cases, databases, events for all members, and events for specific members (like workshops that provide a particular topic) were provided in the case of Mannheim Medical Technology Cluster. The notable feature of this case is that aiming to synergize between virtual and real infrastructure, they expanded physical places as fields for accelerating the interaction. Moreover, the digital platform has recently been utilized to promote knowledge transfer.

Table 12. Established and refined field: Mannheim Medical Technology Cluster

Established field	Focusing on the "virtual" infrastructure (–2014): • Database: Containing about 100 members and opening it on the website. • MEDTECH DIALOGUE: A networking event held every three months, inviting every member under a certain line of topics (e.g., technology, marketing). • DELIVER: Promoting internationalization and market access. • INSPIRE - DIGITAL HEALTH DEVELOPMENT AND TESTING PLATFORM: Systematic and organized access to knowledge, technology, and support for startups and SMEs.
Refined field	Focusing on the "real" infrastructure (2014–): Innovation ecosystem by creating a physical place where startup entrepreneurs, hospital physicians, medical researchers, and technical researchers work together in one room under one roof to develop medical devices. • Cubex41: 1800 square meter office and laboratory space. → (Expansion of its scale) → MMT campus: 20,000 square meter office and laboratory space, funded by the city, the Federal State (E.U. fund), and private investors. → Expanding and establishing the spaces /buildings for collaborative R&D and startup in the technology park (in 2022). • (After COVID-19) Switching to utilize digital platforms for knowledge transfer.

Source: Drawn up by the author with reference to Kawabata (2020).

Intervention for Establishment and Refinement of Field

The case studies show that the cluster organizations intervene to establish and refine the field. This is to direct members with introducing concepts/areas to focus on. The interventions for refinement of the field are implemented considering the business environment, communication with members and other stakeholders (like board members and public sectors such as the state government), and reflection on the results of experienced activities toward forming the collaborations. The following are the details about the intervention in establishing and refining the fields of each case (Tables 13, 14, 15).

InnovativeMedizin NRW

InnovativeMedizin NRW implemented interventions to establish the field by selectively approaching firms to be members, constructing a database, and setting up fields to promote innovations in four areas (Biologization, Digitalization, Human–Technology Interaction, and Personalization). Moreover, surveys and consultations with the stakeholders were conducted to consider the required intervention in establishing and refining the field.

Table 13. Intervention for establishment and refinement of field: InnovativeMedizin NRW

Intervention for the establishment of field	• Approaching to firms: Explaining the benefit of participation (i.e., opportunities for innovation and business, administrative support). • Constructing database. • Focusing on four fields of innovations and setting up fields to pursue them (event, workshop, etc.).
Intervention for refinement of field	(Both for establishment and refinement of field) • Decision based on survey and experience. • Consultation with the local cluster organizations (including the voice of their members), board, external expert, and the state government.
	• (2016–) Introduction of the "structured method" and reform of running fields (e.g., workshops, meetings, etc.) reflected with preceding (inefficient) process toward collaborative projects (See "INTERVENTION IN THE EMERGING INTERACTION TOWARD CROSS-SECTORAL COLLABORATIONS" below for the details).

Source: Drawn up by the author with reference to Kawabata (2020).

As a notable effort, after a certain period of activities of the staff of InnovativeMedizin NRW, through the consultation with the state government, the "structured method" aimed to achieve more efficient/effective ways to intervene in the formation of project consortia was introduced in 2016. The method comprises five steps, one of which is to set up a field (for example, building a community through events and workshops that target persons interested in a specific topic).

Forum MedTech Pharma in Bavaria

Forum MedTech Pharma implemented intervention by openly recruiting members, constructing a database, and conducting technology scouting for setting up the field. Moreover, in both establishment and refinement of the field, consultation with the stakeholders was conducted to consider the intervention to be required. In the refinement of the field, members were selectively approached and recruited.

Regarding the notable effort of Forum MedTech Pharma, the activities and the formats for types of fields (for example, events and workshops) were developed by the staff of Forum MedTech Pharma. The staff conducted technology scouting to identify trends and challenges in the medical technology field. Moreover, refinement of the field has been implemented through close communication with the board and members. The staff always visits member organizations or meets them during

workshops and inquires about their needs (e.g., support for their business and shortening from innovation to the market). Then, the staff receives the critical points and feedback for refinement of the field from the members. Moreover, there is also an opportunity to bring the point of interest for refinement of the field through discussion in the "expert circle," which targets a specific topic to discuss the challenge in a small workshop. Therefore, the process of defining the topics and developing certain formats has been promoted through trial and error and examined to see whether it is successful.

One of the results of the effort was the shift of the main topic/challenge from "developing technology" to "facilitating innovation process" (including dealing with regulatory barriers, digitization and change in business model, and market entry). The field was transformed to provide opportunities to share information/knowledge about the new topic/challenge and to strengthen or increase individual consulting to facilitate interaction in the new direction.

Table 14. Intervention for establishment and refinement of field: Forum MedTech Pharma

Intervention for the establishment of field	• Call for members (open recruitment). • Constructing database. • Conducting technology scouting and setting up the field (events, workshops).
	(Both for establishment and refinement of field) • Technology scouting. • Consultation with key stakeholders (e.g., board, members, etc.).
Intervention for refinement of field	• Developing format to create fields through communication with members. • Approaching to invite clinics, hospitals, academia, and science to be members with consideration of the current composition of members. • Strengthening/increasing information sharing and individual consulting to deal with the shift of topic/challenge to regulation, digitalization, change in business model, and market entry.

Source: Drawn up by the author with reference to Kawabata (2020).

Mannheim Medical Technology Cluster in BW

It is also observed in the case of Mannheim Medical Technology Cluster that the intervention to establish and refine the field is implemented by recruiting members, constructing a database, and setting up the field. Moreover, in both establishment and refinement of the field, consultation with the stakeholders was conducted to

consider the intervention to be required. As a result, the focus of the intervention was shifted from virtual to real, as is explained below.

Concerning the notable effort of Mannheim Medical Technology Cluster, firstly, it implemented a distinctive way of recruiting members in the initial period of the establishment of the field. They openly recruited members who wished to join. In addition, however, they also ranked the potential members based on the value chain impact and approached them by visiting and sending invitation letters. The ranking was based on the following criteria:

- First Approach (Impact 1): Companies performing medical device research, production, and sales.
- Second Approach (Impact 2): Companies that do not have the entire value chain of their market segment (either not to develop but to produce and sell, to develop and produce but not to sell, or to produce critical components of medical devices).
- Third approach (Impact 3): Specialized expert service providers, such as regulation, health technology assessment, reimbursement, market research, highly specialized for R&D and lab operations, etc.

Table 15. Intervention for establishment and refinement of field: Mannheim Medical Technology Cluster

Intervention for the establishment of field	• Call for members: Started from a "proactive approach" by making the catalog of medical technology companies, engineering service providers, hospitals, and universities, then sending letters and visiting to invite them as members. The approach is based on the value chain impact. "Reactive approach": Accepting people who wish to be members. • Constructing database. • (–2014) Focusing on "virtual" infrastructure and setting up the field (event, workshops).
	(Both for establishment and refinement of field) • Continuous loop of validation for creating the concept of the field with the practice advisors, the executive board, and members.
Intervention for refinement of field	• (2014–) Focusing on "real" infrastructure to deal with an increasing number of participants who wish to collaborate.

Source: Drawn up by the author with reference to Kawabata (2020).

The second effort was to refine the field by expanding the real infrastructure (physical places). The measure started in 2014, three years after they launched the cluster initiative when they saw the growing number of people, entries of companies,

and startups. The aim was to secure the development and position of the city as the hub of the medical technology industry by building facilities/spaces (See Table 12 for the details) where entrepreneurs and startups collaborated with doctors, engineers, and scientists and were able to gather under one roof, enhance the ecosystem, and develop medical devices.

INTERVENTION IN THE EMERGING INTERACTION TOWARD CROSS-SECTORAL COLLABORATIONS

The intervention in the emerging interaction toward cross-sectoral collaboration in the three cases is described below (Tables 16, 17, 18). It is observed in all the cases, based on the direction of the established and refined field, interventions are implemented by the cluster organizations to facilitate emerging interactions between members or members and external parties from various sectors toward the formation of cross-sectoral projects.

InnovativeMedizin NRW

The interventions on the emerging interaction implemented by InnovativeMedizin NRW were provided to the potential collaborators (between members or between members and external parties) through supporting marching, providing basic elements to promote collaborations, and implementing the "structured method."

Table 16. Intervention in the emerging interaction: InnovativeMedizin NRW

Intervention for facilitating emerging interaction (Innovative Medizin NRW)	• Support for the matching process with consideration of all the requisite conditions (e.g., required roles and collaboration partners) from the initial step: (1) Through direct approach by the staff of InnovativeMedizin NRW. (2) Supporting firms in approaching potential partners. (3) Announcing and calling for collaboration partners to apply for competitive funds etc. • Providing the basic elements to promote collaborations: (1) Clarifying the common goal. (2) Helping to communicate between the different sectors (moderating and translating). • Implementing the "structured method" to promote the collaborations.

Source: Drawn up by the author with reference to Kawabata (2020).

As an example of a notable effort by InnovativeMedizin NRW, the "structured method" can be mentioned. This is an integrated measure for intervention in setting up the field and emerging interaction to form collaborative projects. The method consists of the following five steps.

Step 1. Definition of the status and analysis of the situation as stocktaking in a specific field and identifying the topic for the cross-sectoral project: This is conducted through survey and hearing to experts in specific fields (e.g., implants). Here, the staff of InnovativeMedizin NRW talks to experts, such as scientists and clinicians, and finds a specific demand for the product. Then the existence of a critical mass of the market in the region is considered. Finally, based on the survey, the topic for the cross-sectoral project is defined.

Step 2. Build up community through events, workshops, and interviews: First, people who work on or are interested in the defined topic are identified by utilizing the network or contacting potential partners (including those in other fields like biotech, patient organizations, and health insurance companies). Then, the partners' interests in participating in the project are confirmed. Second, meetings and workshops are organized by inviting all these people, and the more concrete topic and participants interested in implementing the topic as a project are identified. If it is confirmed, the staff invites them to exchange their opinions. Moreover, if there are calls for projects that provide competitive funds from the state/federal governments or E.U., the staff screens them. The staff contacts potential participants and arranges meetings if they fit the project.

Step 3. Setting up a strategy with white paper: If they trust the partners and agree to participate, then the structured processes for the project are defined, and a white paper is drawn up. This paper is a strategic paper to promote innovation in a particular field (about 15 pages), which is also utilized for applying for competitive funds. The staff of InnovativeMedizin NRW draws up the paper by integrating the opinions of the participants (and experts) and brushes it up through interaction and feedback from members.

Step 4. Conference to set up the project: If the proposal is approved, the project consortium is formally built, and they begin work.

Step 5. After the project's inauguration: Even after they start the project, the staff supports the members, for example, in administrative work, to operate the project smoothly and ensure devotion to the project work itself.

In addition to the steps above, after the phase of a funded project that focuses on R&D, to transfer the achievement (the developed technology) to a business model, an additional partner is sometimes sought, and the staff continuously supports the member of the new consortium in the commercialization phase.

Forum MedTech Pharma in Bavaria

Forum MedTech Pharma introduced a "three-step approach" to intervene in emerging interactions. Moreover, it plays as a bridge between potential collaborators who have different views on time scales and approaches.

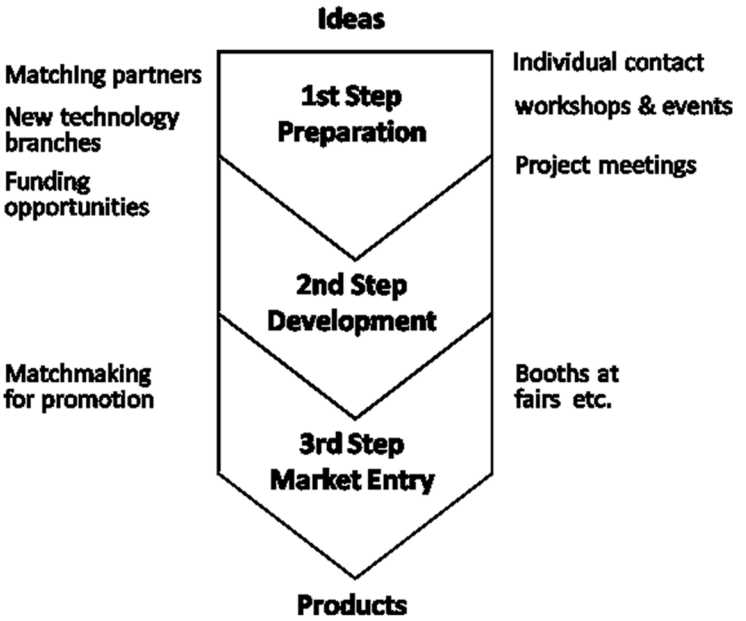
Table 17. Intervention in the emerging interaction: Forum MedTech Pharma

Intervention for facilitating emerging interaction (Forum MedTech Pharma)	• "Three-step approach" as a general framework for promoting funding projects: Support for the whole value chain. • Overcoming the different time scales (e.g., between medical technology and other companies) and approaches (e.g., between clinics and companies): Bringing together to have specific workshops and conferences to deal with the difference through discussing the expectation from each other and improving the sensibility of each to the challenge of another side in order to realize successful cooperation.

Source: Drawn up by the author with reference to Kawabata (2020).

"Three-step approach" is a notable effort by Forum MedTech Pharma in Bavaria (Figure 1). This general framework for promoting funding projects enables effective intervention in the whole value chain (from the idea to the production phase).

Figure 1. The three-step approach by Form MedTech Pharma
Source: Kawabata (2020).



Step 1. Preparation and idea development phase: For example, if a client company has an idea for a new product and needs partners, the staff of Forum MedTech Pharma supports them in several ways. If the idea is confidential, the staff individually contacts persons interested in it. On the other hand, if it is a general idea and the client company wants to discuss it more broadly, the staff sends mail to members. In addition, it organizes small workshops to bring potential partners together from other technologies and sectors. Partnering can also come into effect from networking events and branch meetings (See Table 11). At the meeting with the potential partners, the client company, who has the idea, gives lectures to identify the best and then moves to the project meetings.

Step 2. Launching the project: Here, the staff support identifying the possibility of funding and supports the application process. This step is led by the partners themselves. The product is developed in this step, and usually, the product is demonstrated.

Step 3. Supporting the market entry of the product: The staff helps organize booths at fairs, helps organize matchmaking for promotion, and organizes communication through online and paper tools.

Mannheim Medical Technology Cluster in BW

Mannheim Medical Technology Cluster also implements intervention to facilitate the emerging interaction toward cross-sectoral collaboration. It has two approaches: The "demand-oriented" and "project-oriented" approaches.

Demand-oriented and project-oriented approaches were introduced as the notable efforts employed by Mannheim Medical Technology Cluster for implementing the intervention in the emerging interaction.

The demand-oriented approach is implemented through visiting and talking with members in the meetings and the workshops etc., then providing support (for example, matching partners between members or between members and external parties) based on their request.

Table 18. Intervention in the emerging interaction: Mannheim Medical Technology Cluster

Intervention for facilitating emerging interaction (Mannheim Medical Technology Cluster)	• "Demand-oriented" approach: Visiting, talking, proposing, and supporting to make the appropriate link based on member's demand. • "Project-oriented" approach: Forming a research consortium by supporting to build a project based on the ideas of members (e.g., new diagnosis and treatment proposed by a research institution) or by leading the consortium as a project manager (e.g., the project of INSPIRE).

Source: Drawn up by the author with reference to Kawabata (2020).

The project-oriented approach supports building project consortia based on the idea of members through (1) Matchmaking between members to establish a consortium that confirms the value chain, (2) Using a database to make the information (for example, project aims and technology developed by members) visible either broadly or selectively to members, and (3) Inviting and having a small conference to discuss whether the idea has a high potential and impact. If so, the partners form a consortium and start a collaborative project. In that process, there exists the case that a staff of Mannheim Medical Technology Cluster is appointed as a project manager and leads the consortium.

REFERENCES

Ache, P. (2002). North-Rhine Westphalia. In P. Raines (Ed.), *Cluster development and policy* (pp. 71–90). Routledge.

Clusterportal Baden-Württemberg. (n.d.). *Mannheim Medical Technology Cluster.* https://www.clusterportal-bw.de/clusterdaten/clusterdatenbank/clusterdb/Clusterinitiative/show/clusterinitiative/mannheim-medical-technology-cluster/

deutschland.de. (n.d.). *Federal States of Germany.* https://www.deutschland.de/en/topic/politics/germany-europe/federal-states

Forum MedTech Pharma e. V. (n.d.). https://medtech-pharma.de/

Iwamoto, K. (2015). Hitorigati no Doitu kara Nihon no chiho/chushokigyo heno sisa: Doitu genchichosa kara [Suggestion from sole-winning Germany to local regions/small and medium-sized enterprises in Japan: From field survey in Germany]. *RIETI Policy Discussion Paper Series,* 15-P-002, 1-59.

Kawabata, Y. (2020). Managing to facilitate cross-sectoral inter-organizational collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *10*(2), 13–41.

Mannheim Medical Technology Cluster. (n.d.-a). https://medtech-mannheim.de/

Mannheim Medical Technology Cluster. (n.d.-b). *Executive board.* https://medtech-mannheim.de/de/cluster-management/executive-board

Statista. (n.d.). *Unemployment rate in Germany by federal state*. https://de.statista.com/statistik/daten/studie/36651/umfrage/arbeitslosenquote-in-deutschland-nach-bundeslaendern/

Chapter 9
Discussion and Conclusion

ABSTRACT

Section 3 elucidates the management approach of facilitating the self-organization process toward cross-sectoral collaborations. The review of the theoretical study in Chapter 7 derives the conceptual model, and the case study in Chapter 8 examines the three cases on the management to facilitate cross-sectoral collaborations by cluster organizations of the medical technology field in Germany. In this chapter, based on the conceptual model, the result of the case study is comparatively analyzed and clarifies the similarities and differences between the cases. Then, focusing on the individual case with the approach of process tracing, events observed in the implementation of intervention by the cluster organizations are chronologically clarified, and the causal mechanism is examined by focusing on initial conditions, establishment/refinement of field, and emerging interaction. Finally, the validity of the conceptual model is considered based on the findings, and implications are discussed.

COMPARATIVE ANALYSIS OF THE THREE CASES

This study considers the management to facilitate the self-organization process of cross-sectoral collaborations characterized by complexity (Fuchs, 2003; Heylighen, 2013; Plowman et al., 2007). The case study of the three states in Germany shows differences in the path, methodology, and focus of the intervention. However, it is commonly found that the management layer (in the case study, cluster organization) implements goal-directional intervention to facilitate the self-organization process (Imada, 2008) by focusing on the initial conditions, field, and emerging interaction toward the collaborations. This is, as Gray (2008) explains, to increase the driving

DOI: 10.4018/978-1-6684-8494-4.ch009

factors for alliance success (therefore collaborations) by influencing the interaction between the parties concerned. More specifically, in the following section, the results of the case study are discussed based on the conceptual model.

Intervention for Learning the Initial Conditions and Fostering Felt-Need

Similarity Between the Cases

Intervention in learning the initial conditions aims to learn and share them and foster the felt-need by involving the parties concerned through collaboratively observing and understanding (Dickens & Watkins, 1999).

First, all cases show that surveys to understand the initial conditions were conducted by the core parties involved in the foundation of the management layers. These are the state government (in the case of NRW and Bavaria), the affiliated organization of the state government (Bavaria), the city government (in the case of Mannheim in BW), and the core staff of the management layer (all cases). Learning the initial conditions helps individuals reflect on and obtain new insight into the totality of the situation (Burnes, 2004). In reality, the survey helps them learn about macro and micro environments (Bryson et al., 2006; Bryson et al., 2015; Chen, 2008; Gray, 2008; Whetten, 1981) and social networks (Granovetter,1985; Gulati, 1998; Gulati & Gargiulo, 1999; Lazzarini et al., 2008) related to the business in the medical technology field. Based on the survey, they could grasp the industry's growth potential, clarify the challenges to overcome, and then justify supporting the industry's promotion and the cluster organizations' foundation.

Second, concerning how to foster felt-need, the core parties described above tried to involve key stakeholders from industry and academia through convening, approaching, and inviting them as key constituent members (for example, board, committee, and contracted external expert/advisor). As Dickens and Watkins (1999) explain, this is to involve parties concerned and foster the change. In reality, the stakeholders collaboratively participated in the process to share and learn the initial conditions, discuss, and share felt-need and direction toward launching the activities of the management layer. This, in turn, facilitates cross-sectoral collaborations.

Finally, after a certain period from launching activities, it is also observed that the management layers lead to recognizing the change in the business environment (including change in the initial conditions), feedback from members, and activities experienced. Therefore, in this stage, members from industry and academia are also directly/indirectly involved in learning about the change and fostering the felt-need for the new and reconceptualized direction. This leads to the refinement of the field (Itami, 1999), as shown below.

Difference Between the Cases

The difference is observed in the path to learning the initial conditions, the path to fostering felt-need, and the actor who facilitate fostering felt-need and involve key stakeholders. In the case of NRW, the felt-need for the foundation of InnovativeMedizin NRW and promoting state-wide cross-sectoral collaborations was fostered through bottom-up interaction between the three local cluster organizations. Then, the three cluster organizations requested (and involved) the state government for support and jointly surveyed to grasp the initial conditions and justify the foundation of InnovativeMedizin NRW. In the case of Bavaria and BW, the public sector (the state government and Bayern Innovativ in Bavaria, the city government in BW) conducted a survey first and grasped the initial conditions., then targeted medical technology as one of the industries to promote. Moreover, through providing places to interact or approach, they involved key stakeholders from industry and academia, etc., and facilitated fostering and sharing felt-need toward the collaborations for promoting the medical technology industry.

Intervention for Establishment and Refinement of Field

Similarity Between the Cases

The interventions of the management layer facilitate the establishment and refinement of the field, as Itami (1999) proposes, from the setting-up approach. Moreover, it is found from the case study that the management layer is organized before that. The details are as follows.

First, organizing the management layer is observed in all cases. This is the notable finding observed in "Actions in the initial period" in the case study in Chapter 8 and should be included in the conceptual model. The management layers are organized based on the felt-need and agenda/purpose. These include recruiting staff and inviting key stakeholders who influence each sector (i.e., industry, universities, and medical institutions) as critical constituents of the management layer. This contributes to the management layer to satisfy some requisites for establishing the field (Itami, 1999; Gray, 1989), such as specifying appropriate stakeholders, setting agendas, maintaining legitimacy, authority, and fairness, then justifying the layer to intervene.

Second, it is commonly observed that the establishment of a field is facilitated through the intervention by the staff of the management layer through 1. presenting the goal and (either selectively or openly) calling for members, 2. constructing a member database that helps members/external people access to the partners, and 3. holding general meetings (like annual conferences) for all members to share trends (topics) and facilitate interaction, 4. holding events and workshops targeting

certain members (including external parties) to exchange information and interact toward pursuing the collaborative project in a specific field or realizing a specific purpose (e.g., displaying in the trade fair). The intervention by the layer satisfies some requisites for the establishment of the field (Itami, 1999; Gray, 1989), such as selecting members, setting and sharing the basic elements of the field, enabling members to understand the purpose and the value of collaborations, utilizing the layer's power to convene and skill to perform the process. The intervention to establish a field in the initial period is implemented based on the interaction and agreement between the staff of the management layer and the key constituent members.

Finally, regarding the intervention in the refinement of the field, it is commonly observed that these interventions are not only based on the interactions and the agreement between the staff of the management layer and the key constituent members but also reflect the change in the business environment, feedback from members, or the lessons learned from the experienced activities toward the cross-sectoral collaborations. Here, the management layer facilitates the refinement, as Imada (2008) proposes, through reading and developing new vectors and goals, clarifying the new role and institutionalizing allocation rules, ensuring personnel/social resources, controlling structural incongruence, and steering the system toward a new direction, which enables the field to sustain the continuous state of adaptation (Burnes, 2004) through the cyclical process.

Difference Between the Cases

Looking at the notable effort of each case introduced in Chapter 8, the difference is observed in the methodology of intervention in the establishment field by the management layer (e.g., "expert circle" In the case of Bavaria, "selective approach to members based on the value chain impact" in the case of BW).

Moreover, intervention in the refinement of the field by the management layer varies in terms of timing and methodology; for example, setting the field based on the "structured method" (NRW), approaching new members (Bavaria), introducing new topics and setting new fields (Bavaria), constructing digital platforms (Bavaria), and building physical spaces (BW).

Furthermore, they have their own focus on the intervention (e.g., focusing on four fields of innovations in the case of NRW, the field for "facilitating innovation process" in the case of Bavaria, and "real infrastructure" in the case of BW).

Intervention in the Emerging Interaction Toward Cross-Sectoral Collaborations

Similarity Between the Cases

All cases show that the management layers, based on the direction of the established/refined field, implement interventions to facilitate emerging interaction toward cross-sectoral collaboration. Although each case has its approach (e.g., degree of structuration), the common points are observed as follows.

First, interventions are implemented to facilitate the emerging interaction toward collaboration. It is observed in the case study that interventions that appear to correspond to the role of the intervener introduced in Chapter 7 are performed by the management layer. These are:

1. Visioning (Gray, 2008) through presenting/sharing the domain of the collaborations (like clarifying the demand for the product and sharing the ideas proposed by a member).
2. Networking/matching through convening and approaching potential partners to support the organizing process of collaborative projects. This is implemented through brokering, convening, and organizing professionally to enable members of diverse interests to enjoy meaningful participation (Gray, 2008; Kaats & Opheji, 2014; Koschmann et al., 2012).
3. Clarifying the agreement (e.g., "white paper" in the case of NRW) for institutionalizing it by the text (Gray, 2008; Koschmann et al., 2012).
4. Coordinating between partners (e.g., bridging the gap of the approaches, moderating, and helping/translating to facilitate communications). This ensures brokering and avoiding conflict (Gray, 2008).
5. Structuring (or designing) the process to enable participants to structure the problem, enhance group dynamics, and promote sense-making (Gray, 2008; Kaats & Opheji, 2014).

These interventions facilitate the process from the emerging interaction between individuals to the entity established with a defined role, established project, and the form disseminated to the broader public and audiences (Hartman & Johnson, 1990; Nicotera, 2013; Schacter, 1951; Turner, 1962).

Second, in addition to the emerging interaction toward cross-sectoral collaborations, it is also observed that the management layer also supports the operation of the collaborative project after the launch if requested. Support is provided by helping the operations (i.e., administrative work, matchmaking support in the commercialization phase, or playing the role of a project manager) to promote the project smoothly.

Difference Between the Cases

Regarding the intervention in the emerging interaction, differences are observed between the cases in the sense that they have their methodologies. In the case of NRW, the "structured method," composed of five steps, was introduced as an integrated measure with the refinement of the field to make more efficient/effective ways to intervene in forming a collaborative project. The three-step approach was adopted in the case of Bavaria, which was the general framework for implementing intervention effectively on the whole value chain. Finally, in the case of BW, both demand-oriented and project-oriented approaches have been taken for the intervention.

ANALYSIS AND INTERPRETATION OF EACH CASE

Focusing on the individual case, this part analyzes and interprets the causal relationship between events and deepens the understanding of the management approach of facilitating the self-organization process toward cross-sectoral collaborations. Figures 1, 2, and 3 depict the result of the analysis.

InnovativeMedizin NRW

Initial Conditions and Intervention

Regarding the positive macro-environment, the state government of NRW turned its policy to utilize external partners for promoting new industries/businesses. The state government launched a cluster program in 2007 and supported/directed the cluster initiatives. Moreover, the competitive fund required cross-sectoral project team formation to apply for it. Looking at the positive micro-environment, NRW had large internal/external markets (which were integrated, globalized, and competitive), many SMEs (including potential entrants), research institutions, medical institutions, etc. In addition, the new scope of activities, such as ICT, expanded collaboration opportunities. In contrast, regulatory barriers and lack of coordination between different sectors in the medical technology field were regarded as negative macro/micro environmental factors. In this situation, the staff of the three local cluster organizations repetitively interacted through the events and formed their network.

Through the interactions, the local cluster organizations shared an understanding of the initial conditions and fostered the felt-need to found an integrated structure (i.e., a cluster organization for state-wide activities) to take advantage of the positive factors and overcoming the negative factors toward facilitating the state-wide activities of cross-sectoral collaborations. Then, they requested the state government for

support under the framework of the cluster program and jointly surveyed to clarify the situation and justify launching a state-wide cluster organization. Consequently, the state government and the three local cluster organizations concluded the contract, and the four fields of innovation were identified as targets to promote. In 2011, InnovativeMedizin NRW was founded, and the board members from industry, universities, medical institutions, etc., were invited. Moreover, it conducted an additional survey to grasp more specifically about the medical technology industry of the region and clarify the pictures for launching its activities of promoting the four targeted fields of innovations.

Intervention in the Establishment and Refinement of Field

In order to promote the four fields of innovations (Biologization, Digitalization, Human-Technology-Interaction, and Personalization) through cross-sectoral collaborations, fields (i.e., workshops, events, and meetings) were set up to facilitate the interaction of members (and other stakeholders), and pursue the opportunities for the collaborative project. Moreover, in the initial period of launching, the staff of InnovativeMedizin NRW approached firms to recruit additional members and constructed a database of stakeholders to accelerate the interaction.

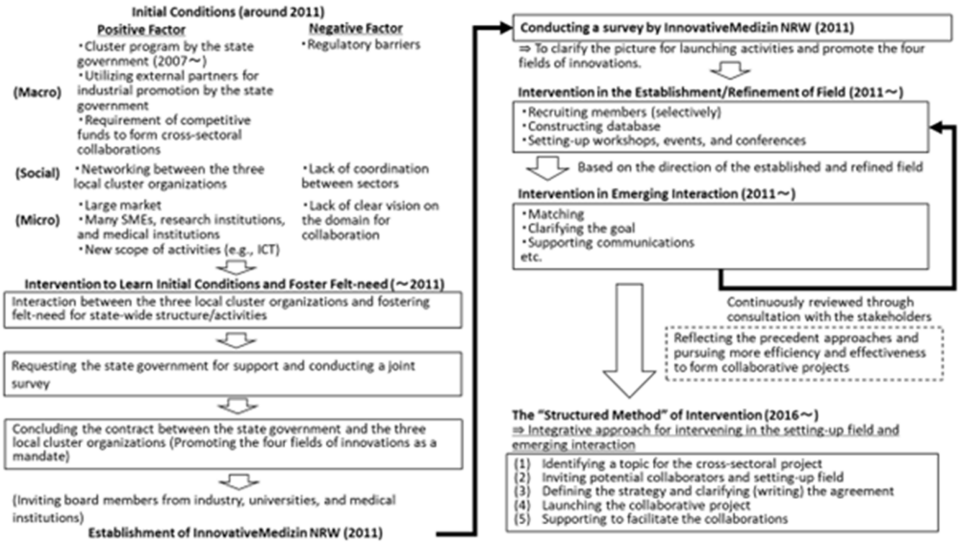
The refinement of the field (i.e., introducing new workshops, etc.) has been continuously implemented through consultation with the stakeholders after launching the activities. Moreover, in 2016, the "structured method" was introduced to realize more efficient/effective ways to intervene in forming a collaborative project. The fields have been set up in accordance with the methodology from then.

Intervention in Emerging Interaction

With the direction guided by the established and refined fields, the interventions (e.g., matching, providing the basic elements such as support for communication, etc.) have been implemented by InnovativeMedizin NRW to facilitate the emerging interaction between members or members and external parties toward the formation of cross-sectoral collaborations.

Reflecting the precedent approach and pursuing a more efficient and effective way to form collaborative projects, the "structural method" was introduced. This was an integrative approach composed of five steps for intervening in emerging interaction and setting up (establishing and refining) field, which could be summarized as (1) Defining a topic for the cross-sectoral project, (2) inviting potential collaborators and setting-up field, (3) defining the strategy through consultation with participants and clarifying (writing) the agreement, (4) launching the collaborative project, (5) supporting to facilitate the collaborations.

Figure 1. Intervention to facilitate cross-sectoral collaborations: InnovativeMedizin NRW
Source: Drawn up by the author.



Forum MedTech Pharma in Bavaria

Initial Conditions and Intervention

The positive macro-environment observed in the case of Bavaria is as follows. First, the state government and Bayern Innovativ supported the industrial network by providing finance and founding cluster organizations from the mid-1990s. The requirement of forming a cross-sectoral collaboration to apply for the competitive fund was also a positive factor. Moreover, from 2006, more systematic support was provided under the cluster program. Concerning the positive micro-environment, Bavaria had large internal/external markets (which are integrated, globalized, and competitive), many SMEs (including potential entrants to the medical technology industry) and large companies, research institutions, medical institutions, etc. Moreover, changes in the business model and new topics to focus on also contributed as positive factors to establishing new forms of collaboration. Conversely, as in the other cases, regulatory barriers (macro-environment) and lack of coordination between different sectors (micro-environment) in medical technology contributed as negative factors. Finally, regarding the social network, although coordination between different sectors was still lacking, networking was facilitated through the meetings/events held by Bayern Innovativ as below.

Bayern Innovativ and the state government led the intervention in learning and sharing the initial conditions before the foundation of Forum Medtech Pharma. They jointly conducted the survey and decided to support promoting the medical technology industry and founding a cluster organization. Moreover, the regional stakeholders from industry, academia, and medical institutions were repeatedly invited to the conferences and meetings/events held by Bayern Innovativ, wherein they had opportunities to form networks, learn/share the initial condition, and foster their felt-need toward collaboratively promoting the medical technology industry. Consequently, Forum Medtech Pharma was founded in 1998 with the participation of 55 members, and board members from industry, academia, and medical institutions were invited.

Intervention in the Establishment and Refinement of Field

In the initial period of launching the activities, a database of members was constructed to accelerate the interaction between them and enable external parties to access them smoothly. Furthermore, forum MedTech Pharma employed open recruitment for members and set up workshops and events based on the result of the technology scouting by itself and consultation with the key stakeholders.

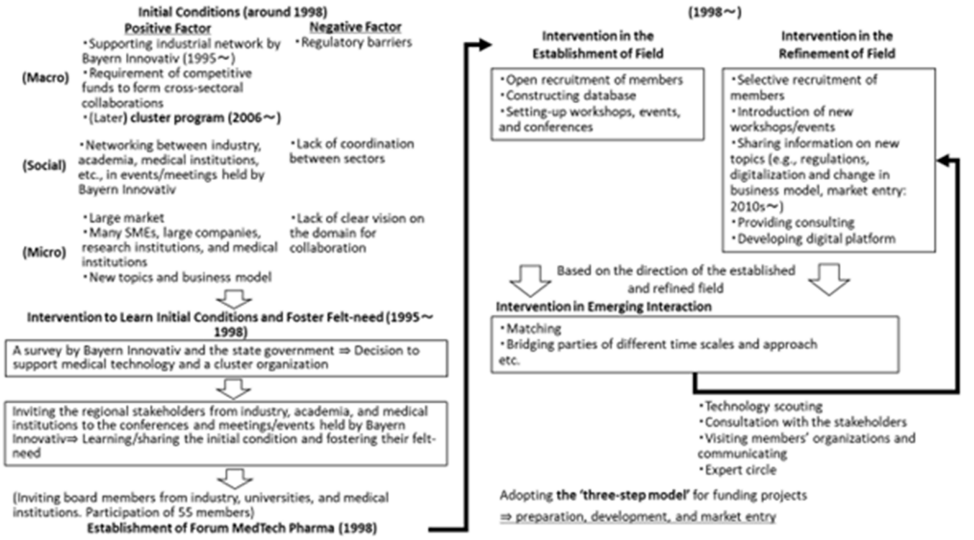
The refinement of the field has been continuously implemented through selectively inviting new members, introducing new workshops/events, sharing information on new topics, providing consulting, and developing a digital platform. The intervention in the refinement of the field has been considered, as in the establishment of the field, by technology scouting and consultation with the key stakeholders. Moreover, as a notable feature of Forum MedTech Pharma, it stressed to reflect the voice of members. This is conducted through communication with member organizations by visiting them and holding an "expert circle" to discuss a specific topic. The feedback from members has been considered to design activities and development formats for refining the field.

Intervention in Emerging Interaction

The intervention (e.g., matching, bridging parties of different time scales and approaches, etc.) has been implemented by Forum MedTech Pharma to facilitate the emerging interaction between members or between members and external parties to form cross-sectoral collaborations. As in the other cases, these are also implemented in line with the direction of the established and refined fields.

As a notable approach of Forum MedTech Pharma, the "three-step approach" was introduced as a general framework to effectively promote the process from idea generation to the market entry of products in the funding projects. Based on the steps, fields (e.g., workshops, meetings, events) are set up, and the intervention in emerging interaction (e.g., matching) is implemented in line with it.

Figure 2. Intervention to facilitate cross-sectoral collaborations: Forum MedTech Pharma
Source: Drawn up by the author.



Mannheim Medical Technology Cluster in BW

Initial Conditions and Intervention

The positive macro-environment observed in the case of BW is as follows. First, the cluster program of the BW state government (2006–) supported professionalizing the management of cluster organizations. In addition, more directly, the city government of Mannheim founded and operated the cluster organization (Mannheim Medical Technology Cluster) to facilitate cross-sectoral collaborations toward promoting the medical technology industry. The requirement of forming a cross-sectoral collaboration to apply for the competitive fund was also a positive factor. Concerning the positive micro-environment, large markets existed inside/outside the region (which is integrated, globalized, and competitive). Moreover, many SMEs (including

potential entrants), ICT companies, research institutions, and medical institutions, which were essential for the collaboration, existed in the region. In contrast, as in the other cases, they also faced regulatory barriers and a lack of coordination between different sectors in the medical technology field. These contributed as negative factors in promoting the collaborations.

The city government of Mannheim led the intervention in learning and sharing the initial conditions. First, in 2009, it conducted a survey and decided to support three high-growth potential industries, including medical technology. In the survey on the medical technology field, the critical mass of the triangle composed of companies, research institutions, and hospitals toward the promotion was recognized. It fostered the felt-need of the parties concerned in the city government to promote the industry through cross-sectoral collaborations. Then, after the approval of the committee of the city government, in 2011, Mannheim Medical Technology Cluster was founded as a unit of the city government. In the initial period of the foundation, the regional stakeholders from industry, academia, medical institutions, etc., were approached by the city government to share the initial conditions, felt-need, and vision toward promoting the industry, then were invited as board members. Moreover, the city government approached experts in these sectors and agreed they would cooperate as practice advisors.

Intervention in the Establishment and Refinement of Field

In the initial period of launching, the database of members was constructed and opened on the website to accelerate the interaction. Members were recruited openly and selectively (based on value chain impact). Moreover, conferences, workshops, and events were set up to interact for networking and discussing specific topics (e.g., MEDTECH DIALOGUE), promoting internationalization and market access (e.g., DELIVER), and accessing knowledge/technology and supporting start-ups (e.g., INSPIRE - DIGITAL HEALTH DEVELOPMENT AND TESTING PLATFORM).

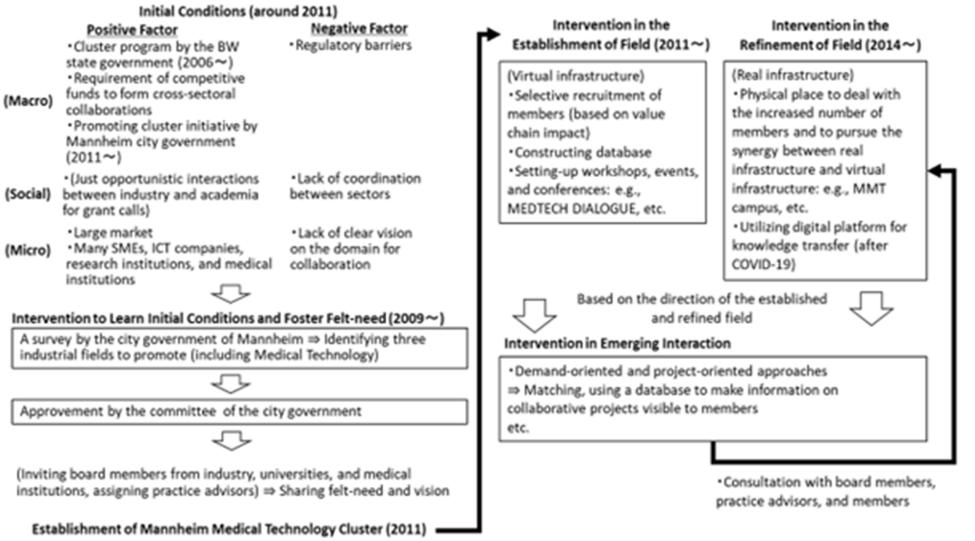
Intervention in the setting-up field has been implemented through consultation with board members, practice advisors, and members. Regarding the refinement of the field, in 2014, a notable change was implemented wherein the focus of the intervention was shifted to “real infrastructure” (e.g., MMT campus). This was determined to deal with the increased number of members and to pursue the synergy between real infrastructure (i.e., physical place) and virtual infrastructure (i.e., conferences, workshops, events as introduced above) through providing the place where start-up entrepreneurs, hospital physicians, medical researchers, and technical researchers work together. Moreover, after COVID-19, digital platform has been increasingly utilized for knowledge transfer.

Intervention in Emerging Interaction

The interventions on emerging interaction have been implemented by Mannheim Medical Technology Cluster to facilitate the interaction between members or between members and external parties toward forming cross-sectoral collaborations.

The notable efforts of Mannheim Medical Technology Cluster, composed of "demand-oriented" and "project-oriented" approaches, have been employed from the launching of this cluster organization. As is introduced in Chapter 8, the former is based on the request of the members, and the latter is promoted with concrete ideas for collaborative projects. Both interventions are implemented to facilitate the interaction that emerged in the field.

Figure 3. Intervention to facilitate cross-sectoral collaborations: Mannheim Medical Technology Cluster
Source: Drawn up by the author.



VALIDITY OF THE CONCEPTUAL MODEL AND CONCLUSION

The purpose of section 3 is to consider the management to facilitate the self-organization process of diversified actors toward cross-sectoral collaborations. In the literature review of Chapter 7, first, the formation of inter-organizational collaboration, a type of network organization, is considered by focusing on self-organization, which is featured by complexity. Then, the role of the management

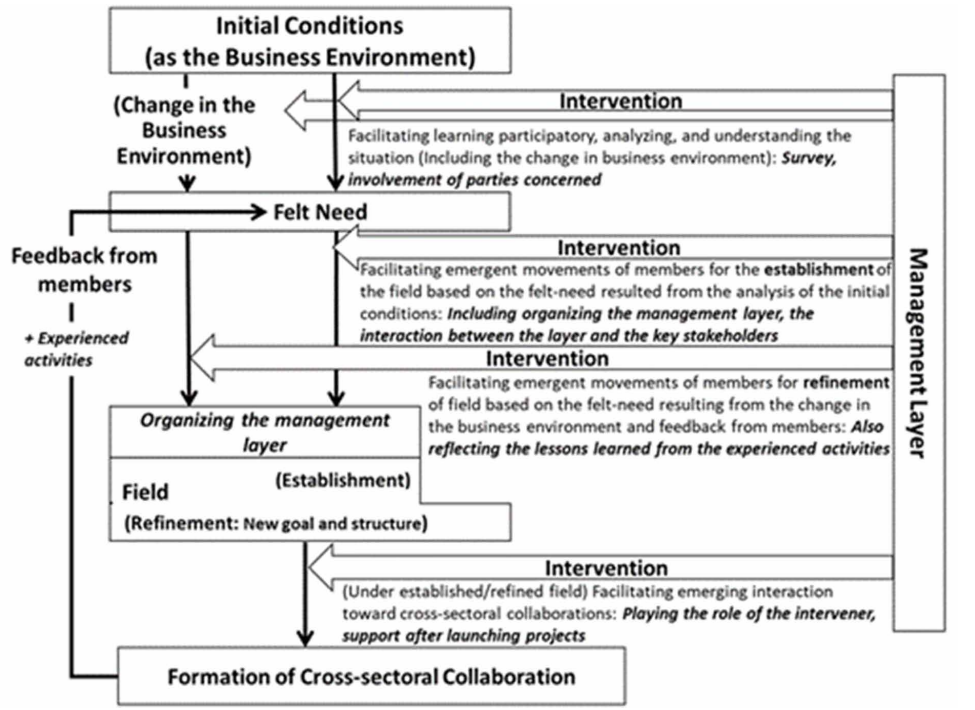
layer is discussed with reference to the argument by Imada (2008). It is proposed that the intervention implemented by the management layer is reflexive control to facilitate bottom-up movements, and it is required to direct the process toward collaboration. Considered with a unified view of a planned approach to change by Burnes (2004), "initial conditions," "field," and "emerging interaction" are clarified as the key elements for facilitating the self-organization process and are identified as the targets of intervention by the management layer. Moreover, the intervention is considered in the context of leadership under complexity. It is proposed that action research-based intervention is required to enhance self-reliance efforts. First, intervention in the initial conditions aims to facilitate participatory learning of the situation and foster a felt-need for collaboration. Second, intervention in the field is to create an environment that works as a device to facilitate emerging interaction toward collaborations by facilitating the establishment and refinement of the field. Third, intervention is also implemented in emerging interactions toward the collaborations, and the intervener's role is discussed. Finally, the conceptual model to explain the "management to facilitate self-organization process of cross-sectoral collaborations" is proposed based on the arguments.

The result of the case study shows variations in the path, methodology, and focus of the intervention. However, the commonality is also found in the management of cross-sectoral collaborations. First, intervention in learning the initial conditions is implemented by involving the parties concerned. It fosters a felt-need for cross-sectoral collaboration in the medical technology field. This leads to intervention in organizing the management layer (cluster organizations) and establishing the field. Then, based on the direction of the established field, the management layer implements interventions to facilitate emerging interactions toward the collaborations. Second, the management layer implements intervention for learning based on the survey on the change in the business environment (including the change in the initial conditions), communicating with members and stakeholders for feedback/advice, and experienced activities. This leads to modification of the felt-need and intervention in refining the field (i.e., inviting new members, setting up new workshops/events, etc.). Moreover, based on the direction of the refined field, the management layer implements interventions to facilitate emerging interactions toward collaborations. Based on these findings from the case study, the conceptual model is modified (with bold italic letters), as shown in Figure 4. Here, "organizing the management layer" and the other findings to be noted from the case study are added.

With some modifications, the conceptual model shows a certain validity with the support of an empirical study. The model proposes a comprehensive management approach for facilitating the cycle of the self-organization process toward cross-sectoral collaboration in which the established field gives a certain direction to move. Moreover, as the stage model proposes, the approach enables members to

unfreeze the assumption of actions, move toward refining the field, and refreeze emerging interactions toward forming collaboration under a refined field that shows a new direction. This self-organization process, often accompanied by fluctuations and featured by complexity, is facilitated by the action research-based intervention implemented by being tested and refined, as Gray (2008) proposes.

Figure 4. Modified conceptual model: Management to facilitate self-organization process of cross-sectoral collaborations
Source: Kawabata (2020).



This approach enables the parties concerned to be exposed to the problem and take structured action. Moreover, as Elden and Chisholm (1993) explain, the approach also enables them to increase adaptive capacity, ability to innovate, and competence in self-design of the system through participative learning, which fosters "felt-need." Therefore, in other words, they can display continuous adaptability and robustness in a dynamic business environment and create innovative businesses through collaborations by combining deliberate and emergent planning (Bryson et al., 2006).

The study in Section 3 achieves a certain result for theory building by extracting some findings about the management approaches. Moreover, the study also provides

practical insights for promoters who consider facilitating cross-sectoral collaborations toward new and competitive industries. In contrast, to sustainably provide management support to facilitate collaborations, the management layer needs to be built and rebuilt as a management body with the organizational competence to implement it. This issue will be examined in Section 4 as a final research question (R.Q. 3).

REFERENCES

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, *66*(s1), 44–55. doi:10.1111/j.1540-6210.2006.00665.x

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2015). Designing and implementing cross-sector collaborations: Needed and challenging. *Public Administration Review*, *75*(5), 647–663. doi:10.1111/puar.12432

Burnes, B. (2004). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, *41*(6), 977–1002. doi:10.1111/j.1467-6486.2004.00463.x

Chen, B. (2008). Managing inter-organizational partnerships: Preconditions, processes and perceived outcomes. In *Academy of Management Annual Meeting Proceedings.* Academy of Management.

Dickens, L., & Watkins, K. (1999). Action research: Rethinking Lewin. *Management Learning*, *30*(2), 127–140. doi:10.1177/1350507699302002

Elden, M., & Chisholm, R. F. (1993). Emerging varieties of action research: Introduction to the special issue. *Human Relations*, *46*(2), 121–142. doi:10.1177/001872679304600201

Fuchs, C. (2003). Structuration theory and social self-organization. *Systemic Practice and Action Research*, *16*(2), 133–167. doi:10.1023/A:1022889627100

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, *91*(3), 481–510. doi:10.1086/228311

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems*. Jossey-Bass.

Gray, B. (2008). Intervening to improve inter-organizational partnerships. In S. Gropper, M. Ebers, C. Huxham, & P. S. Ring (Eds.), *The Oxford handbook of inter-organizational relations* (pp. 664–690). Oxford University Press.

Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, *19*(4), 293–317. doi:10.1002/(SICI)1097-0266(199804)19:4<293::AID-SMJ982>3.0.CO;2-M

Gulati, R., & Gargiulo, M. (1999). Where do interorganizational networks come from? *American Journal of Sociology*, *104*(5), 1439–1493. doi:10.1086/210179

Hartman, R. L., & Johnson, J. D. (1990). Formal and informal group communication structures: An examination of their relationship to role ambiguity. *Social Networks*, *12*(2), 127–151. doi:10.1016/0378-8733(90)90002-Q

Heylighen, F. (2013). Self-organization in communicating groups: The emergence of coordination, shared references and collective intelligence. In A. Massip-Bonet & A. Bastardas-Boada (Eds.), *Complexity perspectives on language, communication and society* (pp. 117–149). Springer. doi:10.1007/978-3-642-32817-6_10

Imada, T. (2008). *Self-organization and society*. Springer.

Itami, K. (1999). *Ba no manejimento: Keiei no shinparadaimu [Managing "ba": New paradigm for management]*. NTT Publishing.

Kaats, E., & Opheji, W. (2014). *Creating conditions for promising collaboration: Alliances, networks, chains, strategic partnerships*. Springer. doi:10.1007/978-3-642-41443-5

Koschmann, M. A., Kuhn, T. R., & Pfarrer, M. D. (2012). A communicative framework of value in cross-sector partnerships. *Academy of Management Review*, *37*(3), 332–354. doi:10.5465/amr.2010.0314

Lazzarini, S. G., Miller, G. J., & Zenger, T. R. (2008). Dealing with the paradox of embeddedness: The role of contracts and trust in facilitating movement out of committed relationships. *Organization Science*, *19*(5), 709–728. doi:10.1287/orsc.1070.0336

Nicotera, A. M. (2013). Organizations as entitative beings: Some ontological implications of communicative constitution. In D. Robichaud & F. Cooren (Eds.), *Organization and organizing: Materiality, agency and discourse* (pp. 66–89). Routledge.

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341–356. doi:10.1016/j.leaqua.2007.04.004

Schachter, S. (1951). Deviation, rejection, and communication. *Journal of Abnormal and Social Psychology*, *46*(2), 190–207. doi:10.1037/h0062326 PMID:14841000

Turner, R. H. (1962). Role-taking: Process versus conformity. In A. M. Rose (Ed.), *Human behavior and social processes: An interactionist approach* (pp. 20–40). Routledge and Kegan Paul.

Whetten, D. A. (1981). Interorganizational relations: A review of the field. *The Journal of Higher Education*, *52*(1), 1–28. doi:10.2307/1981150

Section 4

Building and Rebuilding a Management Body for Facilitating Cross-Sectoral Collaborations

Chapter 10
Review of Literature and a Conceptual Model

ABSTRACT

Section 4 explores the research question (R.Q.) 3 introduced in Chapter 1 of Section 1 to elucidate how to build and rebuild a management body to display the organizational competence for facilitating the self-organization process of cross-sectoral collaborations toward promoting regional industries. This chapter reviews the related literature to consider the theoretical framework for R.Q. 3. First, the introduction describes the background of this study and the link to the research theme. Then, toward the goal of facilitating the collaborations, it is proposed that a governance type featured by a distinctly separate administrative entity (equivalent to the management body in this study) is most suitable for a situation where a large number and variety of autonomous, and mutually dependent actors exist, which this study premises. Moreover, a conceptual model on how to build and rebuild the management body is proposed by identifying the organizational competence and its attributing factors, etc.

INTRODUCTION

Many regions face dynamic, complex, and interconnected economic/industrial environments that bring adaptation and competition challenges for industrial districts. In this context, facilitating cross-sectoral collaborations toward the promotion of industries is essential to overcome this difficulty because it enables the creation of new and innovative businesses. In this type of collaboration, a large number and variety of autonomous and mutually dependent actors inside/outside of the region connect through interaction and self-organize to create new businesses.

DOI: 10.4018/978-1-6684-8494-4.ch010

Regarding this issue, Section 3 argues the management layer ("cluster organization" in the case study) that facilitates cross-sectoral collaborations aiming to promote regional industries through intervention. Moreover, considering the argument in Section 2, the management layer plays its role by utilizing the regional system. Since the layer is an entity with a certain organizational structure and the subject to consider how to build and rebuild as described in R.Q. 3, it is called the "management body" in Section 4.

The related practices, for instance, are implemented in E.U. areas where cluster organizations are founded to facilitate cross-sectoral collaborations and provide services with support from the public sector (Kergel et al., 2014; Kergel et al., 2018). However, despite their vigorous activities, a theoretical framework supported by the empirical study is not well established to guide how to build/rebuild the management body. This paper explores the approach to building and rebuilding the management body. It proposes a conceptual model to consider "How can a management body be built and rebuilt for fulfilling organizational competence for providing continual support for facilitating complex self-organization process of cross-sectoral collaborations to promote competitive regional industry?"

The remainder of this paper proceeds as follows. First, the literature on network governance is examined by focusing on network effectiveness and types of governance. It clarifies that governance by a management body that is a distinctly separate administrative entity is the most suitable type to consider the theme of this study, which is premised on the existence of a large number and variety of autonomous and mutually dependent actors toward the goal of fostering cross-sectoral collaborations aimed at promoting regional industry. Based on this argument, the organizational competence of the management body to facilitate cross-sectoral collaborations is explored. Here, referring to the categorization of organizational competence by Henderson and Cockburn (1994), architectural competence and component competence of the management body are clarified. Clarified competence is developed further to discuss how to build the management body with reference to the literature about antecedents, attributing factors of organizational competence, and a quality management approach. Finally, a conceptual model composed of three phases for building and rebuilding the management body is proposed.

NETWORK GOVERNANCE: TYPES AND EFFECTIVENESS

Network Governance

Inter-organizational collaboration is a type of network organization that displays its strength in competitiveness and innovativeness through flexibility and adaptability, high response capacity to the market, and flexible transformation through self-organization (Baker, 1992; Imada, 2008; Knoke, 2001; Miles & Snow, 1995; Schotter et al., 2017). Powell (1990) explains that this form of organization is characterized by lateral or horizontal patterns of exchanges, independent flows of resources, reciprocal lines of communication, and the alternative governance structure to markets and hierarchies.

Antivachis and Angelis (2015) define network governance as "the apparatus used to govern/manage the whole network so as to secure the optimization of resources that come from the individual organizations constituting the network" (p.587). Kim (2006) defines network governance as "a form of organizational alliance in which relevant policy actors are linked together as co-producers where they are more likely to identify and share common interests" (p.22) and indicates that it "emphasizes the organizational aspect of coordinating and integrating various autonomous and sovereign units to function as an organizational unit" (p.23).

Concerning the advantages of network governance, Provan and Kenis (2008) explain that it includes "enhanced learning, more efficient use of resources, increased capacity to plan for and address complex problems, greater competitiveness, and better services for clients and customers" (p.229). Kim (2006) also indicates that the advantages are more democratic and representative with the participation of various interested parties and experts, improving efficiency by taking advantage of economies of scale and scope through various public/private/nonprofit agencies, allowing new resources to be introduced with the aid of new participants. He also indicates that, with reference to the work of Lipnack and Stamps (1993), it contributes to expanding social capital by forming exchange relationships based on trust and reciprocity.

Types of Network Governance and Effectiveness

Based on the advantages above, the outcome is perceived at the network level, namely "network effectiveness." This is discussed in the context of the critical role of network governance (Antivachis & Angelis, 2015; Provan & Kenis, 2008). Here, network effectiveness is defined as "the attainment of positive network level outcomes that could not normally be achieved by individual organizational participants acting independently" (Provan & Kenis, 2008, p.230).

These studies deepen the argument by focusing on the relationship between the configuration of network governance and network effectiveness. Here, with reference to Kilduff and Tsai (2003), Antivachis and Angelis (2015) focus on the concept of goal-directed networks and the importance of the form of governance. Goal-directed networks are established with a specific purpose, either by network participants or through mandates. In this context, Kapucu (2014) also explains that "the contextual nature of networks impacts the characteristics and structure of governance networks" (p.5).

Concerning the form of network governance, Provan and Kenis (2008) introduce Network administrative organization (NAO) as one of the three forms (another two are participant-governed networks and lead organization-governed networks), which is a distinctly separate administrative entity founded to govern the network and its activities. Network participants are brokered and externally governed (Antivachis & Angelis, 2015). Regarding the effectiveness of network governance, Provan and Kenis (2008) propose that "NAO network governance will be most effective for achieving network-level outcomes when trust is moderately to widely shared among network participants (moderate density trust), when there are a moderate number to many network participants, when network-level goal consensus is moderately high, and when need for network-level competencies is high" (p.241). Moreover, they also explain that it is critical for network effectiveness to manage network tension between 1. efficiency and inclusiveness, 2. internal and external legitimacy, and 3. flexibility and stability. They propose that the NAO mode of governance provides balance in points 1 and 2 and favors stability in point 3, thus satisfying the need for having a formalized structure that can be sustained over time.

This chapter aims to explore how to build a management body to provide continual support for facilitating the self-organization process of a large number of autonomous and mutually dependent actors toward the goal of cross-sectoral collaborations to promote the regional industry. Here, activities are longitudinal and played by the region's internal/external participants. As a result, trust and goals are shared by many participants; moreover, high network-level competence is required because of the existence of a number of actors, their interdependence, and expected functions/tasks (Kapucu, 2014; Sørensen, 2006). Considering this argument, ensuring the support of a management body like NAO appears to be the best choice to maximize the outcome of goal attainment in terms of network effectiveness.

The Role of the Management Body and Its Effect

The roles of the management body examined in this study are discussed as NAO (Lefebvre et al., 2012; Provan & Kenis, 2008; Provan & Milward, 2001), intermediary organization (Arnaldi & Neresini, 2019; Hessels, 2013; Howells, 2006; Klerkx &

Leeuwis, 2009; Winch & Courtney, 2007), and cluster organizations (Mignon & Kanda, 2018). These arguments suggest, at its core, that the management body plays the role of broker/intermediary and provides coordinative and administrative (including funding) support for accelerating the innovation process by facilitating integration and interdependent action from a number of autonomous and diverse organizations (Antivachis & Angelis, 2015).

The role is more specifically clarified in Section 3 with the premise of facilitating the complex self-organization process of a number of diversified actors toward cross-sectoral collaborations. It is found that the role played by the management body has the following effect:

1. Enabling concerned parties to be exposed to the problem and fostering a felt-need for cross-sectoral collaborations
2. Facilitating the cycle of the complex self-organization process of cross-sectoral collaborations that enables involved actors to unfreeze the assumption of actions, to move toward the refinement of the field (wherein the actors interact toward the collaboration in a certain direction: See Section 3 for the detail on the field), and to refreeze for emerging the interaction toward the formation of cross-sectoral collaborations under a refined field which shows a new direction. This cycle displays continuous adaptability and robustness in a dynamic environment.

As a form of network effectiveness, these effects contribute to the continuous formation of cross-sectoral collaborations that create innovative businesses and promote regional industries.

ORGANIZATIONAL COMPETENCE OF THE MANAGEMENT BODY

Organizational Competence and Its Classification

The argument can be further elaborated by focusing on organizational competence displayed for fulfilling the role above.

Regarding the concept of organizational competence, Henderson and Cockurn (1994) explain that organizational competence acts as a source of idiosyncratic firm advantage. Buntak et al. (2015) also show that organizational competence includes "knowledge and abilities to achieve sustainable success" (p.77). Moreover, Taalia (2004) describes organizational competence as its capability to reach its goals.

Concerning the classification of organizational competence, for structuring the empirical analysis, Henderson and Cockurn (1994) distinguish between "component competence" and "architectural competence." Component competence is the local abilities/knowledge and fundamentals to implement day-to-day problem-solving, which includes "resource" (Amit & Schoemaker, 1993) and "knowledge and skills" or "technical systems" (Leonard-Barton, 1992; Teece et al., 1997). Meanwhile, architectural competence is the ability to use component competence by integrating and developing them.

Considering the management body examined in this study, the ultimate goal and mission are to promote new businesses for accelerating innovations through displaying continuous adaptability and robustness in a dynamic environment. This is implemented by playing the role of the management body to facilitate the complex self-organizational process of cross-sectoral collaborations. Based on the classification of organizational competence and the result of the study in Section 3, component competence and architectural competence are clarified as follows.

Component Competence of the Management Body

First, concerning the approach to playing the role of the management body, in Chapter 7 of Section 3, the view of leadership under complexity is introduced. This is featured by enabling emergence (Plowman et al., 2007), organic (Baker et al., 2011), and integrative change leadership (Crosby & Bryson, 2010), which appears to be effective in playing a role of facilitating the complex self-organization process of cross-sectoral collaboration. It is also proposed that to effect leadership, "action research-based intervention" appears to be a suitable approach because the intervention aims to improve, involve, and foster group, organizational, and societal change (Dickens & Watkins, 1999), which contribute to increasing adaptive capacity, ability to innovate, and competence in self-design of systems (Elden & Chisholm, 1993).

Second, concerning the component competence required for playing the role of the management body, the details are clarified in Section 3. Considering the argument above, the component competence is defined as "abilities/knowledge/skills to implement the action research-based intervention, which enables the leadership under complexity in each target element for facilitating the collaboration," as outlined below.

- Initial conditions (including change in business environment): The required competence here is to facilitate learning and sharing the initial conditions among parties concerned and foster a felt-need to involve them in promoting/improving toward cross-sectoral collaborations.

- Establishment/refinement of the field: The required competence is to facilitate (1) establishing the field (i.e., recruiting members, inviting stakeholders, setting topics, and providing events, workshops, and conferences) for people to direct and fairly interact toward the collaborations and (2) refining the field (i.e., inviting new members and stakeholders, setting new topics, and providing new events, workshops, and conferences) based on the change in the business environment, feedback from members, and experienced activities to show a new direction, make people interact under the direction, and adapt to the dynamic environment.
- Emerging interaction toward collaborations: The required competence is to support accelerating the interaction of people in the field above and match the partners toward forming collaborations by displaying the role of the intervener (See Chapter 7 of Section 3 for the detail).

Architectural Competence of the Management Body

Regarding the architectural competence required for the management body, the study in Section 3 shows the following two competences for the management body to facilitate the complex self-organization process of cross-sectoral collaborations.

Architectural competence 1: It is required to change flexibly and self-organizationally the management body itself. This is implemented according to the intention and situation of the supportee (i.e., members, etc.) by forming a cohesive system and support to sustain and improve the quality of behavior of the supportee toward self-organization (Imada, 2008). This requires awareness for grasping the change through sensing capabilities introduced by Teece (2007) and displaying reflexivity, resilience, responsiveness, and revitalizing proposed as the governance capabilities (Termeer et al., 2012) to clarify newly required component competence. Then, the management body self-organizationally adapts itself, enabling it to continually display its competence for facilitating collaborations.

Architectural competence 2: Consist of "interrelated resources to enable support and a set of models (know-how elements) to utilize them" (Imada, 2008, p.174). This requires altering, integrating, and recombining component competence (as the resource bases), which is introduced as dynamic capability (Eisenhardt & Martin, 2000; Helfat et al., 2007), combinative capability (Kogut & Zander, 1992) and relational capability (Dyer & Kale, 2007), to generate new value-creating strategies under complexity.

More clearly, 1. the management body is required to evolve itself to adapt to the changing environment, and 2. it is required to facilitate, as discussed in Section 3, the cycling process of the complex self-organization process toward the collaborations

through altering, integrating, and recombining the component competence which is required for the day-to-day implementation of the intervention in the target elements as above.

The following part further considers how to build and rebuild the management body to display the organizational (component and architectural) competence clarified above.

GUIDE TO CONSIDER HOW TO BUILD AND REBUILD THE MANAGEMENT BODY AND ITS IMPLICATIONS

Concerning the framework to consider how to build the management body, Franks and Bory (2017) indicate a lack of study to guide the development of intermediary organizations and propose that competencies should be developed to fulfill the required roles and functions of intermediary organizations. In this context, they show facilitators and barriers impacting the role/function of intermediaries and identify the contextual factors that may influence the development of intermediary organizations. Moreover, they mention that, for being responsive to emerging needs and adaptable/responsive to the environment, performance measurement is required, and stress to employ quality management strategies that enable intermediaries to determine the needs of the system and the synergy through environmental scan and needs assessment.

The above arguments for considering factors and frameworks on how to build the management body reveal some key findings and implications. First, the argument about facilitators/barriers impacting the role and function of intermediary organizations and some of the contextual factors proposed by Franks and Bory (2017) imply the existence of the factors to be considered as antecedents in the initial period of building the management body.

Second, regarding the factors influencing organizational competence, Buntak et al. (2015) suggest that organizational design to create an optimal structure is the source of organizational competence. Kogut and Zander (1992) also point out that organizing principles, which are expressions of how organized the activities of a firm are, are the primary unit of analysis and stress their importance because it is related to the variation in firm performance and growth. Moreover, Franks and Bory (2017) stress the importance of organizing external partnerships (collaborations) for the development of system capacity (therefore, "co-creation" introduced above). Concerning attributing factors contributing to organizational competence, Taatila (2004) identifies and classifies them into individual employees, organizational

structure, and assets. He explains that the attributing factors are the internal factors that enable the organization to reach its goals. Related to the above argument about how organized, with reference to Joyce et al. (2003), Taatila (2004) proposes that a combination of attributing factors is required for organizational success.

Third, Buntak et al. (2015) stress continuous innovation in organizations and designing new organizational solutions by adjusting to developing needs and, with reference to ISO 9004 (2009), they suggest that organizations' adaptation to needs/change through a quality management approach is the source of organizational competence. The quality management approach stresses the importance of effective management that enables awareness of the organization's environment through learning and appropriate application of improvement or innovation (or both) to sustain the organization's success. Considering the argument of Franks and Bory (2017), this approach should be considered in conjunction with the performance measurement of the management body.

Based on these arguments, it is concluded that the first finding implies the importance of identifying the antecedents to be considered in the "initial phase" of building the management body. The second finding shows the elements (i.e., the attributing factors) to be considered for organizational design, which are the source of organizational competence, in the "building phase" of the management body. Finally, the last finding appears to mention the necessity of the management body to adapt to the change in the "rebuilding phase."

HOW TO BUILD AND REBUILD THE MANAGEMENT BODY

Initial Phase

The initial phase begins with the antecedents to be considered in building the management body. Here, the antecedents are identified, learned, and shared by founding members and key stakeholders to prepare for the phase of building the management body.

First, as discussed above, Franks and Bory (2017) identify the facilitators/barriers and contextual factors that appear to be antecedents. Similarly, Donada et al. (2016) show the external and internal factors that act as triggers and enablers and explain that these are the antecedents of relational dynamic capabilities.

Based on these studies, antecedents are listed with consideration of the findings of Sections 2 & 3 and other relevant studies.

Political Climate and Existing Bureaucracy

The case study in Chapter 5 of Section 2, which focuses on the movement in Germany, supports this view because the strong political climate pushes for the implementation of cluster policy and supports the establishment of the management body for promoting new industries and innovations by the federal and state governments under economic stagnation since the 1990s.

Politics for Supporting the Implementation of New Practices

The support includes managing and coordinating various policy and production networks by resolving resource allocation and dependency issues. Regarding the related practice, with reference to Charles et al. (2004), Kerry and Danson (2016), and Koschatzky and Kroll (2009), the case study in Chapter 5 of Section 2 clarifies the role of the public sector in supporting new practices by building a regional system that aims to promote innovations and industries through public-private partnerships. Moreover, it is found that the public sector also supports founding the management body, strengthening their management capability, funding, and directing their activities toward creating new businesses through cross-sectoral collaborations.

Institutional, Industry, Market, or Technological Factors

Donada et al. (2015) explain that these factors characterize the velocity of the context of the firm and its ability to adapt. In this context, the case studies in Chapter 5 of Section 2 and Chapter 8 of Section 3 find that, for facilitating cross-sectoral collaborations, the management body (cluster organizations in the case studies) received institutional support from the public sector. Moreover, they work on integrating between different sectors, which have different technological backgrounds and are complemental, to promote innovation and new business for increasing the potential for growth in the huge market inside/outside the region and dealing with severe competition through utilizing the region's potential for growth.

History of Success in Implementing New Practices

The case study in Chapter 5 of Section 2 shows that, although it is not necessary that all the past trials are successful, the new practice (such as policy for industrial promotion) is implemented by the state governments in Germany, with a trial-and-error basis, based on the experience of the preceding program.

Need for the System, Readiness of the System to Change and Buy-In, Having an Adequate Timeline for Implementation, and Interest in Outcomes/Effectiveness

The case studies in Chapter 5 of Section 2 and Chapter 8 of Section 3 show that substantial time has been spent conducting surveys that involve key stakeholders to identify, learn, and share the initial conditions. Based on the argument by Burnes (2004), the study in Section 3 concludes that this contributes to fostering the felt-need to facilitate cross-sectoral collaborations and building the management body to create new businesses and promote regional industries. It also leads to discussing and sharing the direction to implement among the parties concerned.

Strong Leadership or Champions that Support Innovation and the Implementation of New Practices

Consistent with the arguments by Bryson et al. (2006) and Crosby and Bryson (2005), the case study in Chapter 8 of Section 3 finds that, in the process of building the management body, key stakeholders who have influence in each sector (such as industry, public sector, universities, and medical institutions) are invited as key constituents (e.g., board members) of the body to guide and support its activities.

Regarding the implications of the last two antecedents, with the premise that the management body provides the field for the parties concerned to interact to form cross-sectoral collaborations, the study in Section 3 shows that involving key stakeholders is necessary for satisfying some requisites for the establishment of the field (Gray, 1989; Itami, 1999), such as specifying appropriate stakeholders, setting agendas, maintaining legitimacy, authority, fairness, and justifying the management body's intervention for facilitating collaboration. In addition, creating readiness and involving key stakeholders contributes, as Bryson et al. (2006) mention, to establishing the body's legitimacy for obtaining internal/external support, resources, recognition, and trusted interaction.

Other Factors

The other factors listed by Donada et al. (2015) and Frank and Bory (2017), which can be regarded as antecedents, are the resources, such as physical assets, capital, labor, and alliance functions (can be interpreted as the existence of potential partners). It appears essential to understand the existence and accessibility of these factors in the initial phase.

Building Phase

Guiding Principles and Activities

With consideration of the identified antecedents that are learned and shared by founding members and key stakeholders, they work on building the management body. First, with reference to Hamel (2000) and Mintzberg et al. (1998), Taatila (2004) introduces the attributing factors contributing to organizational competence. Among them, "guiding principles and activities" (equivalent to visions, mission, value, and strategies), which "show an organization the direction it advances in and the ways by which it should advance" (p.44), appear to be the fundamental attributing factor. Concerning this factor, the study in Section 3 found that the direction, strategic domain, and activities of the management body are determined based on the consensus between the founders and key stakeholders of the management body. Moreover, Kergel et al. (2018) suggest involving the participants in the decision-making process of strategic priority, documentation of the strategy, and defining the activities/services in the context to propose management excellence of the cluster organizations (therefore, the management body in this study). Based on the arguments up to now, this study sees that "Guiding principles and activities" help to identify the required organizational competence (architectural and component competence). Then, the other attributing factors are configured and organized to create an optimal structure for building the management body that displays the required organizational competence.

In the following, the other attributing factors listed by Taatila (2004) will be explained with consideration of the concepts and the findings by the studies in Sections 2 and 3, Kergel et al. (2018), and other relevant studies*.

Role

Taatila (2004) shows two roles, "manager" and "expert," which are essential for organizational competence.

First, with reference to Saarnio et al. (2000), a manager is explained as those who "guide the organization's strategy, vision and mission" (Taatila, 2004, p.43). As a party to play the manager's role in facilitating cross-sectoral collaborations, Bryson et al. (2006) introduce the concept of a "powerful sponsor," who has prestige, authority, and access to resources. With reference to the work of McEvily and Zaheer (2004) and Provan et al. (2004), Provan and Kenis (2008), who focus on NAO, describe that the board's role is to address strategic level network concerns, while others address operational decisions. Moreover, the case study of Chapter 8 in Section 3 shows that

regional stakeholders from industry, research institutions, etc., are invited as board members of the management body, who direct it from a strategic level. The additional point is that, as explained above, involving/inviting key stakeholders enables the management body to satisfy the requisites of establishing the field and to justify the management body's intervention in facilitating collaborations. Therefore, it is construable that the involvement/invitation is required for the management body in terms of authorization to implement support to facilitate cross-sectoral collaborations of actors from various fields to promote regional industries.

Second, the issue concerning experts is whether there is "a correct number of expert people in expert roles to succeed in the tasks" (Taatila, 2004, p.42). This point is also stressed by Zhao and Xu (2013), who focused on professional training, staff structure (including age structure), and job specifications. Considering the role of facilitating cross-sectoral collaborations, Bryson et al. (2006) introduce the concept of "champion" and explain that it performs to keep "the collaboration going and use process skills to help the collaboration accomplish its goals" (p.47). Regarding the process of implementation of the role, Provan and Kenis (2008) show that leaders and staff of NAO are mainly involved in operational decisions and have the task of "work with participants on a daily basis, resolving possible conflict and enhancing commitment to the network and its goals" (p.240). Here, the participants enrolled as members of the management body shall be composed of businesses (industry/service providers) in relevant fields, research organizations, and/or universities and be committed to the activities (Kergel et al., 2018).

Defined Organizational Processes

Taatila (2004) defines organizational process as a defined and structured way to perform repetitive tasks and explains its importance "as the means of creating, gathering and sharing organizational competence" (p.46). The case study of Chapter 8 in Section 3 also shows that some of the management bodies examined in the case study have a methodology (e.g., "structured method") composed of several steps for intervening more efficiently/effectively to facilitate cross-sectoral collaborations.

Organizational Culture

With reference to Saariluoma (2002), Taatila (2004) explains that organizational culture defines how organizations react instinctively because it reflects psycho-social habits and traditional working practices. Moreover, he shows that organizational value plays a significant role in organizational culture. Concerning the facilitation of cross-sectoral collaborations, the study in Chapter 7 of Section 3 introduces the

concept of "leadership under complexity" featured by enabling emergence, organic, and integrative change leadership (Baker et al., 2011; Plowman et al., 2007) Moreover, Imada (2008) proposes the concept of "support" that consists of the approach to others, understanding the intention of others, the maintenance and improvement of the quality of others' actions, empowerment, and mutual relation. These concepts appear to be interpreted as the way or values involved. They, therefore, are seen through organizational culture, which influences psycho-social habits and working practices suitable for facilitating the complex self-organization process of the collaborations.

Managerial Practices

Based on the arguments by Greenberg and Baron (2000), Handy (1999), and Mintzberg et al. (1998), Taatila (2004) explains that managerial practices are "the defined and tacit ways used by employees in an organization to affect other people's actions" (p.54). He focuses on knowledge management, organizational learning, managing individuals, and intellectual capital management as practices. Concerning knowledge management, the case study of Chapter 8 in Section 3 finds that the management body works to increase its knowledge base by utilizing IT systems (e.g., knowledge portal), holding workshops, and visiting member companies to facilitate knowledge transfer, which contributes to providing a field for participants to share/exchange knowledge, and grasp new trends. Moreover, regarding organizational learning, with reference to Kirjavainen et al. (2000), Taatila (2004) shows that it "means developing the structures, processes, and culture of the organization in order to create a system, which develops organizational competence continuously and in a self-directing manner" (p.55). The case study of Chapter 8 in Section 3 also finds that some relevant practices of the management body, such as (1) dialog between the staff and the members for absorbing members' needs and making the organization more functional, (2) constant learning of the staff from change/trend in the business environment and opinions by experts, and (3) obtaining lessons from their experiences (including the practice to facilitate cross-sectoral collaborations).

IT Systems

Taatila (2004) shows the contributions of IT systems to support the reengineering of business processes, share large amounts of knowledge between individuals, and create knowledge. Moreover, he indicates that the non-physical working environment created by IT systems contributes to organizational competence by encouraging interactions. The case study of Chapter 8 in Section 3 also finds that IT systems are utilized by the management body to match potential partners for collaborations and

share ideas for collaborative projects and knowledge. Moreover, Kergel et al. (2018) point out the effectiveness of web presence (e.g., web pages and social networks) for increasing visibility and reputation to attract new members and convince policymakers of the importance of activities.

Cash

Taatila (2004) explains that cash is the immediate liquid finance of an organization and contributes to the operational elasticity and swift realization of its goals. Winch and Courtney (2007) show that funds for intermediaries are provided by the public fund or individual partners as membership fees. Moreover, the case study of Chapter 8 in Section 3 finds that competitive funds for collaborative projects also contribute to realizing the goal of the management body. Concerning longevity, Kergel et al. (2018) explain that for sustainable existence and development, a broad mix of various sources of income (such as from public funding, income from chargeable services, membership fees, and private foundations or donations) is best for cluster organizations.

Fixed Assets

With reference to Taloustieto (1995), Taatila (2004) explains that fixed assets take various forms, such as buildings, production factors, and shares, and their use value is more critical than accounting valuation. For example, the physical working environment is regarded as an essential factor and listed by him as one of the attributes of organizational competence. The case study of Chapter 8 in Section 3 also finds that management bodies are supported by the state government or its affiliate organization by providing office space and others. Moreover, there is the case that the management body invests in expanding physical places, which plays a role in building the hub of industry, gathering parties concerned, and promoting cross-sectoral collaborations. Furthermore, Kergel et al. (2018) indicate the importance of the geographical concentration of committed participants as indicators of cluster management excellence. This implies that the location of the physical place also needs to be considered for increasing the organizational competence of the management body to provide easy access to the participants.

External Partners

In addition to the attributing factors above, considering the argument on "relational capability" by Dyer and Kale (2007) and collaborations with stakeholders by Franks and Bory (2007) discussed above, additional competence/resource to those of the management body itself are necessary; therefore, external partnerships are required

to increase organizational competence. The case study of Chapter 8 in Section 3 also finds that, for strengthening and improving the supporting service of the management body, it establishes partnerships with specialized institutions, other clusters, and individual experts. Moreover, the study in Section 2 and Kergel et al. (2018) show that it is important to integrate the management body into the region's innovation system, e.g., through interaction between the management body and the public sector.

Rebuilding Phase

As discussed above, with reference to Imada (2008), the architectural competence required for the management body is clarified as evolving itself flexibly and self-organizationally in accordance with the change in environment (including the intention and situation of the supportee). Then, the management body alters, integrates, and recombines the resource base to generate new value-creating strategies.

Thus, rebuilding is necessary for the management body to adapt to the change by acquiring additional organizational competence required to display new value-creating strategies. Figure 1 depicts the approach to rebuilding the management body based on the following discussion.

Subjects to Investigate and Learn

Imada (2008) indicates the necessity to examine the change in the intention/situation of the supportee (therefore, members and other stakeholders of the management body in this study) and the environment (therefore, the business environment that includes the antecedents). This is discussed as a needs assessment and an environmental scan as a quality management approach to be aware of the appropriate application of improvement/innovation (Buntak et al., 2015; Franks & Bory, 2017). Second, performance measurements are proposed, such as a framework for measuring intermediary organizations (Franks & Bory, 2017) and a perspective to evaluate collaborative network organizations (Baker et al., 2011). In addition, Kergel et al. (2018) list the benchmarking indicators of cluster organizations by categorizing the field of structure, management & governance/strategy, financing, service, and achievement/recognition.

Approaches for Investigating and Learning

Focusing on the approach to refine the field for interaction between actors toward collaboration, the case study of Chapter 8 in Section 3 finds that staff of the management body not only investigate by themselves but also communicate with the parties concerned to learn from the change in the business environment, feedback/voice

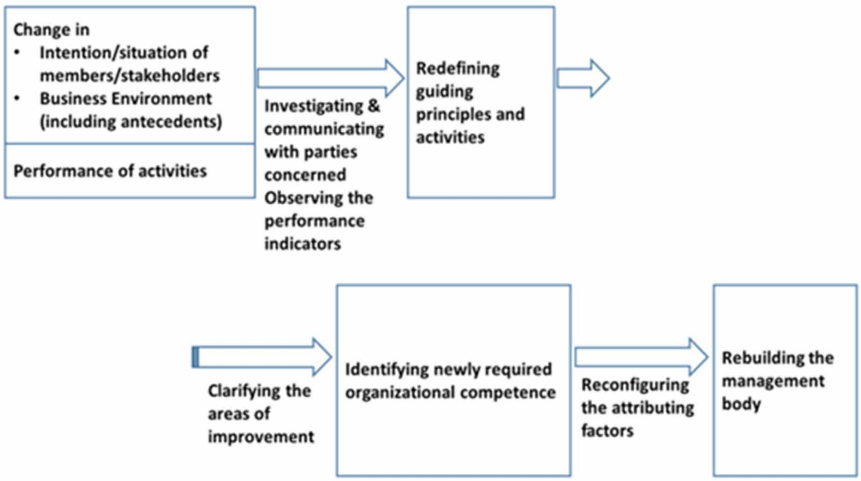
of members, and experience of activities, to identify the change. The approach for investigating and learning through communication appears effective and adaptable for rebuilding the management body, especially for grasping performance and change, which are not revealed by explicit indicators.

Evaluating the Results of the Investigation/Learning and Rebuilding the Management Body

The results of the investigation and learning are evaluated to consider the adaptation to sustaining/improving the organizational competence of the management body. Franks and Bory (2007) indicate the importance of utilizing evidence and data to demonstrate the efficacy and value of intermediaries, setting clearly articulated goals, and measuring progress. This implies that it is necessary to examine the results, identify the areas to be improved, and redefine the guiding principles and activities. Then, based on the redefinition, newly required organizational competences (component and architectural competences) are identified, and the attributing factors are modified to rebuild the management body.

This view is supported by the study in Section 3, which finds that after the staff of the management body experiences its activities and communicates with the parties concerned (its members, advisory board, experts, etc.), they modify the direction/strategy and goal/activities. Then, to display organizational competence, they reform IT/knowledge management, organizational processes (e.g., introducing structured methods to provide the service), and physical infrastructure.

Figure 1. Approach to the rebuilding of the management body
Source: Drawn up by the author.

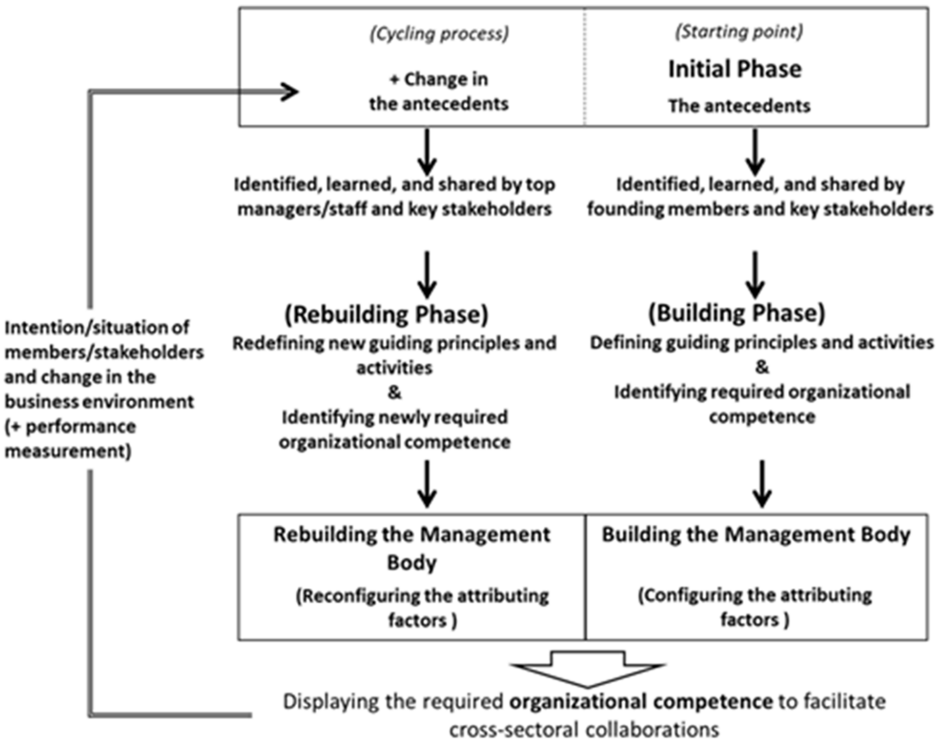


DISCUSSION AND CONCLUSION: THE CONCEPTUAL MODEL

Based on the argument above, a conceptual model can be proposed (Figure 2). The model provides a theoretical framework to consider the research question (R.Q.) 3 that explores "How to build and rebuild a management body to display the organizational competence for facilitating the self-organization process toward cross-sectoral collaboration to promote competitive regional industry?"

The conceptual model illustrates a cycling process for building a management body composed of the initial, building, and rebuilding phases. The model shows that the management body displays the organizational competence required to facilitate the self-organization process of cross-sectoral collaborations. The effectiveness of the conceptual model in displaying the required organizational competence is as follows.

Figure 2. Conceptual model: Building and rebuilding a management body for facilitating cross-sectoral collaborations
Source: Drawn up by the author.



First, as discussed above, organizational competence is defined as a source of idiosyncratic firm advantage (Henderson & Cockburn, 1994), "knowledge and abilities to achieve sustainable success" (Buntak et al., 2015, p.77), and the capability to reach its goals (Taalia, 2004). The competence is further scrutinized by categorizing component competence and architectural competence.

Second, these organizational competences are identified through the cycling process. Here, the parties concerned identify, learn, and share the antecedents, which leads to defining the guiding principles and activities and then identifying the required organizational competence. Based on the identification, attributing factors are configured, and the management body is built. Then, in the rebuilding phase, the guiding principles and activities are redefined based on the intention/situation of members/stakeholders, the change in the business environment (including change in the antecedents), and the performance measurement. It is followed by identifying the newly required organizational competence and reconfiguring the attributing factors. This cycling process enables the management body to adapt to the change and provide continual support for facilitating collaboration through evolving its organizational competence.

In the next chapter, based on the conceptual model, the case studies are conducted by focusing on the management bodies (i.e., cluster organizations) in Germany that aim to promote regional industrial development through cross-sectoral collaborations.

REFERENCES

Amit, R., & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33–46. doi:10.1002mj.4250140105

Antivachis, N. A., & Angelis, V. A. (2015). Network organizations: The question of governance. *Procedia: Social and Behavioral Sciences*, *175*(12), 584–592. doi:10.1016/j.sbspro.2015.01.1241

Arnaldi, S., & Neresini, F. (2019). The role of intermediary organizations in the mainstreaming of responsible research and innovation in the Italian industrial sector. *Journal of Responsible Innovation*, *6*(3), 361–367. doi:10.1080/23299460.2019.1608616

Baker, E., Kan, M., & Teo, S. T. T. (2011). Developing a collaborative network organization: Leadership challenges at multiple levels. *Journal of Organizational Change Management*, *24*(6), 853–875. doi:10.1108/09534811111175797

Baker, W. E. (1992). The network organization in theory and practice. In N. Nohria & R. G. Eccles (Eds.), *Network and organizations: Structure, form, and action* (pp. 397–429). Harvard Business School Press.

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, *66*(s1), 44–55. doi:10.1111/j.1540-6210.2006.00665.x

Buntak, K., Drožđek, I., & Rašan, I. (2015). The interdependence of structural competence, organizational maturity and competitiveness. In *Proceedings, III International Conference Quality System Condition for Successful Business and Competitiveness.* Association for Quality and Standardization of Serbia.

Burnes, B. (2004). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, *41*(6), 977–1002. doi:10.1111/j.1467-6486.2004.00463.x

Charles, D., Perry, B., & Benneworth, P. (Eds.). (2004). *Towards a multi-level science policy: Regional science policy in a European context*. Regional Studies Association.

Crosby, B. C., & Bryson, J. M. (2005). *Leadership for the common good: Tackling public problems in a shared-power world* (2nd ed.). Jossey–Bass.

Crosby, B. C., & Bryson, J. M. (2010). Special issue on public integrative leadership: Multiple turns of the kaleidoscope. *The Leadership Quarterly*, *21*(2), 205–208. doi:10.1016/j.leaqua.2010.01.001

Dickens, L., & Watkins, K. (1999). Action research: Rethinking Lewin. *Management Learning*, *30*(2), 127–140. doi:10.1177/1350507699302002

Donada, C., Nogatchewsky, G., & Pezet, A. (2016). Understanding the relational dynamic capability-building process. *Strategic Organization*, *14*(2), 93–117. doi:10.1177/1476127015615286

Dyer, J., & Kale, P. (2007). Relational capabilities: Drivers and implications. In C. E. Helfat, S. Finkelstein, W. Mitchell, H. Singh, D. Teece, & S. G. Winter (Eds.), Dynamic capabilities: Understanding strategic change in organizations (pp. 65-79). Blackwell Publishing.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, *21*(10/11), 1105–1121. doi:10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

Elden, M., & Chisholm, R. (1993). Emerging varieties of action research: Introduction to the special issue. *Human Relations*, *46*(2), 121–141. doi:10.1177/001872679304600201

Franks, R. P., & Bory, C. T. (2017). Strategies for developing intermediary organizations: Considerations for practice. *Families in Society*, *98*(1), 27–34. doi:10.1606/1044-3894.2017.6

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems*. Jossey-Bass.

Greenberg, J., & Baron, R. A. (2000). *Behaviour in organizations*. Prentice–Hall.

Hamel, G. (2000). *Leading the revolution*. Harvard University Business School Press.

Handy, C. (1999). *Understanding organizations* (4th ed.). Penguin Books.

Helfat, C., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, *15*(S1, s1), 63–84. doi:10.1002mj.4250150906

Hessels, L. K. (2013). Coordination in the science system theoretical framework and a case study of an intermediary organization. *Minerva*, *51*(3), 317–339. doi:10.100711024-013-9230-1 PMID:23950615

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy*, *35*(5), 715–728. doi:10.1016/j.respol.2006.03.005

Imada, T. (2008). *Self-organization and society*. Springer.

ISO 9004. (2009). *Managing for the sustained success of an organization: A quality management approach*. International Organization for Standardization.

Itami, K. (1999). *Ba no manejimento: Keiei no shinparadaimu (Managing "ba": New paradigm for management)*. NTT Publishing.

Joyce, W. F., Nohria, N., & Roberson, B. (2003). *What really works: The 4+2 formula for sustained business success*. Harper Business.

Kapucu, N. (2014). Complexity, governance, and networks: Perspectives from public administration. *Complexity*. *Governance & Networks*, *1*(1), 1–10. doi:10.7564/14-CGN3

Kergel, H., zu Köcker, G. M., & Nerger, M. (2014). *New approaches to improve the performance of cluster management organisations in Europe*. European Secretariat for Cluster Analysis (ESCA).

Kergel, H., zu Köcker, G. M., Nerger, M., & Ziegler, O. (2018). *Cluster management excellence in the Danube region*. European Secretariat for Cluster Analysis (ESCA) c/o VDI/VDE Innovation + Technik GmbH.

Kerry, C., & Danson, M. (2016). Open innovation, triple helix and regional innovation systems: Exploring CATAPULT centres in the U.K. *Industry and Higher Education*, *30*(1), 67–78. doi:10.5367/ihe.2016.0292

Kilduff, M., & Tsai, W. (2003). Social networks and organizations. *Sage (Atlanta, Ga.)*.

Kim, J. (2006). Networks, network governance, and networked networks. *International Review of Public Administration*, *11*(1), 19–34. doi:10.1080/12294659.2006.10805075

Kirjavainen, P., & Laakso-Manninen, R. (2000). *Strategisen osaamisen johtaminen (Strategic competence management)*. Oy Edita Ab.

Klerkx, L., & Leeuwis, C. (2009). Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy*, *33*(3), 260–276. doi:10.1016/j.foodpol.2007.10.001

Knoke, D. (2001). *Changing organizations: Business networks in the new political economy*. Westview Press.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383–397. doi:10.1287/orsc.3.3.383

Koschatzky, K., & Kroll, H. (2009). Multi-level governance in regional innovation systems. *EKONOMIAZ. Revista vasca de Economía, Gobierno Vasco / Eusko Jaurlaritza / Basque Government, 70*(1), 132-149.

Lefebvre, V. M., Molnár, A., & Gellynck, X. (2012). The role of network administrative organizations in the development of social capital in inter-organizational food networks. *International Journal on Food System Dynamics*, *3*(3), 228–242.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, *13*(S1, s1), 111–125. doi:10.1002mj.4250131009

Lipnack, J., & Stamps, J. (1993). *The TeamNet Factor: Bringing the power of boundary crossing into the heart of your business*. Oliver Wright Publications.

McEvily, B., & Zaheer, A. (2004). Architects of trust: The role of network facilitators in geographical clusters. In R. Kramer & K. Cook (Eds.), *Trust and distrust in organizations* (pp. 189–213). Russell Sage Foundation.

Mignon, I., & Kanda, W. (2018). A typology of intermediary organizations and their impact on sustainability transition policies. *Environmental Innovation and Societal Transitions*, *29*, 100–113. doi:10.1016/j.eist.2018.07.001

Miles, R. E., & Snow, C. C. (1995). The new network firm: A spherical structure built on a human investment philosophy. *Organizational Dynamics*, *23*(4), 5–18. doi:10.1016/0090-2616(95)90013-6

Mintzberg, H., Quinn, J. B., & Ghoshal, S. (1998). *The strategy process* (Revised European edition). Prentice Hall Europe.

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341–356. doi:10.1016/j.leaqua.2007.04.004

Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*, *12*, 295–336.

Provan, K. G., Isett, K. R., & Milward, H. B. (2004). Cooperation and compromise: A network response to conflicting institutional pressures in community mental health. *Nonprofit and Voluntary Sector Quarterly*, *33*(3), 489–514. doi:10.1177/0899764004265718

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration: Research and Theory*, *18*(2), 229–252. doi:10.1093/jopart/mum015

Provan, K. G., & Milward, H. B. (2001). Do networks really work? A framework for evaluating public-sector organizational networks. *Public Administration Review*, *61*(4), 414–423. doi:10.1111/0033-3352.00045

Saariluoma, P. (2002). *Ajattelu työelämässä. Erehdyksistä mahdollisuuksiin [Thinking in working life. From mistakes to opportunities]*. WSOY.

Saarnio, A., Puttonen, V., & Eronen, A. (2000). Omistajalähtöinen johtaminen [Owner-driven management]. Ekonomia-sarja. WSOY.

Schotter, A. P. J., Mudambi, R., Doz, Y. L., & Gaur, A. (2017). Boundary spanning in global organizations. *Journal of Management Studies*, *54*(4), 403–421. doi:10.1111/joms.12256

Sørensen, E. (2006). Metagovernance: The changing role of politicians in processes of democratic governance. *American Review of Public Administration*, *36*(1), 98–114. doi:10.1177/0275074005282584

Taatila, V. (2004). *The concept of organizational competence: A foundational analysis* [Doctoral dissertation, University of Jyvaskyla]. Jyväskylä University Digital Repository.

Taloustieto. (1995). *Kirjanpito—ja tilinpäätössanasto* [Glossary of accounting and financial statements] (2nd ed.). Taloustieto Oy.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319–1350. doi:10.1002mj.640

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533. doi:10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Termeer, C. J. A. M., Dewulf, A., Breeman, G., & Stiller, S. J. (2012). Governance capabilities for dealing wisely with wicked problems. *Administration & Society*, *47*(6), 680–710. doi:10.1177/0095399712469195

Winch, G. M., & Courtney, R. (2007). The organization of innovation brokers: An international review. *Technology Analysis and Strategic Management*, *19*(6), 747–763. doi:10.1080/09537320701711223

Zhao, Y., & Xu, W. (2013). On countermeasures of specification and development of social intermediary organizations. In W. Du (Ed.), *Informatics and management science II: Lecture notes in electrical engineering 205* (pp. 413–419). Springer. doi:10.1007/978-1-4471-4811-1_54

ENDNOTE

* Since this study aims to consider the factors required for building the management body, employees are treated as one of the attributing factors related to the structure of an organization, therefore, examined in "Role." Examining the details about the attributing factors related to individual employees shown by Taatila (2004) is reserved for another research occasion.

Chapter 11
The Case of the Three States in Germany

ABSTRACT

This chapter scrutinizes the cases of building and rebuilding cluster organizations, equivalent to the management body examined in Chapter 10. The cluster organizations subject for this case study are (1) MedEcon Ruhr GmbH/e.V. in North Rhine-Westphalia (NRW), (2) Forum MedTech Pharma e.V. in Bavaria, and (3) Mannheim Medical Technology Cluster in Baden-Württemberg (BW). All cluster organizations facilitate cross-sectoral collaborations toward promoting medical technology industries in their region and provide the relevant services for that goal. In the following, first, the three cluster organizations are outlined. Then, based on the conceptual model, the experiences of these cluster organizations are examined by focusing on the initial, building, and rebuilding phases.

INTRODUCTION

Many regions in Germany tackled the policy to strengthen innovation capability and increase the competitiveness of industries through cluster initiatives after the stagnation in the 1990s. Cluster organizations (equivalent to the management body in this study) are established as promoters of the initiatives through the cooperation between industry, academia, and government in the region. The organizations are an association (e.V.), a limited company (GmbH), or a department of regional government. Toward the advancement of the regional industries, wherein medical technology is one of the fields, the cluster organizations provide services to facilitate cross-sectoral collaborations to accelerate innovation and new business.

DOI: 10.4018/978-1-6684-8494-4.ch011

The case study of this chapter focuses on the experiences of building and rebuilding the cluster organizations in the field of medical technology of the three states in Germany: North Rhine-Westphalia (hereafter "NRW"), Bavaria, and Baden-Wuerttemberg (hereafter "BW").

First, the cluster organizations in the three states are outlined. Then, the antecedents the parties concerned faced in the initial phase of building the cluster organizations are clarified. Moreover, attributing factors for displaying organizational competence, which must be considered in the building phase of the cluster organizations, are examined. Finally, how the cluster organizations are rebuilt is discussed.

OVERVIEW OF THE MANAGEMENT BODIES

In NRW, with the cooperation of industry-academia and support from the public sector (economic development agency of the state government and several cities in the state), MedEcon Ruhr was founded in 2007. Table 1 describes the details of it.

Table 1. The management body: MedEcon Ruhr

MedEcon Ruhr GmbH/e.V. (NRW)	• MedEcon Ruhr GmbH: Bochum-based company owned its shares by MedEcon Ruhr GmbH e.V. (staffs belong to the GmbH and members belong to the E.V.). • Founded in 2007. • Number of staff: 18 (15 full-time equivalents). • More than 170 members. • Member structure: Companies (medical technology, ICT, healthcare services, etc.), medical institutions/hospitals, research institutions (including universities), regional/economic development agencies (public sectors and associations). • Budget: Members' fee, service/project fee, competitive funds for the project, etc. • Service (Activities): Support, coordinate, and lead role in (1) project management, (2) promoting networking, (3) creating business concepts and business models, and (4) organizing event formats.

Source: Drawn up by the author with reference to MedEcon Ruhr GmbH/e.V. (n.d.)

In Bavaria, Forum MedTech Pharma was founded in 1998 with the support of Bayern Innovativ GmbH, the affiliated organization of the Bavarian state government. Since 2006, under the cluster program, the cluster organization has received financial support from the state government for operating costs (See Table 2 in Chapter 8 of Section 3 for detail about Forum MedTech Pharma).

In BW, based on the economic strategy of the Mannheim city government, Mannheim Medical Technology Cluster was founded as one of the units of the city government of Mannheim in 2011 (See Table 3 in Chapter 8 of Section 3 for the detail about Mannheim Medical Technology Cluster).

These cluster organizations facilitate cross-sectoral collaborations and provide relevant services to members to promote their region's medical technology industries.

ANTECEDENTS IN THE INITIAL PHASE

The antecedents to be considered in the initial phase of building the management body are examined based on the argument in Chapter 10. The clarified antecedents are as follows.

Political Climate and Existing Bureaucracy

In all cases, it is observed that regional politics recognize the importance of employing cluster programs and promoting industry/innovation through cross-sectoral collaborations (Table 2).

Table 2. Political climate and existing bureaucracy

MedEcon Ruhr GmbH/e.V. (NRW)	• Declination of major industries (coal, mining, and steel), political awareness to upgrade industrial structure as a top priority. • A lead market strategy was adopted by the NRW state government, and the healthcare industry was targeted. Then, precursor associations of MedEcon Ruhr (Biometric Ruhr, Life Technologies Ruhr, etc.) were established with support (including finance) from the economic development agency of the state government. • Momentum toward cluster program at regional (city/state) and national level.
Forum MedTech Pharma e.V. (Bavaria)	• Recognition of the Bavarian state government on the importance of industrial clusters for innovation and growth of new industries in the mid-1990s. • From the mid-1990s, the state government financially supported the industrial network (therefore, industrial cluster). • The state government led the establishment of Bayern Innovativ, through cooperation with industry/academia, to promote innovation and knowledge transfer and support cluster organizations (accelerating the process from science to market).
Mannheim Medical Technology Cluster (BW)	• Momentum toward cluster program at state and national level. • Interest in the new area of industry to promote in the city and awareness of the growth potentiality of the medical technology industry through the survey conducted by the city government. • Momentum of the city government to support the industry and a unit (team) to support was organized.

Source: Drawn up by the author.

Politics for Supporting the Implementation of New Practices

The public sectors (i.e., the state and city governments) support the management bodies (cluster organizations) for their foundation, finance, and activities (Table 3).

Table 3. Politics for supporting the implementation of new practices

MedEcon Ruhr GmbH/e.V. (NRW)	• The precursor associations above received financial support (for three years) from the economic development agency of the NRW state government. Then, the agency led the integration of them: Establishment of MedEcon Ruhr. • Projects financing (funded studies in specific topics) by the state government.
Forum MedTech Pharma e.V. (Bavaria)	• Support for founding the cluster organization (Forum MedTech Pharma), financial support (founding period in 1998 and after launching cluster policy from 2006) by the Bavarian state government.
Mannheim Medical Technology Cluster (BW)	• Launching the structure (a section) and promotion by the city government (approved by the city assembly). • Support by the BW state government (information, networking, competitive fund).

Source: Drawn up by the author.

History of Success in Implementing New Practices

The previous trials are the basis for implementing the new programs (NRW, Bavaria). In contrast, the survey result can also justify implementing the new practice (BW) (Table 4).

Table 4. History of success in implementing new practices

MedEcon Ruhr GmbH/e.V. (NRW)	• Existence of the precursor associations above, their activities/achievements focusing on specific areas of healthcare sectors, and experienced staff and members belonging to the associations. (Although shifting the business was required: From purely focusing on technology issues to healthcare topics for expanding partners such as clinics and healthcare providers, e.g., networking for specific disease programs.)
Forum MedTech Pharma e.V. (Bavaria)	• Support by the state government (including finance) to the industrial networks in the state. • Events organized by Bayern Innovativ to get industry and academia together for interacting/communicating to explore how to promote the medical technology industry. • Networking in the medical technology field was promoted through the events above, and the parties concerned got to know each other and sought collaborations.
Mannheim Medical Technology Cluster (BW)	• No particular policy/program for medical technology (and related field) before. However, in 2009, the city government recognized through the survey that related sectors of the medical technology industry (e.g., medical institutions, companies, universities, etc.) already had substantial achievement and satisfied the critical mass for further growth through collaborations.

Source: Drawn up by the author.

Institutional, Industry, Market, or Technological Factors

The new programs are encouraged to implement with the institutional capacity to support and with the recognition of the potentiality of industry, market, and technology (Table 5).

Table 5. Institutional, industry, market, or technological factors

MedEcon Ruhr GmbH/e.V. (NRW)	• Institutional: Support by the economic development agency of the NRW state government and city governments. Competitive funds for projects by the state and federal governments and E.U. • Industry: Many potential collaborators in the industry (including IT and consulting companies), hospitals, universities, insurance companies, consultants, etc. • Market: Huge market with high growth potential. • Technology: Needs for collaboration to complement industry-engineering-medical, patents and studies in the related field (seeds for R&D and practices), and R&D Institutions (Universities, Fraunhofer, Max Planck, Helmholtz, etc.).
Forum MedTech Pharma e.V. (Bavaria)	• Institutional: Support by Bayern Innovativ on cluster programs/organizations (including technology and information transfer). Funding and supervision by the Bavarian state government. Competitive funds for projects by the state and federal governments and E.U. • Industry: Mix of big and small companies, hospitals and insurance companies, etc. (and existing network between them as above, became initial members of Forum MedTech Pharma). • Market: High growth potentiality of the market. • Technology: Needs for collaboration to complement industry-engineering-medical, patents, high-class research institutes, universities, and research achievements in the related field.
Mannheim Medical Technology Cluster (BW)	• Institutional: Initiative and structure to promote by the city government. Support by BW state government. Competitive funds for projects by the state and federal governments and E.U. • Industry: Satisfying the critical mass of potential collaborators (number of companies, medical institutions, and research institutions). • Market: High growth potential of the market. • Technology: Needs for collaboration to complement industry-engineering-medical, patents, and research achievement in the related field (e.g., in university hospitals).

Source: Drawn up by the author.

Need for the System, Readiness of the System to Change and Buy-In, Having an Adequate Timeline for Implementation, and Interest in Outcomes/Effectiveness

The public sector, which supports/leads the cluster programs, approaches the stakeholders of industry and academia (including hospitals) or the existing network, then evokes their recognition of the need for the new system for further innovation/growth and makes them ready for the new system (i.e., involvement in the activities of cluster organizations) (Table 6).

Table 6. Need for the system, readiness of the system to change and buy-in, having an adequate timeline for implementation, and interest in outcomes/effectiveness

MedEcon Ruhr GmbH/e.V. (NRW)	• Recognition of the parties concerned on the benefit from partnering between the precursor associations above. • Public sectors (cities, especially economic development departments of the region's major cities) were interested in promoting their cities, economy, and R&D through regional cooperation. • No specific timeline (adequate time for preparation).
Forum MedTech Pharma e.V. (Bavaria)	• The network between industry-academia-government was already formed through the initiative of Bayern Innovativ. • Being interested in business creation in the medical technology field and understanding the necessity of collaborations for creating the ecosystem between science, industry, and medical institutions (Initially, 55 members joined Form MedTech Pharma with the spirit of creating together). • The need for founding an association (cluster organization) to facilitate collaborations toward promoting the industry. The Bavarian state government and Bayern Innovativ recognized it from the survey result. • No specific timeline (however, it could be ready swiftly because of having the initial members), stressing the performance quality with a long-term view.
Mannheim Medical Technology Cluster (BW)	• Recognition by the city government about the growth potential of the medical technology industry in Mannheim city and the need for organizing structure to promote the industry through facilitating collaborations. • Approach to industry and research institutions by the mayor to join the promotion. Recognition of these stakeholders about the business opportunities with support from the city government. • No specific timeline (adequate time for preparation).

Source: Drawn up by the author.

Strong Leadership or Champions that Support Innovation and the Implementation of New Practices

Based on the recognition of the need for the new system, the industry-academia-government of the region cooperated and displayed their leadership in launching the management body (Table 7).

Other Factors: Resources

It is also observed that prospects for resources, such as physical assets, capital, labor, and alliances, contributed to the smooth launching. The public sector supports some of them (Table 8).

Table 7. Strong leadership or champions that support innovation and the implementation of new practices

MedEcon Ruhr GmbH/e.V. (NRW)	• Led by city governments (especially Essen, Dortmund, and Bochum), companies, universities, and regional health insurance companies with affiliated hospitals. Cooperation between these entities to host healthcare-related events to make the Ruhr area attractive to visit.
Forum MedTech Pharma e.V. (Bavaria)	• Led by the Bavarian state government and Bayern Innovativ through conducting the survey, justifying the necessity of a cluster organization (Form MedTech Pharma). Then the organization was founded. • Initial 55 members for starting the activities.
Mannheim Medical Technology Cluster (BW)	• Initiative of the city government. Recruiting a new staff, who had links to the industry and industry thinking, and delegating the staff as a managing director to lead the team. • Involvement of medical institutions, universities, and industries as initial members to launch.

Source: Drawn up by the author.

Table 8. Other factors (resources): Physical assets, capital, labor, and alliance functions

MedEcon Ruhr GmbH/e.V. (NRW)	• Physical assets: An office space provided in the technology center at the University of Bochum. • Capital: Membership fees from the initial members of the association, the prospect of the revenue from funded projects ordered by the state government and industry, and competitive funds for projects from federal/state governments and E.U.). • Labor: Staff of the precursor associations, additional staff were also recruited. • Alliance functions: Support from city governments, cooperation between city government, companies, universities, regional health insurance companies, etc.
Forum MedTech Pharma e.V. (Bavaria)	• Physical assets: The office of the Forum MedTech Pharma is provided and run by Bayern Innovativ. • Capital: Financial support from the state government, member fees, and competitive funds for projects from federal/state governments and E.U.). • Labor: Support for launching (including recruitment of talented personnel and administrative support) by Bayern Innovativ. • Alliance functions: Support by Bayern Innovativ (including facilitating knowledge exchange and cooperation through cross-cluster activities).
Mannheim Medical Technology Cluster (BW)	• Physical assets: Utilizing the city's infrastructure, such as office space and IT system, without initial costs. • Capital: Budget from the city government for operation costs, competitive funds for projects from federal/state governments and E.U.). • Labor: Delegating the city government staff to the team and supporting members from other sections of the city government if necessary. • Alliance functions: Prospects to cooperate with experts (delegating later as practice advisors) and stakeholders from several sectors (delegating later as board members).

Source: Drawn up by the author.

BUILDING PHASE OF THE MANAGEMENT BODY

Guiding Principles and Activities

In all cases, the essence of the guiding principles is to promote the healthcare industry (mainly medical technology) through networking (therefore, facilitating cross-sectoral collaborations) and are sustained until today. Regarding the activities, it is observed that the scope/topic and the approach are reviewed and revised after a certain period of activities. These are based on, as is discussed in "REBUILDING PHASE OF THE MANAGEMENT BODY" below, the change in the business environment, the intention/situation of members and other stakeholders (such as board, experts, etc.), and the performance indicators. The details about the guiding principles and activities set by the management body are described in Table 9.

Table 9. Guiding principles and activities

MedEcon Ruhr GmbH/e.V. (NRW)	**Guiding principles:** Promoting the healthcare sector (prevention, hospital care, ambulant care, and rehabilitation of the Ruhr area) by strengthening healthcare structures, improving the services, and upgrading the industry by building the network and facilitating cross-sectoral collaborations. **Activities:** • Early stage: Shift the focus from pure technology issues (e.g., technology transfer) to healthcare topics for more collaborative project opportunities (e.g., with clinics, healthcare providers) in the healthcare sector and society. • Scope and focus are changed/widened: e.g., Teleradiology network (2010–), promoting digitalization such as e-health and system to connect hospitals and local doctors (2012–2016), developing cyber security (2016–). • Today, considering digitalization and change in business models, three main areas are focused (Medical Technology, Managed Care, and Smart Health Data) with additional sub-areas (Children and Youth Care, Health Professions).
Forum MedTech Pharma e.V. (Bavaria)	**Guiding principles:** With members and partners from business, science, and politics, innovative and future-oriented trends are taken up, and cooperations (collaborations) are on an equal footing and promoting knowledge exchange. **Activities:** • Focusing mainly on technology issues (e.g., technology transfer, joint R&D for the new technology) in the past. • Shifting the focus to the hurdles in the innovation process (e.g., regulation for certification of products, change in business model, and market entry to play a part of value chain under digitalization) and stressing more on individual support to members (e.g., consultation).
Mannheim Medical Technology Cluster (BW)	**Guiding principles:** Facilitating the networking (and cross-sectoral collaborations) of companies, startups, clinics, and research to promote the medical technology industry in Mannheim City by providing relevant services. **Activities:** • Focusing on medical technology issues. • Widening the scope from medical technology to the healthcare industry (from 2019), focusing on elderly care recently. As a strategic roadmap for promoting the collaborations: • Focusing on virtual infrastructure in the initial period (e.g., MedTech dialog). • Expanding its focus on physical infrastructure from 2014 (e.g., building the MMT campus as a place to collaborate), it is still ongoing (in 2022). • Trying to synergize between virtual and physical infrastructures.

Source: Drawn up by the author with reference to Clusterportal Baden-Württemberg (n.d.), Forum MedTech Pharma e.V. (n.d.), Mannheim Medical Technology Cluster (n.d.), and MedEcon Ruhr GmbH/e.V. (n.d.).

Attributing Factors

The details about the attributing factors, clarified as the contributor to displaying the organizational competence in Chapter 10, are described in the following tables (from Table 10 to Table 19).

These factors are configured (or reconfigured) under the guiding principles and activities (and their redefinition).

Role

It is commonly observed that the role of the top manager is played by the managing director and the board (composed of stakeholders from industry, universities/research institutions, medical institutions, and public sectors) through setting strategies and defining the scope of activities, etc.

The staff, categorized as experts as introduced in Chapter 10, plays its role mainly as a project manager of collaborative projects based on their expertise.

Regarding recruitment, staff (including the management director) are employed by open recruitment in the case of NRW. In Bavaria, the managing director and a part of the staff belong to Bayern Innovativ and are dispatched to Forum MedTech Pharma, and others are employed by open recruitment. In BW, the officials (including the managing director) of the Mannheim city government are assigned to Mannheim Medical Technology Cluster (See Tables 10 and 11).

Table 10. Role of top manager

MedEcon Ruhr GmbH/e.V. (NRW)	**Top manager:** • Board of directors (including two managing directors): Strategy planning and securing the source of financing and external partners. Composed of diverse facets of industry & science (academia) in the healthcare sector. The board of directors is partly replaced by election, and before the election, persons who are effective for new activities are often approached by the managing director to be candidates. • 2 managing directors: One for the association (e.V.) and the company (GmbH)/one for the association. Strategy planning, human resource management, budget, business administration, and daily business.
Forum MedTech Pharma e.V. (Bavaria)	**Top manager:** • Board of directors: Strategy planning. The board members are from medical-related companies, universities, hospitals, insurance companies, and Bayern Innovativ. The board of directors is partly replaced by election. Before the election, managing directors approach members, who are effective for new activities, and ask them to be candidates for the board of directors. • Managing director (belonging to Bayern Innovativ): Strategy planning and implementation, human resource planning/management, business administration.
Mannheim Medical Technology Cluster (BW)	**Top manager:** • Executive Board: Helping to shape the strategic planning and implementation. The board members are from regional medical technology companies, universities, and research institutions. • Managing director: Strategy planning, directing and managing the organization, supervising the operation, networking, and public relations.

Source: Drawn up by the author.

Table 11. Role of staff

MedEcon Ruhr GmbH/e.V. (NRW)	**Staff:** • 18 staff (15 full-time equivalents) (2022). • 16 project managers: Project management based on expertise (medical technology, telemedicine, managed care, etc.), recruiting based on the scope of activities and topics. • 2 secretaries: Administrating projects, staff, and facilities. • (Recently) Strengthened communication team for visibility of MedEcon Ruhr. • Role: Facilitating network, matching, cross-sectoral collaborations, etc.
Forum MedTech Pharma e.V. (Bavaria)	**Staff:** • 8 full-time staff (2022): 4 are directly employed by Forum MedTech Pharma, and 4 are from Bayern Innovativ (enabling to constitute the best mix of staff). • Composed of project managers, marketing & event manager etc. • Role: Facilitating cross-sectoral collaborations by displaying each expertise (specific area/technology, marketing & communication, regulatory affairs, approval, etc.) through promoting networking, matching, planning/holding event & workshop for members.
Mannheim Medical Technology Cluster (BW)	**Staff:** • Composed of city government officials: 2 full-time staff (May 2023) and support members from other sections. • Filling up the support members based on the needs for implementing projects. • Role: Facilitating networking (cross-sectoral collaborations), practical support for routine business issues, strategic planning, and implementation.

Source: Drawn up by the author.

Defined Organizational Processes

In all cases, a defined organizational process is not strictly operated but roughly defined for the efficiency and effectiveness of operations (See Table 12).

Organizational Culture

The common features of organizational culture are horizontal and open. These are shared by internal and external parties to promote networking and collaboration (See Table 13).

Managerial Practices

In all cases, sharing information/knowledge between staff for better service provisions is practiced. Moreover, as a service for members, various methods and means (including utilization of IT systems) are taken to provide the field for facilitating learning, interacting, and sharing knowledge/ideas for new opportunities for collaborative businesses (See Table 14).

Table 12. Defined organizational processes

MedEcon Ruhr GmbH/e.V. (NRW)	• General process composed of 1. project idea by members, 2. looking for partners, 3. structuring project team, 4. looking for financing. • Double checking of written record. • Reporting to the board member by the managing director. (Basically, flexible processes and not strictly defined.)
Forum MedTech Pharma e.V. (Bavaria)	• Three-step approach for implementing collaborative project:1. Preparation (workshops, matching partners, identifying new technology branches), 2. Development (project meetings, funding), 3. Market entry (booth on fairs etc.). • Structured approach for forming collaborative project: 1. Stimulating the idea for the project, 2. Bringing the idea with the funding programs, 3. Matching to partners and forming the consortium, 4. Structuring the project. • Application of the quality management process of Bayern Innovativ for structured procedure and creativity/innovation.
Mannheim Medical Technology Cluster (BW)	• Two types of approaches for matching: 1. Demand-oriented approach (responding to the request from members and matching the partners), 2. Project-oriented approach (forming research consortia by developing an R&D project plan with core members and making it visible to others for matching partners). • Approaching to new partners: Defined process to contact (email), set events (workshops, etc.), and organize meetings to seek collaboration opportunities.

Source: Drawn up by the author.

Table 13. Organizational culture

MedEcon Ruhr GmbH/e.V. (NRW)	• Horizontal and open between staff or between staff and CEOs. • Flexible (including work-life balance) to implement the operations. • Unification and team building.
Forum MedTech Pharma e.V. (Bavaria)	• Valuing the bottom-up idea from staff (project managers) for the topics and collaborative projects to work on. • Horizontal and open-minded in search of new inter-sectoral fields of interest (e.g., other cluster organizations, human resources) through networking.
Mannheim Medical Technology Cluster (BW)	• Stressing to display leadership (e.g., for rallying support from collaborators), valuing horizontal/open relationships between staff.

Source: Drawn up by the author.

Table 14. Managerial practices

MedEcon Ruhr GmbH/e.V. (NRW)	• Utilizing knowledge portal (e.g., the database of past practices such as project reports, member information, materials such as research reports, etc.), workshops, visiting member's company for knowledge transfer, sharing/exchanging knowledge, and grasping new trends. • Periodical communications between managing directors and staff to share the progress of the project management (including size and amount of revenue earned etc.) and consider how to improve if necessary. • Creating new event (including workshop) formats/setups based on the change/ expansion of the scope of activities (e.g., Radiology Congress Ruhr). • (Recently) "Digital Health Academy Ruhr": E-learning platform for members and staff concerning the challenge of digitalization in the healthcare field (planning to provide non-members in the future).
Forum MedTech Pharma e.V. (Bavaria)	• Sharing knowledge, experience, and ideas between staff of different expertise and considering the best proposition for the collaborative projects, then proposing it to members toward forming the consortium. • Setting coffee breaks in the event/workshop to promote the interaction between various fields of expertise for creating a room of unfettered idea generations. • Grasping a gap of perspectives between different parties (e.g., different time scales) and setting a place to fill it. • Grasping the needs for support through visiting members and communicating in workshops, then improving the service or providing new ones. • The subjects of interest for members are brought as topics, then holding workshops or events (e.g., expert circles) where 15 to 20 persons are invited to discuss to develop joint projects. • Using digital platforms to enhance communication, transfer of knowledge, and matchmaking.
Mannheim Medical Technology Cluster (BW)	• MedTech dialog: Inviting members and discussing/learning a certain line of topics and providing a networking opportunity. • Events targeting CEO of industries, workshops for learning/sharing solutions (e.g., supply chain problem). • Database to share ideas/activities for developing collaborative projects. • Visiting members to find the solution for overcoming the cross-sectoral issue, supporting matching, and making the common goal/approach visible. • Constant communications between staff and members for sharing trends/ideas (recently utilizing LinkedIn). • Constant learning/reflection from activities (e.g., learning from failure). • Building physical places to interact and to share/exchange knowledge and idea toward the collaborations. • (After COVID-19) Switching to utilize a digital platform for knowledge transfer.

Source: Drawn up by the author.

IT Systems

IT systems are utilized for daily operations. Moreover, the system is utilized for training, knowledge sharing, matching, and enabling to form collaborations more smoothly (See Table 15).

Table 15. IT systems

MedEcon Ruhr GmbH/e.V. (NRW)	• Usual IT System (including IT system for remote work for the staff), videoconferencing within the team and the members, shared documents (e.g., Microsoft Teams). • Internal database: Member information, project report. • Own and new Platform, "Digital Health Academy Ruhr," for sharing digital health educational content (e-learning).
Forum MedTech Pharma e.V. (Bavaria)	• IT infrastructure provided by Bayern Innovativ. • Introduction of a digital platform showing clear pictures of technology and roadmap for specific subjects (stakeholders and members can view). Helping them identify the paths to work on and their part transparently and efficiently. • (Recently) digital platform for interactive Q&A and digital matchmaking.
Mannheim Medical Technology Cluster (BW)	• Utilizing IT infrastructure of the city government. • Usual IT system, database, video conference system (e.g., webinar).

Source: Drawn up by the author.

Cash

All the cases have access to the competitive fund for the collaborative project provided by the federal/state governments and E.U. In contrast, the budget for the operations is earned by the cluster organization by itself in the case of NRW, partially supported by the state government in the case of Bavaria, and totally provided by the city government in the case of BW (See Table 16).

Table 16. Cash

MedEcon Ruhr GmbH/e.V. (NRW)	Source of finance: (1) Member fee, (2) event fee, (3) project fee, (4) competitive funds from the federal/state governments and E.U. (for the project), (5) fee for services/assignments, (6) others. (Recently) New root for the competitive fund: e.g., Research development fund by the federal government for the healthcare issue of the whole of Germany.
Forum MedTech Pharma e.V. (Bavaria)	Source of finance: (1) Member fee, (2) competitive fund for projects from the federal/state governments and E.U., (3) fee of event/workshop and project management, (4) venture capital for particular projects. In addition, since 2006, financial support has been provided by the state government under the cluster program.
Mannheim Medical Technology Cluster (BW)	Source of finance: (1) Budget from the city government for operation cost, (2) finance for particular purposes (e.g., construction of MMT) from the city & state governments, E.U., private investors, (3) competitive funds for projects (50% from the federal/state governments and E.U., 50% from the city government).

Source: Drawn up by the author.

Table 17. Fixed assets

MedEcon Ruhr GmbH/e.V. (NRW)	• Neutral location of the office for members to come, join, and meet together. • Locational proximity to universities for easy access to R&D opportunities. • Moving several times for better conditions. Most recently, moving the office to the biomedical park, best suited to interact with actors from different sectors.
Forum MedTech Pharma e.V. (Bavaria)	• Office/conference (including events) space, IT infrastructure, and other facilities such as O.A. equipment are provided by Bayern Innovativ, which enables Forum MedTech Pharma to realize "lean" operations.
Mannheim Medical Technology Cluster (BW)	• Office: Provided by the city government. Recently, moving the office to the technology park of Mannheim city and being closer to industry and academia. • Physical space for collaborative R&D and startup (e.g., MMT campus, CUBEX ONE). Expanding and establishing the spaces/buildings for collaborative R&D and startup in the technology park (in 2022).

Source: Drawn up by the author.

Fixed Assets

Physical assets such as offices and other facilities are prepared by the cluster organization itself in the case of NRW. Conversely, these are supported or provided by the public sector (or its affiliation) in the case of Bavaria and BW (See Table 17).

External Partners

External partners are composed of organizations/institutions of various sectors. They are often utilized for providing services, and new partners are invited based on the scope of the activities (See Table 18).

Others

The additional attributing factors, which contribute to the organizational competence of the cluster organizations, are observed. First, in all cases, the composition of the members is considered, and, if necessary, the potential members are selectively approached by the cluster organizations with consideration of the balance of the composition and introduction of the new scope of activities. Moreover, the attributing factors of individual cases are also observed, such as the influence of the types of organization (the case of NRW), the access to the external partners facilitated by supporting institutions (the case of Bavaria), the introduction of the accreditation (the case of BW), and the authorization of the activities (the case of BW) (See Table 19).

Table 18. External partners

MedEcon Ruhr GmbH/e.V. (NRW)	• Insurance companies and patient organizations for grasping market trends, needs, and reimbursement requirements. • Communicating with the state government to get MedEcon Ruhr's business-related information and convey its intention through board members. • Consulting companies and marketing agents for activities and events promotion. • Communal sectors (e.g., the health department of city governments), which has people's healthcare data, are utilized for medical development. • ICT and cybersecurity companies (for promoting digitalization and communication between local doctors and hospitals, etc.). • Radiology providers and artificial intelligence (AI) companies (for promoting teleradiology networks). • Research Institutions (including universities).
Forum MedTech Pharma e.V. (Bavaria)	• Collaborations with other cluster organizations (facilitated by Bayern Innovativ). • Research institutions (e.g., Fraunhofer Institutes). • Startup centers of universities. • Patient organizations. • Industry associations such as the medical industry. • Close and continuous communication with the state government. • Approaching and scouting new partners based on needs to complement the weak points identified through feedback from members and periodic surveys.
Mannheim Medical Technology Cluster (BW)	• Practice Advisor (composed of clinicians, engineers, etc.): Contract with the city government to provide advice based on its expertise and can be the partner for collaborative projects. • Cluster Agency BW: Affiliated organization of the state government to support the cluster organizations through advising management methods (e.g., the conceptualization of activities/services, providing knowledge and technical assistance, and providing funding information, etc.). • Consulting companies, universities, etc. (some of them are members).

Source: Drawn up by the author.

Table 19. Others

MedEcon Ruhr GmbH/e.V. (NRW)	• Selective approach to the potential members (e.g., inviting firms and research institutions in the field of IT and cybersecurity in order to cope with the new scope of activities). • Balancing composition of members: Including healthcare providers (e.g., clinics that bring more project opportunities to members from the industry). • Type of organization: GmbH (not only e.V.) to smoothly develop profitable businesses.
Forum MedTech Pharma e.V. (Bavaria)	• Selective approach to the potential members to maintain the balance of industry and academia and to reflect the new scope of activities/topics. • Partnering with other cluster organizations of different fields of industries (e.g., Sensor Technology Cluster that Bayern Innovativ also supports).
Mannheim Medical Technology Cluster (BW)	• Selective approach of members: Considering the whole value chain impact (also reflecting the scope of activities). • Quality Label (accreditation by the BW state government): Increasing popularity and trust, which contributes to gaining good partners and members, harmonizing strategy/activities with the policy of the state government, then increasing the quality of work. • Authority/credibility of the city government that contributes to involving industry and academia smoothly.

Source: Drawn up by the author.

REBUILDING PHASE OF THE MANAGEMENT BODY

The efforts to rebuild the management body (cluster organizations) in the dynamic environment are observed in all cases.

Approach for Investigating and Learning the Necessity for Rebuilding

In addition to the survey on the change in the business environment by the staff of the cluster organizations themselves, they receive feedback from the stakeholders (e.g., members, board, experts, etc.) through communications. Moreover, each case has its approach, as described in Table 20.

Table 20. Approach for investigating and learning the necessity for rebuilding

MedEcon Ruhr GmbH/e.V. (NRW)	• Investigating or conducting surveys on the trend by the staff itself. • Learning intention/situation of members, stakeholders (e.g., external partners, the state government), and business environment. • Learning (and benchmarking) the practices of other healthcare cluster organizations in other regions through monthly video meetings. (A continuous process of investigating/learning for strategic change.)
Forum MedTech Pharma e.V. (Bavaria)	• Technology scouting by the staff to identify trends and challenges in the medical technology industry. • Communication and feedback from members, the board of directors, and the state government through activity and daily interactions to gain ideas about the change required (such as contents of workshops/events and services, the scope of activities, and strategy): Based on the principle of (1) observe and listen, (2) define and structure, (3) act, change and modify. • Total evaluation by the state government at the end of each stage of the cluster program (every four years) stimulates the evolution of strategy and activities.
Mannheim Medical Technology Cluster (BW)	• Tracing the change in the business environment. • Feedback (through communication) from opinions by practice advisors, board, and members to gain ideas and visions on the change. • Intention of the city government (including the decision by the congress). • Re-examination by the state government to determine whether the cluster organization is continually listed in the Cluster Portal BW or not (every two years). • Referring to the indicator and result of the application of Quality Label (Accreditation program of the BW state government) for reviewing organizational structure and management etc.

Source: Drawn up by the author.

Performance Indicators to Be Focused on for Rebuilding

Second, performance indicators are also referred to in all cases (Table 21). However, the feedback through communicating with stakeholders (including members) is stressed more than the indicators for considering rebuilding the management bodies in all cases.

Table 21. Performance indicators to be focused on for rebuilding

MedEcon Ruhr GmbH/e.V. (NRW)	• Revenue from events and projects is monitored. However, growth is a natural process (adaptive to changing situations).
Forum MedTech Pharma e.V. (Bavaria)	• Composition and scale of the network (external partners), composition and number of members, number of funded projects, revenue from service (event, workshop, etc.).
Mannheim Medical Technology Cluster (BW)	• Measuring three performance parameters every year: Number of new companies, startups, and conducted events and workshops.

Source: Drawn up by the author.

The Process to Reflect the Evaluation for Rebuilding

Finally, regarding the process to reflect the evaluation for rebuilding, the results of the investigation/learning and the performance indicators are reviewed by the top manager and also discussed as an agenda in the general meeting (e.g., annual conference) in which the board of directors, staffs, members, and other stakeholders get together. Then, based on the review and the discussion, the results are utilized for redefining guiding principles and activities. As far as being observed in the case study, up to today, redefinition has not been implemented in guiding principles but in the scope of activities. The redefinition enables the parties to identify the new organizational competence to be displayed. For example, it is observed in the case study that to implement the new scope of activities and promote/expand cross-sectoral interactions and collaborations; the management bodies identify the newly required competence to provide more appropriate fields. In accordance with the newly required competence, the attributing factors are reconfigured, e.g., introducing new managerial practices and building/expanding the physical place, etc. The process to reflect the evaluation for rebuilding the management body of each case is described in Table 22.

Table 22. The process to reflect the evaluation for rebuilding

MedEcon Ruhr GmbH/e.V. (NRW)	• The result of the investigation/learning is discussed in the annual strategy meetings. Then, the activities are defined: e.g., Changed/widened scope/focus of activities (e.g., healthcare topics). • Identifying new organizational competence to realize the activities: e.g., Continually operating for further development of the organization with new scope/ focus of activities through providing the refined field. • Reconfiguring the attributing factors for rebuilding: e.g., New managerial practices (creating new event formats/setups), expanding/moving the office, new partnership, etc.
Forum MedTech Pharma e.V. (Bavaria)	• Based on the investigation, learning, and the result of the performance indicators, new activities are discussed in the general conference and defined: e.g., Digital health, regulation, business model, and new topic. • Identifying new organizational competence to realize the new activities: e.g., Providing the refined field to pursue the new topic (such as individual consulting, coping with regulation, supporting new business models, etc.). • Reconfiguring the attributing factors for rebuilding: e.g., New managerial practice (new events/workshops), recruitment of new staff, approaching new external partners, introducing a digital platform, etc.
Mannheim Medical Technology Cluster (BW)	• Based on the investigation/learning and the result of the performance indicators, new activities are discussed in the general conference and defined: e.g., A new strategy roadmap to develop the physical infrastructure and increase the synergy between the virtual and physical infrastructure. A new topic to focus on (e.g., elderly care). • Identifying new organizational competence to realize the new activities: e.g., Providing the refined field (i.e., physical place, workshops/events) to promote/expand cross-sectoral interactions and collaborations. • Reconfiguring the attributing factors for rebuilding: e.g., Building/expanding physical assets (spaces) such as MMT campus, approaching new partners (practice advisors), etc.

Source: Drawn up by the author.

REFERENCES

Clusterportal Baden-Württemberg. (n.d.). *Mannheim Medical Technology Cluster.* https://www.clusterportal-bw.de/clusterdaten/clusterdatenbank/clusterdb/Clusterinitiative/show/clusterinitiative/mannheim-medical-technology-cluster/

Forum MedTech Pharma e. V. (n.d.). https://medtech-pharma.de/

Mannheim Medical Technology Cluster. (n.d.). https://medtech-mannheim.de/

MedEcon Ruhr GmbH/e. V. (n.d.). https://medecon.ruhr

Chapter 12
Discussion and Conclusion

ABSTRACT

The purpose of Section 4 is to explore how to build and rebuild a management body that facilitates cross-sectoral collaborations to create new businesses toward promoting competitive regional industries. The review of the theoretical study in Chapter 10 derives the conceptual model, and the case study in Chapter 11 examines three cases on building and rebuilding cluster organizations in the medical technology field in Germany. In this chapter, based on the conceptual model, the result of the case study is comparatively analyzed and clarifies the similarities and differences between the cases. Then, focusing on the individual case with the process tracing approach, events observed in the initial, building, and rebuilding phases of the cluster organizations are chronologically clarified, and the causal mechanism is examined. Finally, the validity of the conceptual model is considered based on the findings, and implications are discussed.

COMPARATIVE ANALYSIS OF THE THREE CASES

The study in Section 4 aims to consider how to build and rebuild a management body that displays the organizational competence required for facilitating the self-organization process of cross-sectoral collaborations toward promoting regional industries. The case study of the three states in Germany shows some differences, such as approaches and methodologies. However, the following are commonly observed in all cases.

First, the founding members and key stakeholders identify, learn, and share the antecedents in the initial phase. Then, guiding principles and activities are defined as the fundamental attributing factor. Second, the organizational competences required

DOI: 10.4018/978-1-6684-8494-4.ch012

for realizing the guiding principles and activities are identified, and the rest of the attributing factors are configured. Moreover, in the rebuilding phase, considering the intention/situation of members, the change in the business environment, and the performance measurement, the scope of activities is redefined. This leads to the reconfiguration of the attributing factors for displaying the newly required competence. In the following section, more specifically, the results of the case study are discussed based on the conceptual model.

Initial Phase: Antecedents

Similarity Between the Cases

The antecedents are the factors that can be facilitators/barriers and triggers/enablers (Donada et al., 2016; Franks & Bory, 2017) to be considered in the initial phase of building the management body. It is commonly observed in cases that the establishment of the management body is facilitated by the antecedents such as:

- Political climate to support cluster initiatives by facing the decline of conventional industries and the awareness of the growth potential of new industries.
- Political support for launching the management body (i.e., cluster organizations).
- Institutional capability and potential for growth of new field (i.e., medical technology) in terms of industry, market, and technology.
- Recognition of needs and readiness to launch the management body, involvement of stakeholders in the region, and adequate time to pursue the outcome.
- The leadership of the public sector toward building the management body through approaching and involving the stakeholders of industry-academia in the region, then sharing the recognition of the need to prepare for the building.
- The prospect of obtaining physical assets (such as office space), capital, labor, and alliance functions.

In addition to the above, the case study does not show the notable antecedents as barriers to launching the management body. On the contrary, it is observed that, with the initiative of the public sectors and cooperation/participation of the stakeholders from industries and academia in the regions, if necessary, the required antecedents

are deliberately readied toward building the management bodies and launching their activities (e.g., leadership by Bayern Innovativ for networking between stakeholders from industry and academia).

Difference Between the Cases

The difference is observed in the history of success in implementing new practices between the cases. Prior to the foundation of the management body, activities of the precursor associations (the case of NRW) and collaborative events and networking (the case of Bavaria) were already experienced in medical technology and related field. Based on the experience, they intended to develop further by launching the management body. In contrast, since BW does not have prior activities, they conducted a survey that showed the growth potential of the medical technology industry and reinforced to justify the implementation of the new practices (launching the management body to facilitate cross-sectoral collaborations).

Building Phase

Guiding Principles and Activities

It is commonly observed in the case study that the management bodies launch their activities based on the guiding principles and activities that show the direction, ways, and scope. The guiding principles and activities are defined initially by the founding members and key stakeholders (core staff, board composed of parties from industry-academia in the region, and public sectors, etc.), then are shared with the enrolled members. As described in the case study, notable changes in guiding principles are not observed after the foundation of the management bodies. However, in all cases, the scope of activities (such as topic and approach) is redefined in the course of their experience and through the review (the detail about the process of revision is described in "rebuilding").

Similarity of Attributing Factors Between the Cases

Concerning the attributing factors, the following features are commonly observed.

Regarding "role," top manager ("manager" in Chapter 10) is played by the board (composed of stakeholders in the healthcare/medical technology field in the region, from industry, universities/research institutions, medical institutions, and public sectors, etc.), and by the managing director who set strategies and defines the scope of activities. The managing director is also involved in the management and administration of the management body. In contrast, the staff ("expert" in Chapter

10), mainly as a project manager, plays its role in its expertise. To deal with the introduction of new activities or expansion of the activities, new staff is recruited. However, different ways of recruitment are employed between the cases, as below.

Concerning the other attributing factors, "organizational culture" is characterized by horizontal and open, and "defined organizational process" is roughly determined. "Managerial practices" are promoted to share information/knowledge between staff for better service provisions and provide the field to members for facilitating learning, interacting, and sharing knowledge/ideas for new opportunities for collaborative businesses. Moreover, various methods and means (including utilization of "IT systems") are taken as a service for members, such as to provide the field for facilitating learning, interacting, and sharing knowledge/ideas for new opportunities for collaborative businesses.

In addition, "external partners" are often utilized for providing services, and new partners are invited based on the scope of the activities. Moreover, regarding the attributing factor categorized in "others," the composition of the members is considered, and, if necessary, the potential members are selectively approached by the cluster organizations with consideration of the balance (composition) of members and the scope of activities.

Difference of Attributing Factors Between the Cases

Conversely, some differences are also observed between the cases.

The access to management resources is different between the cases. First, as for "fixed assets," offices and other facilities are prepared by the cluster organization in the case of NRW. In contrast, these are supported or provided by the public sector (or its affiliation) in the case of Bavaria and BW. Second, concerning "cash," although all the cases have access to the competitive funds for the collaborative project provided by the state/federal governments and EU, the budget for the operations is earned by the cluster organization by itself in the case of NRW, partially supported by the state government in the case of Bavaria, and wholly provided by the city government in the case of BW. Lastly, regarding the staff (including the managing director), they are openly recruited in the case of NRW, openly recruited and dispatched from Bayern Innovativ in the case of Bavaria, and assigned by the Mannheim city government from the city office in the case of BW.

In addition to the above, other differences are also observed, such as the access to external partners facilitated by supporting institutions (the case of Bavaria), the introduction of the accreditation program (e.g., the Quality Label BW), the authorization and credibility of the activities (e.g., the cluster organization governed by the city government in the case of BW), and type of organization (e.g., both e.V. and GmbH adopted by MedEcon Ruhr).

These differences come from the difference in the support from the public sector, the historical path of launching and circumstances/conditions that each case faced, and the entities that founded the cluster organizations.

Contribution of the Attributing Factors to the Organizational Competence

Attributing factors are configured to contribute to the required organizational competence identified by the defined guiding principles and activities.

Component Competence

It appears that the "role" played by top managers and staff, "organizational culture," and "cash" widely contribute to the component competences introduced in Chapter 10. Moreover, the other attributing factors can be explained as contributing to the component competence as follows.

Initial conditions and change in the business environment: The required organizational competence is to facilitate learning/sharing the antecedents or change in the business environment, then to foster a felt-need for involving parties concerned toward promoting cross-sectoral collaborations. This leads to the establishment (refinement) of the field and a better approach to accelerate the emerging interaction toward collaborations. As an attributing factor, (1) "managerial practices" and "IT systems" for sharing ideas/experience among staff and communicating with members/stakeholders for receiving feedback, and (2) "external partners" who provide the information/knowledge (e.g., about new trends), appears to contribute to strengthening the competence.

Establishment/refinement of the field: The following attributing factors appear to contribute to this competence: (1) "defined organizational processes," which provide a structured approach for setting-up field toward the collaborations, (2) "managerial practices," which establish/refine the field for knowledge sharing and interaction, (3) utilization of "IT systems" which enhance knowledge/idea sharing and communications, (4) "fixed assets," which provide the space for interaction, (5) "external partners," who provide new knowledge and information, and (6) "Composition of members (through selective approach)," that enhances the activities and interactions in the field toward the pursued goal of collaboration.

Emerging interaction toward collaborations: The required competence here is to accelerate the interaction of members in the field above and to match the partners (including the external parties) toward forming the collaborations. The following attributing factors appear to contribute mainly to this competence: (1) "defined organizational processes," which provide a structured approach to form collaborations,

(2) "IT systems," which make it easier to find partners, (3) "external partners" who provide opportunities for the new partnership, and (4) "composition of member (through selective approach)" that increases the chance to match appropriate partners.

Architectural Competence

Architectural competence, defined in Chapter 10, is to sense the change in environment and flexibly/self-organizationally change the management body itself, then alter, integrate, and recombine resources (component competence) for new value creation. As argued in Section 3, this enables the management body to facilitate the self-organization cycle toward cross-sectoral collaborations, which displays continuous adaptability and robustness in a dynamic environment. The wide range of attributing factors contributes to competence. Among them, "managerial practices" displays sensing capability to the change in environment, the "role" of the top manager which scrutinizes the change and considers new direction/strategy, and the "guiding principles and activities" which are reviewed and redefined appear to contribute to the competence significantly.

Rebuilding Phase

Similarity Between the Cases

Regarding the "approach to investigating and to learn the necessity for rebuilding," it is commonly observed that they are implemented by investigating/conducting surveys by the staff themselves on the change in the business environment and learning intention/situation of the members and the stakeholders through communication. Moreover, "performance indicators" are also referred to periodically. However, in all cases, they put more weight on the learning and feedback from the communication with members and the stakeholders to consider rebuilding the management body.

Concerning the "process to reflect the evaluation for rebuilding," as Kergel et al. (2018) show, it is commonly observed that the participants (in the cases, members and other stakeholders of the cluster organizations) are involved in the decision-making process of strategic priority, documentation of the strategy, and defining the activities/services. Therefore, in other words, the guiding principles and activities are reviewed and redefined by the top managers (such as the board and managing director) with the participation of members, staff, and other stakeholders through the discussion in the general meeting (e.g., annual conference). As stated in the case study, although redefinition is not observed in the guiding principles, the scope of activities is redefined.

After the redefinition of the scope of activities, the notable effort for identifying newly required architectural competence is not confirmed. However, the newly required component competence is identified (e.g., providing the refined fields suitable for the new activities). Then, the attributing factors contributing to the competence are reconfigured, such as introducing new managerial practices, inviting new members, introducing an IT system, and building the physical space to interact. This requires architectural competence in terms of scheming how to change (therefore rebuild) the management body itself and identifying the resource (newly required component competence) to alter, integrate, and recombine with consideration of the attributing factors to be reconfigured.

This process of rebuilding the management body is continuous and cycled, which enables it to be adaptable and competent for providing the required service in the changing environment.

Difference Between the Cases

Although the overall features of the rebuilding of the management body show the similarity as above, looking at the details, the following differences are observed.

Regarding the "approach for investigating and learning the necessity for rebuilding," in addition to the survey by the management body and the feedback from the stakeholders through communication, each case has its way. First, in the case of NRW, the management body puts weight on the benchmark with other healthcare-related cluster organizations. Second, in the case of Bavaria, the management body is assessed by the state government to consider the continuity of the support. Finally, in the case of BW, the management body is the subject of (1) the re-examination by the BW state government to consider the listing in Cluster Portal BW, which is determined based on the cluster organization's performance, and (2) Quality Label that is the accreditation program of the BW state government. Moreover, the cluster organization is also influenced by the intention of the Mannheim city government (i.e., the decision by Congress). These also contribute to each management body re-considering its performance (therefore, activities and organizational competence), which leads to rebuilding.

Looking at the "performance indicators to be focused for rebuilding," each management body has its focus, such as revenue from the service provided (NRW, Bavaria), scale and composition of the network (Bavaria), and the number of conducted events and workshops (BW), etc.

Finally, concerning the "process to reflect the evaluation for rebuilding," the difference is observed in the new scope of activities redefined, newly required organizational competence, and attributing factors reconfigured. In other words,

the difference comes from the new activities redefined by each management body that stems from investigation/learning and referring to the performance indicators for considering the necessity of rebuilding.

ANALYSIS AND INTERPRETATION OF EACH CASE

Focusing on the individual case, this part analyzes and interprets the causal relationship between events to deepen the understanding of how and why the management body is built and rebuilt. Figures 1, 2, and 3 depict the result of the analysis.

MedEcon Ruhr GmbH/e.V. in NRW

Antecedents in the Initial Phase

Before 2000, facing the decline of the major conventional industries such as coal, mining, and steel in NRW, a "political climate" was fostered toward developing new industries, and the state government adopted a lead market strategy. In this context, the medical technology industry was recognized as having a large potential for growth in terms of the "market, industry, and technology" of the region and received "political support" for promotion.

With the support (e.g., seed financing for three years) for launching by the "institution" (i.e., economic development agency) of the state government, precursor associations that aimed to promote medical technology and related fields were established in the Ruhr area around 2002.

Then, around the mid-2000s, with the recognition of the benefit of partnering to make the region attractive for the business, several cities (e.g., Essen, Dortmund, Bochum) displayed "leadership" to promote collaborative healthcare-related events with the participation of other regional stakeholders such as company, universities and health insurance companies that had affiliated hospitals. They understood the "need for the system" and promoted the integration of the precursor associations. Moreover, they shifted the business from purely focusing on technology to healthcare topics for expanding partners such as clinics and healthcare providers.

Based on the "history of success in implementing new practices" in terms of the activities/achievements by the precursor associations, existent staffs, and prospect for "resources" (e.g., physical assets, capital, additional staffs and external partners for alliances), in 2007, MedEcon Ruhr was established.

Building/Rebuilding Phase

In this part (and the following analysis on Forum MedTech Pharma e.V. in Bavaria and Mannheim Medical Technology Cluster in BW), since the organizational competence and the attributing factors are continually reviewed and changed, the building phase and rebuilding phase are integrally analyzed and discussed the causal relationship.

With the "guiding principles," which have not been modified until today, MedEcon Ruhr started its activities in 2007. The priority in the early stage is to understand the actors of the healthcare field in the region and stimulate their unification (and networking) of them. Initially, the "scope of activities" was roughly set as healthcare topics with the intention of not just pursuing the pure technology issue but pursuing more opportunities for collaborative projects (e.g., with clinics and healthcare providers) to solve problems in the healthcare sector and society through expanding the business opportunities. Then, as described in Chapter 11, the attributing factors are configured in the building phase of MedEcon Ruhr.

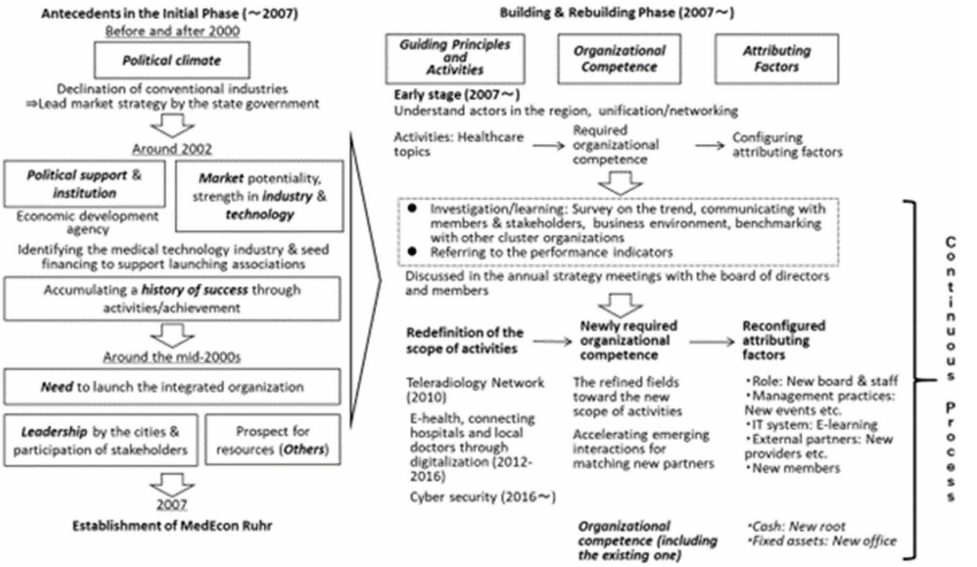
The scope of activities has been continually reviewed and redefined based on the needs/problems and intentions/situations of actors (i.e., members and other stakeholders) for working on the new trial in the region. The review and redefinition have proceeded through the continuous process of investigating and learning through conducting surveys on the trend by the staff, communicating with members and stakeholders, understanding the business environment, and benchmarking with other cluster organizations of the same field. In addition, the performance indicators, such as revenue from events and projects, are referred to. However, the top manager put more weight on the continuous investigation and learning process for the review and redefinition. The result of the investigation and learning are discussed in the annual strategy meeting with the board of directors and members, and, up to today, the scope of activities has been redefined. The activities redefined are, as introduced in Chapter 11, teleradiology network from 2010, e-health and connecting hospitals and local doctors through digitalization from 2012 to 2016, and cyber security from 2016.

In order to implement the new scope of activities, the newly required organizational competences (categorized as component competences in Chapter 10) are identified. These are (1) Providing the refined field that enables members to interact and learn toward the collaborations in the new direction (therefore, the new scope of activities), (2) Accelerating emerging interactions through matching the new partners toward the collaborations in the new scope of activities.

Until today, a notable change has not been observed in "defined organizational processes" and "organizational culture." However, intending to display the newly required organizational competence, MedEcon Ruhr has reviewed and reconfigured the following attributing factors. Regarding "role," the board of directors and staff are changed or joined. "Managerial practices," such as new events, workshops, and

knowledge portal, are continually reviewed and introduced. Moreover, to strengthen the capabilities of members and staff for the challenges of digitalization, recently, a new "IT system" with the content of an e-learning platform has been introduced. "External partners" are newly approached and obtained (e.g., communal sectors, IT & cybersecurity, and radiology providers) based on the scope of activities. Finally, to strengthen the foundation for networking and collaborative business development in the new scope of activities, new members are invited and, if necessary, selectively approached. In addition to coping with the new scope of activities, the reconfiguration of the following attributing factors appears to contribute to the organizational competence for both new and existing scopes of activities. As for "cash," the sources have been the same. However, with the growing organization and its network, MedEcon Ruhr can access the new root for the competitive fund (e.g., research development fund by the federal government). Office, one of the critical "fixed assets," is reviewed and moved (and widened) several times to keep it geographically neutral and the best for the interaction for R&D and business development.

Figure 1. Initial, building, and rebuilding phases of MedEcon Ruhr
Source: Drawn up by the author.



Forum MedTech Pharma e.V. in Bavaria

Antecedents in the Initial Phase

In the mid-1990s, the Bavarian state government already recognized the importance of industrial clusters for innovation and the growth of new industries, and a "political climate" to promote them was fostered. As a result, the "political support" for developing industrial networks (therefore, the cluster initiatives) was increased (See also Chapter 5 in Section 2 for the detail). In this context, in 1995, the state government led the establishment of Bayern Innovativ through cooperation with industry and academia.

With the "institution" to support, the positive prospects for promoting the medical technology industry and the related field were recognized in terms of potentiality/strength in the "market, industry, and technology" of the region. Furthermore, the "history of success in implementing new practices" was accumulated through supporting industrial networks and holding events that contributed to forming the networks of parties concerned (industry and academia) in the medical technology industry. Then, with the understanding of the necessity of collaborations for creating the ecosystem and the "need for the system" to promote, the state government determined to support the cluster initiatives of the medical technology industry and provided financial support ("capital") for launching the cluster organization. In this process, Bayern Innovativ displayed its "leadership" to found the cluster organization with the premise to provide "the resources" (physical assets, labor, and alliance functions); then, Forum MedTech Pharma was established in 1998.

Building/Rebuilding Phase

With the "guiding principles," which have been consistent until today, Forum MedTech Pharma launched in 1998. The initial members, composed of 55 from industry and academia, had been interacting in the events/workshops held by Bayern Innovativ and had already networked and shared the goal of promoting the industry. The main "scope of activities" targeted technology issues (e.g., technology transfer, joint R&D for the new technology). The guiding principles and the scope of activities reflected identifying the required organizational competence, then configuring the attributing factors in the building phase of the management body of Forum MedTech Pharma.

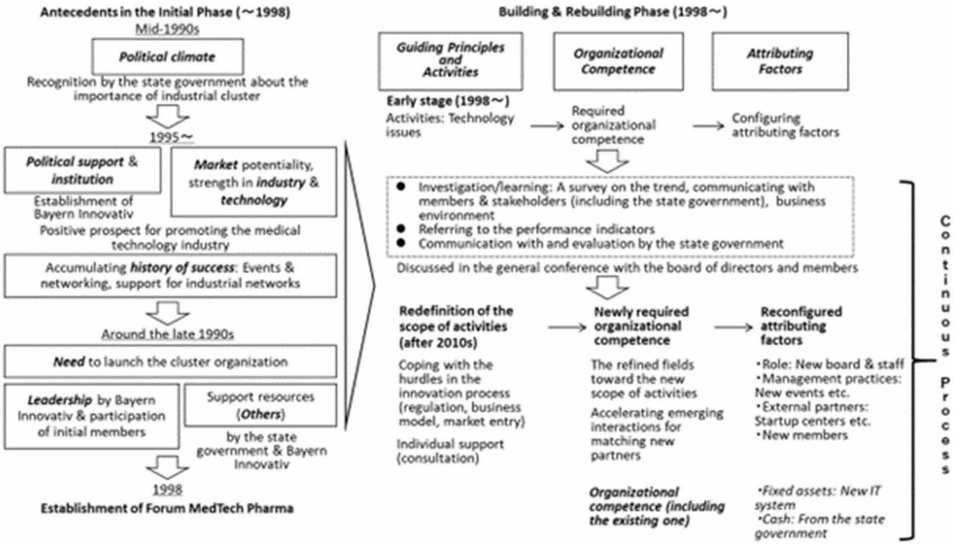
The scope of activities has been continually reviewed and redefined by reflecting the continuous process of investigating and learning through conducting surveys on the change in the business environment by the staff and communicating with members and stakeholders to grasp the intention/situation. The performance indicators were also set, and the composition and scale of the network (external partners), composition

and number of members, number of funded projects, and revenue from service (e.g., events, projects) are periodically referred to. As in the other cases, the top manager put more weight on the continuous investigation and learning process to review and redefinition the scope of activities. Moreover, constant communication and sharing of the direction/approach with the state government have been carried on in this case. Forum MedTech Pharma is conscious of the evaluation by the state government, which is conducted periodically (at the end of each stage of the cluster program) to determine the continuity of the support since 2006. The result of the investigation/learning above is discussed in the general conference with the board of directors and members, and, up to today, the scope of activities has been redefined. As a result of it, especially after the 2010s, the main focus was shifted to coping with the hurdles in the innovation process (e.g., regulation for certification of products, change in business model, and market entry to play a part of value chain under digitalization) and stressing more on individual support to members (e.g., consultation).

The following organizational competences (categorized as component competences in Chapter 10) are identified for implementation of the new scope of activities: (1) Refining the field for members to interact, access information and receive services toward the collaborations in the new direction (therefore, the new scope of activities), (2) Accelerating emerging interactions through providing the efficient way of matching the new partners.

Regarding the attributing factors, up to today, a notable change has not been observed in "defined organizational processes" and "organizational culture." However, other attributing factors have been reviewed and reconfigured. Regarding the "role," the new board of directors and staff (including the staff dispatched from Bayern Innovativ) are recruited to strengthen the lineup for the new scope of activities. New events, workshops, and knowledge portal are continually reviewed and introduced to refine the "managerial practices." "External partners" were newly approached and obtained, e.g., other cluster organizations, startup centers of universities, etc., based on the scope of activities. New members are invited and, if necessary, selectively approached for enhancing networking and collaborative business development in the new scope of activities. In addition, the reconfiguration of the following attributing factors appears to contribute to the organizational competence for both new and existing scopes of activities. First, IT infrastructure ("IT systems") provided by Bayern Innovativ as "fixed assets" are newly introduced (e.g., digital platform) for more efficient/effective interaction, matching, and knowledge sharing. As for "cash," in 2006, the state government started to provide financial support as a new source of finance under the cluster program.

Figure 2. Initial, building, and rebuilding phases of Forum MedTech Pharma
Source: Drawn up by the author.



Mannheim Medical Technology Cluster in BW

Antecedents in the Initial Phase

There was momentum toward cluster programs in BW state, and the state government launched its policy for promoting industrial clusters in 2006 (See Chapter 5 in Section 2 for details). In this trend, the city government of Mannheim was interested in promoting the new area of industry and recognized the growth potentiality of the medical technology industry. There had not been an apparent "history of success in implementing new practices" to promote the industry through facilitating networking and collaboration. However, the city government recognized through the survey that sectors required for promoting the medical technology industry (e.g., medical institutions, companies, universities, etc.) already had substantial achievement and had the potential to promote the industry through collaborations. The city government evaluated that the critical mass for launching the cluster initiatives had already been satisfied in terms of "market, the strength of industry and technology." In this context, "political climate" was fostered to develop the industry, and the "political support" was approved by the city assembly. Then, Mannheim Medical Technology Cluster was established in 2011 as a unit of the city government with the recognition of the "need for the system" to organize a structure for promoting the industry through facilitating collaborations. Therefore, the "institution" for promoting the

cluster initiative was structured by the "leadership" of the city government that also positively approached industry and research institutions, etc., to collaborate toward the new business opportunity. Moreover, the cluster organization was promised to fully utilize the city government's "resources" (physical assets, capital, labor, and alliance functions).

Building/Rebuilding Phase

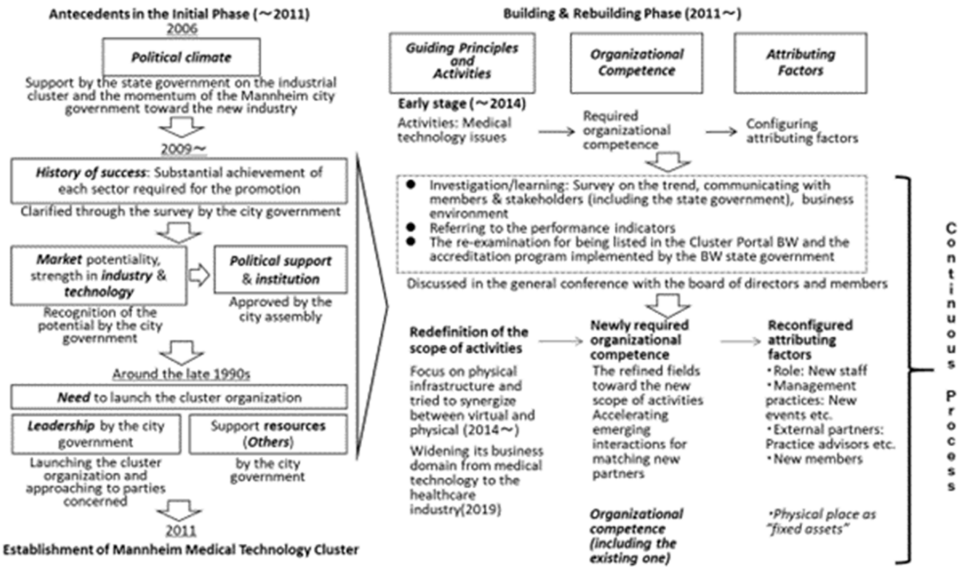
Since the foundation of Mannheim Medical Technology Cluster in 2011, the "guiding principles" has not changed until today. Concerning the "scope of activities," the cluster organization focused on medical technology issues and, approximately three years since its launch, developing the virtual infrastructure such as events and workshops toward the collaborations was mainly worked on as a strategic roadmap to promote collaborations. The attributing factors were configured based on the required organizational competence to realize the guiding principles and the scope of activities in the building phase of the management body.

The scope of activities has been reviewed and redefined based on the investigation and learning through surveying the trend and the change in the business environment by the staff and communicating with members and stakeholders, many of which are conducted in the day-to-day work. The performance indicators (number of new companies, number of start-ups, and number of conducted events and workshops) were also set and referred to. However, the top manager put more weight on the continuous investigation and learning process for the review and redefinition. Moreover, in this case, it is notable that the management body is conscious of the re-examination to be listed in the Cluster Portal BW and the accreditation program (i.e., Quality Label), which the state government implements. The result of the investigation/learning above is discussed in the general conference with the board of directors and members, and up to today, the following have been implemented. In 2014, as a strategic roadmap to promote collaborations, Mannheim Medical Technology Cluster expanded its focus on physical space and tried to synergize between virtual and real infrastructures. This effort has been continued until today. Moreover, in 2019, the organization widened its business domain from medical technology to the healthcare industry and recently focused on elderly care.

In order to display the organizational competences (categorized as component competence in Chapter 10), first, refinement of the field (including the physical one) was required for the members to interact, access information and receive services toward the collaborations in the new direction (therefore, the new scope of activities). Moreover, emerging interaction is also reviewed to provide an efficient way of matching new partners.

In this case, a notable change has not been observed in the attributing factors such as "defined organizational processes" and "organizational culture," "IT system," and "cash." However, other attributing factors have been reviewed and reconfigured. Regarding "role," new staff (including those dispatched from the other city government units) are recruited to strengthen their competence. Concerning the "managerial practices," events and workshops are continually reviewed and refined. "External partners," such as practice advisors and partners from industry/academia, and members were newly and selectively approached and invited. In addition, regarding the reconfiguration of the attributing factors for the organizational competence of both new and existing scope of activities, looking at the "fixed assets," physical place was built and expanded to accelerate interaction and strengthen knowledge and idea exchange/sharing. Moreover, the office was moved to the technology park to make access to industry and academia easier. These contribute to providing a refined field for promoting knowledge creation and learning toward collaborations.

Figure 3. Initial, building, and rebuilding phases of Mannheim Medical Technology Cluster
Source: Drawn up by the author.



VALIDITY OF THE CONCEPTUAL MODEL AND CONCLUSION

The study in Section 4 examines how to build and rebuild a management body that facilitates a complex self-organization process toward cross-sectoral collaborations to promote the competitive regional industry. In the review of literature in Chapter 10, first, studies on network governance are examined by focusing on network effectiveness and types of governance and shown that a distinctly separate administrative entity called "Network Administration Organization" (NAO; equivalent to the "management body" in this study) is the most suitable type to facilitate a large number and variety of autonomous, and mutually dependent actors, which this study premises. Based on this argument, the management body's role/effect and organizational competence are explored, and based on Henderson and Cockburn (1994), component competence and architectural competence are clarified. Then, the argument is further developed to examine the methodology to build/rebuild the management body. First, with reference to Frank and Bory (2017) and other relevant studies (Buntak et al., 2015; Kogut & Zander, 1992; Taatila, 2004), antecedents, attributing factors contributing to organizational competence, and adaptation through a quality management approach are clarified as issues to be examined. Based on these arguments, to consider "how to build and rebuild the management body," three phases composed of initial, building, and rebuilding are examined. Finally, a conceptual model is proposed, and the details of each phase are examined.

The case study in Chapter 11 and the comparative analysis in this chapter show that, although variations in the approaches and methodologies are observed, commonality is also found. First, the founding members learned and shared the antecedent in the initial phase, which is expanded to involve the key stakeholders in the region. This fosters the parties above toward establishing the management body. Then, guiding principles and activities are defined, and the required organizational competences are identified. Moreover, the attributing factors are configured, and the management body is built. In addition, the scope of activities is redefined based on the investigation/survey by the staff themselves on the change in the business environment, the intention/situation of members and stakeholders, and the performance measurement. Moreover, in some cases, it is observed that the evaluation and the accreditation program by the authority (i.e., the state government) also influence the redefinition. Finally, the management body is rebuilt by reconfiguring the attributing factors to display the newly required competence. These findings show that the cycling processes of the initial, building, and rebuilding phases are continuously promoted, enabling the management body to be adaptable and competent in providing the required service in the dynamic business environment.

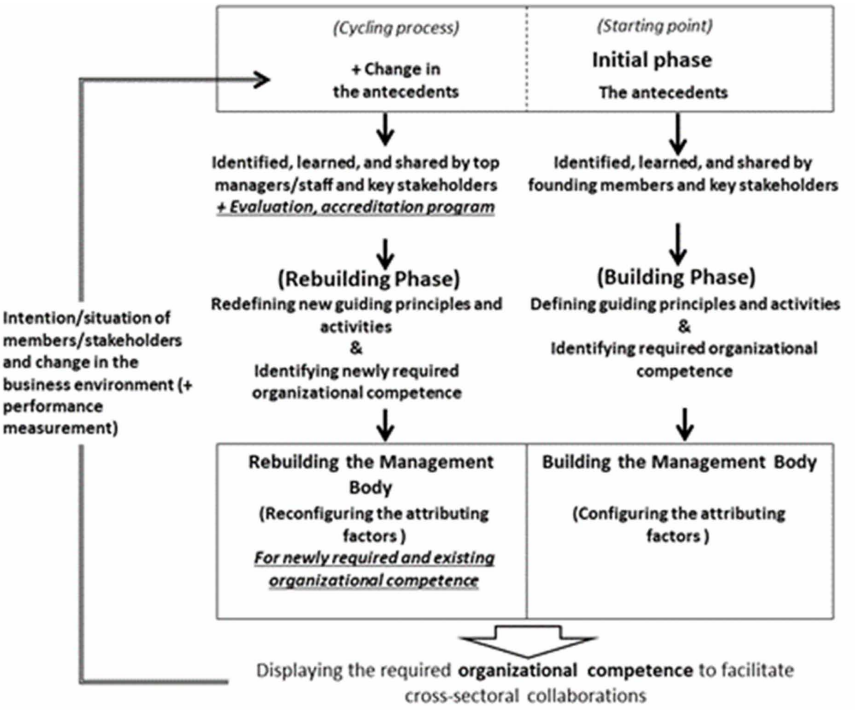
In addition to the comparative analysis of the three cases, the analysis of each case clarified the causal relationship between events in the initial, building, and rebuilding phases. It deepened the understanding of how and why the management body is built and rebuilt.

Based on the analysis above, the notable findings to be added to the conceptual model, which is introduced in Chapter 10, are:

(1) The evaluation and the accreditation program by the authority (the state government in this study) have also influenced the rebuilding of the management body.
(2) The reconfiguration of the attributing factors is also implemented to strengthen the existing organizational competence.

The modified conceptual model, which includes the findings above (written with the italic letter with underline), is described in Figure 4.

Figure 4. Modified conceptual model: Building and rebuilding a management body for facilitating cross-sectoral collaborations
Source: Drawn up by the author.



With the premise of the existence of a large number and variety of autonomous and mutually dependent actors inside/outside of the region toward promoting the regional industries, the model proposes a comprehensive approach to consider "how to build and rebuild a management body that displays the organizational competence to facilitate a complex self-organizational process toward cross-sectoral collaborations."

Through the case study, with some modification, a certain validity of the conceptual model is confirmed about how to build/rebuild the management body. Moreover, the study provides practical insights for promoters considering establishing management bodies to facilitate cross-sectoral collaborations toward promoting regional industries. Conversely, the following must be considered further to deepen the theoretical basis. As Mignon and Kanda (2018) explain, the source of funding influences the role, activities to undertake, technological neutrality, and longevity of intermediary organizations. This view also can be applied to other factors, such as the source of other management resources and the composition of key stakeholders such as the board of directors. Clarifying the influence of these factors requires continuing the case study by expanding its scope and period of activities for examining further findings.

REFERENCES

Buntak, K., Drožđek, I., & Rašan, I. (2015). The interdependence of structural competence, organizational maturity and competitiveness. In *Proceedings, III International Conference Quality System Condition for Successful Business and Competitiveness.* Association for Quality and Standardization of Serbia.

Donada, C., Nogatchewsky, G., & Pezet, A. (2016). Understanding the relational dynamic capability-building process. *Strategic Organization*, *14*(2), 93–117. doi:10.1177/1476127015615286

Franks, R. P., & Bory, C. T. (2017). Strategies for developing intermediary organizations: Considerations for practice. *Families in Society*, *98*(1), 27–34. doi:10.1606/1044-3894.2017.6

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, *15*(S1, s1), 63–84. doi:10.1002mj.4250150906

Kergel, H., zu Köcker, G. M., Nerger, M., & Ziegler, O. (2018). *Cluster management excellence in the Danube region*. European Secretariat for Cluster Analysis (ESCA) c/o VDI/VDE Innovation + Technik GmbH.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383–397. doi:10.1287/orsc.3.3.383

Mignon, I., & Kanda, W. (2018). A typology of intermediary organizations and their impact on sustainability transition policies. *Environmental Innovation and Societal Transitions*, *29*, 100–113. doi:10.1016/j.eist.2018.07.001

Taatila, V. (2004). *The concept of organizational competence: A foundational analysis.* [Doctoral dissertation, University of Jyvaskyla]. Jyväskylä University Digital Repository.

Section 5
Concluding Remarks

Chapter 13
Toward Promoting Regional Industries Through Cross-Sectoral Collaborations

ABSTRACT

This study aims to elucidate how to facilitate the self-organization process toward cross-sectoral collaborations for business creation with the medium- to long-term objective of promoting new regional industries. To explore this research theme, 1) a regional system to support such promotion, 2) a management to facilitate cross-sectoral collaborations, and 3) a management body to implement the management are considered. As the chapter for concluding this study, first, the study is summarized. Second, focusing on the study in Sections 2 to 4, wherein the regional system, the management, and the management body are examined respectively through the analysis of the case studies, the significance of the findings on the theory building is discussed. Then, the practical implication of the findings is considered. Finally, after explaining the limitations of this study, future research issues are shown for further development of the study.

SUMMARY OF THIS STUDY

Section 1: Introduction

The aim of Section 1 is to introduce the overall picture and the approach of this study, which views that facilitating cross-sectoral collaboration is indispensable for promoting competitive new regional industries.

DOI: 10.4018/978-1-6684-8494-4.ch013

Chapter 1 shows that this study explores the effective promotion of new regional industries through collaborations. Next, collaboration, the subject of this study, is defined to be established between organizations with different functions that are equal and complementary to each other, with the objective of both parties benefiting from the new business opportunity. Moreover, it is clarified that collaboration is formed through a self-organization process among people belonging to different organizations, wherein the parties involved in the process interact by communication, and it is required to implement intervention to facilitate the process. In order to consider the effective promotion of new regional industries through cross-sectoral collaborations, it is proposed to explore the theme by focusing on the regional system, management, and the management body to implement it. Then, the relevant literature is introduced. Finally, the need for a case study that enables us to learn lessons from the practice is discussed, and it is suggested to conduct a comparative analysis of the cases by focusing on the efforts to promote the medical technology industry in the three states of Germany.

Chapter 2 explains the overall picture and the background of the case study by focusing on the economy and industry of Germany. After the mid-2000s, the country has been performing well in the economy, displaying steady growth and strength in innovation capability. However, in the late 1990s and early 2000s, it faced severe economic stagnation, and the government implemented policies to recover from it. One of the main policies is the growth strategy, intended to strengthen innovation capability and increase labor productivity. This aims to promote competitive industries across the country, including SMEs, which are the backbone of the economy and play a significant role in industrial development. One of the core measures toward this goal is promoting cluster programs supported by the federal and state governments. The notable feature is that Germany has a long tradition of decentralization, and each state is authorized to implement the policy for industrial promotion. Therefore, each state government provides its own support for cluster initiatives in its region (i.e., facilitating goal-oriented interaction for promoting regional innovation processes) to increase location-based competition. In contrast, the federal government provides support (i.e., evaluating and providing incentives to sort out the excellent cluster initiatives) by maintaining the coherence of policies between the state government through dialog and coordination. The medical technology field, which has a high potential for growth and leading the economy, is one of the industries targeted by a number of the state government for its promotion.

Chapter 3 explains the research design of this study, that is to elucidate 1. how to build/operate the regional system, 2. how the management is to be implemented for facilitating the self-organization process toward cross-sectoral collaborations, and 3. how to build/rebuild the management body to support this process. The approach is to build a comprehensive theory by proposing the conceptual model with a review

of the previous studies, then conducting a detailed examination of multiple case studies and considering the model's validity. Next, the importance of selecting the target case is explained. The criteria for selecting case studies are listed, and the cases in three German states are explained to fulfill them. Finally, data collection and analysis were described. Data collection for conducting the case studies is promoted through collecting the secondary data, then conducting semi-structured interviews with the parties concerned. Regarding analysis, a qualitative comparative analysis method based on several case studies is used to analyze the data, and process tracing for each case study is conducted by focusing on the chronology of events to clarify the causal chain and "how" and "why" issues that are the mechanism of leading to the results of each case study.

Section 2: Regional System to Promote Competitive Industries Through Cross-Sectoral Collaborations – How to Build and Operate

Section 2 explores R.Q.1, which aims to elucidate "a management approach to build and operate a regional system for facilitating the self-organizing process of cross-sectoral collaborations to promote new competitive regional industries."

Chapter 4 reviews the literature and proposes the conceptual model on R.Q. 1. First, the region is discussed as the best level to consider processes and patterns of innovation and construct competitive advantage, and the literature about the drivers and goals for competitive regional industries is reviewed. Then, based on the concept of "Constructed Advantage," approaches and key dimensions of "Constructing Regional Advantage (CRA)" are discussed. Here, it is suggested that each region is required to seek its own solution with consideration of initial conditions and interfacing of various directions. Moreover, a platform policy, which includes various actors, agencies, and structures, creates more scope and flexibility and is introduced as a suitable approach toward CRA. It is proposed that a platform policy should be deployed by building a regional innovation system (RIS) based on the Triple (Quadruple)-Helix model. Finally, actors and their roles are clarified, and it is indicated that the business environment is created by involving actors from the two subsystems composed of firms and research institutions, etc., then feedbacked by the environment for further development. These cycles occur as a self-organization process toward cross-sectoral collaborations. Conversely, government public policies are implemented to create a regional environment for facilitating these cycles. Based on these arguments, the conceptual model of R.Q. 1 is depicted. The model describes that, first, policymakers in the public sector should understand the initial conditions and identify the sector (industry) to be promoted. Moreover, they also have to approach and involve the local stakeholders. This is to build RIS based on the triple (quadruple)-helix model

for implementing platform policy and seeking the own solution, then facilitate the self-organization process toward cross-sectoral collaborations. The regional system is built and operated through interaction between top-down public forces (i.e., public sector) and bottom-up creative forces (i.e., firms and R&D institutions, etc.). The building process also includes experimentalism for evolution.

Chapter 5 illustrates the result of the case studies. The study scrutinizes the experiences of NRW, Bavaria, and BW in Germany. In these three cases, regional systems have been built and operated with trial and error, and today, cluster programs are promoted through interaction between the state government and regional stakeholders. This aims to strengthen innovation capability and promote regional industries by facilitating cross-sectoral collaborations. After explaining the overview of the economic and industry background of each state with the SWOT framework, the movements toward building the regional system are described wherein they promoted the effort either by reflecting and learning from the experience of the precedent program or gradually introducing the policies through conducting a survey and the interaction between regional stakeholders for pursuing their own solutions. These efforts result in the establishment of present regional systems. Regarding the structure of the regional system, industrial fields to be promoted are defined wherein the state governments (and the affiliate organizations) support launching cluster organizations and their activities. In addition to these overall movements, the case study focuses on the movements in the medical technology industries. First, the industrial background of each state is clarified with the SWOT framework. Then, the feature of the medical technology cluster of the three states is introduced. In all cases, the cluster organizations provide services to the members, such as networking and matching opportunities for collaborations, support for the application for competitive funds, and consulting for projects and training. It is also found that the state governments (or the affiliated organizations) supported the bottom-up movement of industry-academia (and local authority) to establish cluster organizations. Moreover, through observing the efforts in the medical technology field, it is found that the state governments direct the activities of the cluster organizations utilizing various measures to operate the regional system.

Chapter 6 conducts the comparative analysis of the result of the case studies based on the conceptual model and clarify the similarity and difference between the cases. Then, each case is analyzed with a process tracing approach wherein events observed are chronologically clarified, and the causal mechanism is examined by focusing on the efforts of 1. understanding the initial condition and exploring own solutions, 2. building and strengthening the regional system, 3. direction by the state government to operate the regional system. The result of the case studies shows the difference in paths to build the regional systems, their structures, and operations between the states. These differences are described in the comparative analysis and

are clarified more concretely in the analysis of each case. In contrast, the following are generally observed as the similarities between the cases. First, all three states focused on the concept of the industrial cluster for their goal, then understood initial conditions and pursued their own solutions. Here, it is found from the case study that the initial condition is learned through the interaction between the public sector and the two subsystems composed of industry and academia. Second, in the process of building the regional system, experimentalism is observed in terms of the interaction between the public sector and the two subsystems with trial and error, either through experiencing a precedent program or gradually implementing policies. The public sector also supports the self-organization (therefore, bottom-up) process of industry and academia to establish and strengthen the structure of cluster organizations. Third, to operate the regional system, it is found that the state governments try to direct the self-organization process of cross-sectoral collaborations toward regional priorities by influencing the activities of cluster organizations. With these findings from the case study, a certain validity of the conceptual model proposed in Chapter 4 is corroborated.

Section 3: Managing the Facilitation of Cross-Sectoral Collaborations – The Intervention in Complex Self-Organization Processes

Section 3 explores R.Q.2, which aims to elucidate "the management approach of facilitating the self-organization process toward cross-sectoral collaborations."

Chapter 7 reviews the literature and proposes the conceptual model on R.Q. 2. First, inter-organizational collaboration, which has its nature as a type of network organization, is argued that its strength of flexibility and innovativeness is derived from the loose coupling and its formation through self-organization; however, it is characterized by complexity. Therefore, intervention by the management layer is required to facilitate complex self-organization processes toward collaboration. Second, since complexity theory and Lewin's planned approach to change are identified as having common ground, the latter is scrutinized to consider further how complex self-organization processes can be facilitated. Here, action research-based intervention is proposed for performing leadership under complexity. Moreover, the initial conditions, fields, and emerging interactions are identified as the targets of management through intervention. Each target is clarified in detail. Then, the management, which is implemented through intervening in the targets to facilitate the self-organization process toward collaboration, is considered. Here, intervention in the initial conditions aims to facilitate participatory learning of the situation and to foster the felt-need for cross-sectoral collaborations. The purpose of the intervention in the field is to facilitate emergent movements of members for the establishment/

refinement of the field. Intervention is also implemented to facilitate emerging interaction toward collaborations. Based on these arguments, the conceptual model is proposed as a comprehensive management framework to facilitate complex self-organization processes toward cross-sectoral collaboration. The model illustrates the self-organization process of learning the initial conditions and fostering/sharing the felt-need, establishing/refining the field, and emerging interaction toward cross-sectoral collaboration. The process is cycled based on the felt-need fostered by the change in the business environment and feedback from members. Moreover, it also shows that the management layer implements the action research-based intervention to facilitate the process.

Chapter 8 illustrates the result of the case studies. The study scrutinizes the experiences of cluster organizations in NRW, Bavaria, and BW. After reviewing the socioeconomic environment and regional systems in the three states, the cluster organizations subject to the case studies (InnovativeMedizin NRW, Forum MedTech Pharma in Bavaria, Mannheim Medical Technology Cluster in BW) are introduced. The three cluster organizations have staff and members, and the former provides service to the latter to facilitate cross-sectoral collaborations. Then, based on the proposed conceptual model, the targets of intervention and the interventions of the three cases are scrutinized. First, the initial conditions of each case are clarified based on the category of positive and negative factors of the macro-environment, social network, and micro-environment. Intervention in the initial conditions is observed in the actions in the initial period, such as conducting surveys, fostering and sharing the felt-need among the founding members, and expanding the sharing of the felt-need with the regional stakeholders through approaching and inviting them as board members. This results in the foundation of cluster organizations. Second, the established and refined field of the three cases is clarified. Here, all the cases experienced the establishment of the field, then the refinement of the field after a certain period of activities. These are implemented through the intervention, wherein characteristic manners are observed in each case (e.g., recruiting members based on the value chain impact by Mannheim Medical Technology Cluster). The implementation of the intervention is determined through the survey (e.g., technology scouting in the case of Forum MedTech Pharma) and communication with stakeholders. Finally, intervention in the emerging interaction toward collaboration is also examined in each case. It is found that the intervention is implemented based on the established/refined field, and each case has a characteristic manner (e.g., the structured method in the case of InnovativeMedizin NRW).

Chapter 9 comparatively analyzes the result of the case studies based on the conceptual model and clarify the similarity and difference between the cases. Then, each case is analyzed with a process tracing approach wherein events observed are chronologically clarified, and the causal mechanism is examined by focusing on 1.

initial conditions and intervention, 2. intervention on establishment and refinement of field, and 3. intervention on emerging interaction. The result of the case studies shows differences in the path, methodology, and intervention's focus. In contrast, similarities are also observed in the following. First, the founding members intervene in learning the initial conditions by involving the parties concerned. It fosters a felt-need among them toward cross-sectoral collaborations in the medical technology industry, followed by the intervention in organizing the management layer (i.e., cluster organization) and establishing the field. Moreover, the management layer implements interventions to facilitate emerging interaction toward cross-sectoral collaborations based on the direction of the established field. Second, the management layer implements intervention for learning through surveys on the change in the business environment (including the change in the initial conditions), communicating and consulting with members and stakeholders to receive feedback/advice, and experienced activities. This leads to modification of the felt-need and intervention in refining the field that shows new direction. Then, the management layer implements interventions to facilitate emerging interactions based on the new direction. This facilitation of the cycle of the self-organization process of the collaborations by the management layer displays continuous adaptability and robustness in a dynamic environment to create innovative businesses through combining deliberate and emergent planning. These findings from the case study verify a certain validity of the conceptual model proposed in Chapter 7 with some modifications.

Section 4: Building and Rebuilding a Management Body for Facilitating Cross-Sectoral Collaborations

Section 4 explores R.Q.3, which aims to elucidate "how to build and rebuild a management body to display the organizational competence for facilitating the self-organization process of cross-sectoral collaborations toward promoting regional industries." As explained in Chapter 10, the management body is equivalent to the management layer, discussed in Section 3, that implements intervention to facilitate collaborations.

Chapter 10 reviews the literature and proposes the conceptual model on R.Q. 3. First, studies on network governance are examined by focusing on network effectiveness and types of governance. It is clarified as a distinctly separate administrative entity called "Network Administration Organization" (NAO; equivalent to the "management body" in this paper) is the most suitable type to consider the subject of this study that premises facilitating a large number and variety of autonomous, and mutually dependent actors toward the goal of forming cross-sectoral collaborations aimed at promoting regional industry. Based on this argument, the role/effect and organizational

competence to be displayed by the management body are explored. It clarifies that the core role of the management body is (1) fostering the felt-need of concerned parties toward the collaboration and (2) facilitating the cycle of self-organization toward the collaborations, which displays the role of continuous formation of cross-sectoral collaborations that create innovative businesses and promotes regional industries. Then, the component competence and architectural competence of the management body are clarified. Here, component competence is clarified and classified based on the targets of intervention to facilitate collaboration (i.e., initial condition, establishment/refinement of field, and emerging interaction). Moreover, architectural competence is identified as (1) sensing the change, then changing itself, and (2) altering and integrating component competence to generate new value-creating strategies through facilitating collaborations. Finally, the argument is further developed to examine the methodology for building and rebuilding the management body. First, antecedents, attributing factors contributing to organizational competence, and adaptation through a quality management approach are clarified as issues to be examined. Based on these arguments, to consider "how to build/rebuild the management body," three phases composed of initial, building, and rebuilding are examined. Then the conceptual model of how to build the management body is proposed.

Chapter 11 illustrates the result of the case studies. The study scrutinizes the experiences of cluster organizations in NRW (MedEcon Ruhr), Bavaria (Forum MedTech Pharma), and BW (Mannheim Medical Technology Cluster). After outlining the three management bodies (i.e., cluster organizations), the following are scrutinized based on the proposed conceptual model. First, the antecedents to be considered in building the management body in the initial phase are examined. Then, the guiding principles and activities are clarified. Here, in all cases, it is found that the guiding principles are sustained until today, and the scope of activities has been reviewed and redefined. Moreover, the details about the attributing factors contributing to displaying organizational competence are examined. It is clarified that these factors are configured (or reconfigured) under the guiding principles and activities (and their redefinition). Finally, how to rebuild the management body is examined. Here, first, investigation and learning of the necessity for rebuilding are conducted through surveys, feedback from the stakeholders, and other approaches (e.g., benchmarking with other cluster organizations, etc.). In this stage, performance indicators (e.g., revenues from events and projects, composition and number of members, etc.) are also referred to. The results of the investigation/learning and the performance indicators are reviewed by the top manager and discussed as an agenda in the general meeting. Then, the scope of activities is redefined. Moreover, based on the redefinition, new organizational competences are identified (e.g., providing more appropriate fields for implementing the new scope of activities or promoting/expanding cross-sectoral interactions and collaborations). Based on the

newly required competence being identified, the attributing factors are reconfigured (e.g., new managerial practices, physical place, etc.).

Chapter 12 conducts a comparative analysis of the result of the case studies based on the conceptual model and clarifies the similarity and difference between the cases. Then, each case is analyzed with a process tracing approach wherein events observed are chronologically clarified, and the causal mechanism is examined by focusing on 1. antecedents in the initial phase, 2. building/rebuilding phase. The case studies show the difference in approaches and methodologies between the cases. In contrast, the following similarities are observed. First, the founding members and key stakeholders identify, learn, and share the antecedents in the initial phase. It is found that facilitation to establish the management body is reinforced by some antecedents. Second, guiding principles and activities, which are the fundamental attributing factors, are defined by the founding members and key stakeholders, then shared with the enrolled members. The guiding principles and activities show the direction and ways of the management body. Moreover, the organizational competences required for realizing the guiding principles and activities are identified, and the rest of the attributing factors are configured. Here the contributions of the attributing factors to component and architectural competences are discussed. Finally, in the rebuilding phase, (as far as observed in the case studies) scope of activities is redefined by considering the result of the change in the business environment, the intention/situation of members and other stakeholders, and the performance measurement. This leads to the reconfiguration of the attributing factors for displaying the newly required competence. These findings from the case study corroborate a certain validity of the conceptual model proposed in Chapter 10 with some modifications.

FINDINGS FOR THEORY BUILDING

Significance of the Achievement

The significance of the findings on research questions described in Sections 2, 3, and 4 is the contribution to the academic value (theory building) of the research theme "How to implement the management for facilitating the establishment of cross-sectoral collaborations to promote new competitive regional industries through business creation, and with what kind of regional system and competence of the management body to facilitate it?" Here the achievement is, first, the contribution to the theory building concerning the management to facilitate self-organization toward cross-sectoral collaboration that is featured by complexity. Moreover, this study also elucidates the management approach for building and operating the regional system and building and rebuilding the management body that facilitates collaboration.

This study considers collaboration between organizations that are equal and complementary to each other, with the objective of the participating parties benefiting from the new business opportunity. Here, to promote the new regional industry, the facilitation of cross-sectoral collaboration is promoted through interactions among many, diverse, independent, and interdependent entities. With this premise, based on the viewpoint of theoretical sampling discussed in Chapter 3, the experience of the three states in Germany are selected wherein regional systems for industrial promotion are built and operated, and the management bodies are established for implementing the management to facilitate a self-organization process toward the cross-sectoral collaborations. These cases are comparatively analyzed. Moreover, the individual case is further analyzed based on the process tracing approach to clarify the causal relationship more clearly. Then, the validity of the conceptual models is considered. This is the challenge and the achievement to overcome the situation wherein empirical studies that comprehensively cover the research theme are scarce and to propose a highly credible theoretical framework.

Findings on Each Research Question

More concretely, the proposed conceptual models on R.Q.1 to 3 are validated with some modifications through the case study.

Regarding R.Q.1, the conceptual model describes the management approach to building and operating the regional system for promoting competitive regional industries through cross-sectoral collaborations. Here, the public sector learns the initial conditions through interaction with the two subsystems (i.e., private firms, research institutions, etc.) and pursues their own solutions. Then, the regional system is built through interaction between the public sector and two subsystems with trial and error. Moreover, the public sector also supports establishing and strengthening the entity (i.e., the management layer/body discussed in Sections 3 and 4) that facilitate the collaborations. Finally, the operation of the regional system is implemented by the public sector by directing the self-organization process toward collaboration.

The conceptual model on R.Q.2 shows management to facilitate the self-organization process of cross-sectoral collaborations. The model proposes that through the management by intervening in learning the initial conditions (including the change in the business environment), establishing and refining the field, and the emerging interactions; the cycling process of the self-organization process toward collaboration is facilitated. Moreover, the process displays continuous adaptability and robustness in a dynamic environment to create innovative businesses by combining deliberate and emergent planning through collaborations.

Concerning R.Q.3, the conceptual model describes the approach of building and rebuilding the management body to facilitate cross-sectoral collaborations. The model shows that the cycling processes comprise the initial phase to learn antecedents, the building phase of the management body, and the rebuilding phase of the management body. The last phase is promoted based on the intention/situation of members and stakeholders, changes in the business environment (including the antecedents), and performance indicators. The process is continuously promoted, enabling the management body to be adaptable and competent in providing the required service in the dynamic business environment.

Integrated Viewpoint on the Findings

Finally, considering the relationship between the findings, these theoretical frameworks can be integrated as follows.

Management and Building/Rebuilding

Considering the management to facilitate the collaborations and building/rebuilding the management body, these two are implemented in parallel.

First, the management is begun by learning the initial conditions and fostering the felt-need for collaboration that is shared by the core parties. This is followed by building the management body. Here, the antecedents are identified, learned, and shared by founding members and key stakeholders; some are similar to the elements to be considered as the initial conditions (e.g., political support, need for the system, and institutional, industry, market, or technological factors, etc.). Then, the guiding principles and activities are defined, and the organizational competence is identified, which directs the configuration of the attributing factors for building the management body. Moreover, in conjunction with the fostered felt-need among the core parties, the guiding principles and activities and the required organizational competence also influence the management body to implement the management by intervention through involving the additional stakeholders (i.e., board members) and fostering/sharing the felt-need, establishing the field, and facilitating emerging interactions.

Second, from the next stage and after, cycling processes are deployed on the management to facilitate collaboration and rebuild the management body. Concerning the management, change in the business environment, feedback from members, and experienced activities modify the felt-need, and it is reflected in the refinement of the field with a new direction. Then, the intervention on emerging interactions is implemented based on it. Similarly, rebuilding the management body is reflected by the change in the business environment, the intention/situation of members and stakeholders, performance indicators, etc. Then, the guiding principles and activities

are redefined, and newly required organizational competence is identified, which leads to the reconfiguration of attributing factors for rebuilding the management body. Here, the elements considered for the rebuilding significantly correspond to what is learned, analyzed, and understood in the cycling process of the management above because both are identified for providing better services to facilitate cross-sectoral collaborations. Moreover, the redefinition of guiding principles and activities and identification of newly required organizational competence influence intervention in the refinement of the field (i.e., the field for the new scope of activities) and emerging interactions. Therefore, except for the minor revision of the management that does not require the redefinition of the guiding principles and activities, the management reform and the rebuilding can be promoted in parallel.

Regional System

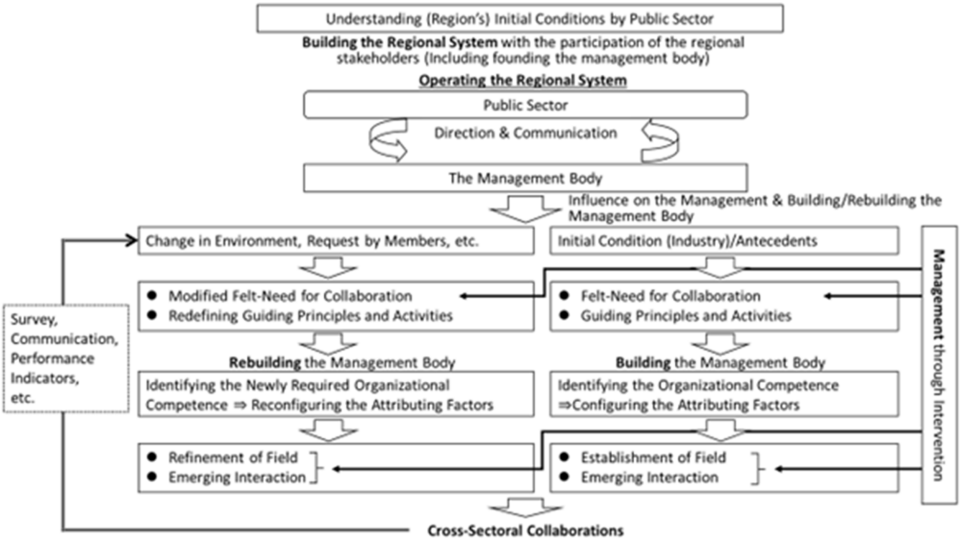
Looking at the regional system, initially, the public sector needs to understand the situation (such as potentiality) of industries and the bottom-up movements of industrial promotion in the region to identify the prospective fields of industries to promote. This is implemented through the survey or based on the experience of the relevant precedent programs. Moreover, the regional stakeholders from industry and academia, etc., of the identified fields above are approached by (or approach to) the public sector, then involved in jointly pursuing their own solutions for promoting the industries and building the regional system.

For the promotion of each industry, while the bottom-up (self-organizational) movement toward founding the management body is deployed by the core parties from industry, academia, etc., the public sector can facilitate the effort through support such as providing a platform to interact (e.g., conference, events) and financing. Furthermore, in the context of operating the regional system, the self-organization process of cross-sectoral collaborations is directed through evaluating and monitoring the management body by the public sector or the interaction between the two. In other words, the management to facilitate collaboration and the building/rebuilding, which are implemented by the management body, are influenced by the direction of the public sector.

The Integrated Framework of the Study

The arguments above clarify the organic relationships between the findings on the research questions, and that can be depicted as follows (Figure 1).

Figure 1. Integrated framework of the study
Source: Drawn up by the author.



PRACTICAL IMPLICATIONS

In addition to the theory building, based on the findings from the case study, this study also obtains the implications for practitioners involved in the management approach to facilitate cross-sectoral collaborations toward promoting regional industries. More concretely, the implications can be suggested for officials of the public sector (e.g., officials of a regional government and its affiliate) and facilitators (e.g., managers/ staff of the management body like cluster organizations) who intend to promote regional industries through collaborations.

Implications for the Official of Public Sector

Concerning the implications for the officials of the public sector who consider promoting the regional industry through collaborations, first, it is necessary to identify the industries with growth potential to be targeted for promotion. This is implemented through the survey and the relevant precedent experiences. Moreover, it is also required to grasp the bottom-up movements of the industrial network in order to identify the parties concerned to be supported. Furthermore, from the early period, the platform (e.g., events, workshops, etc.) for interacting between the public sector and these parties should be set up to promote understanding and sharing of the initial conditions and jointly pursue the solutions.

Second, to build the regional system, the platform can be utilized to jointly consider how it is built in terms of its structure and functions. Moreover, the management body that facilitates collaborations to promote certain fields of the industry should receive support from the public sector for its foundation or to strengthen its organization.

Finally, the critical point for operating the regional system is not to interfere but support the self-organization process toward collaboration through direction to achieve regional priorities. The public sector can implement this through communication with the management body, evaluation, and accreditation programs. In addition, the platform (like Cluster Dialogue in the case of BW), wherein stakeholders from various industries, academia, and the public sectors discuss and exchange/share information and goal, contributes to fostering the regional consensus and generating synergies between the different sectors/industries toward new dimensions of innovations.

Implications for the Facilitator

The study provides valuable concepts such as action research-based intervention and the concept of support that are beneficial approaches to practice management to facilitate collaborations. Moreover, as is discussed in "Integrated Viewpoint on the Findings" above, the implications for the facilitator are withdrawn on the management and building/rebuilding the management body wherein these two can be combined and synergized.

In the launching period of the management body, the initial conditions to consider the collaboration and the antecedents to build the management body are clarified by conducting the survey. Both should be learned and shared by the founding members and key stakeholders (i.e., public sector officials providing support, etc.). These have to be promoted through parallel efforts and can be utilized to justify founding the management body. Moreover, with the definition of guiding principles and activities, the organizational competence required for the management body must be identified to clarify the attributing factors and build the body. Furthermore, toward launching the activities, the founding member needs to recruit staff, approach and invite the board members and collaborators by sharing felt-need, and recruit the members openly/selectively by showing the benefit of participating. Finally, the staff must lead workshops, events, and meetings to establish the field to interact and promote matching potential partners for collaborative projects through accelerating the emerging interaction.

The major management reform that requires the redefinition of guiding principles and activities can also be promoted in a parallel effort. First, change in the business environment and feedback (i.e., request, intention, situation) from members and stakeholders, which are the drivers both for the rebuilding of the management body and the management reform, should be scrutinized through the study of the

business environment and communication with members and stakeholders, etc. Then, through the discussion at the general meeting and forming the consensus with members and stakeholders, redefining the guiding principles and activities, and rebuilding the management body (by identifying newly required organizational competence and reconfiguring the attributing factors) are taken the lead. Then, to facilitate collaborations in the new topics and activities, intervention is implemented to refine the field (i.e., new events, workshops, spaces, etc.) and accelerate emerging interaction.

In addition to the above, as an implication for top managers of the management body, communication with the public sector and playing as a liaison are also required to share the direction toward promoting regional industry and keep access to the public sector's support (including resources such as financing, physical assets, and information, etc.).

FOR FURTHER DEVELOPMENT OF THE STUDY

Limitations and Challenges of This Study

As discussed above, this study could achieve a certain contribution to theory building and withdrawing practical implications on the research theme. However, there are some limitations and challenges attributed to the focus and approach of this study.

Firstly, since the scope of this case study is confined to certain regions and industry, the findings may have room for the refinement of theory building. In response to this, it is required to continue the case study by expanding the scope of regions of different backgrounds in the structure/authority of the public sector (i.e., national and regional governments) and industrial structure. Then, the applicability of the proposed conceptual models needs to be considered. Moreover, the effectiveness of the practical implications discussed above has to be evaluated through the survey on the practitioners (i.e., officials of the public sector and facilitators) of various regions/countries and industrial fields, then revised based on the result. These efforts may find the additional factors, such as the key characteristics of the region, that influence the outcome of collaboration and promotion of regional industries, then contribute to the further development of theory through modifying the conceptual model.

Second, in order to elucidate the research theme and the research questions, the case study focused on the practice of the parties that facilitate cross-sectoral collaborations (i.e., the management bodies that directly work on the facilitation) and the parties that support the activities (i.e., public sectors that support the facilitation). Conversely, the experience and the viewpoint of the members who participate in

the collaborations (i.e., firms, universities, etc.) are not sufficiently discussed. In response to this, it is required to conduct a case study on the participants of the collaborations who belong to different fields and have different resources, scales, structures, and cultures, then to clarify how the facilitation effectively contributes to the formation of the collaborations. This contributes to clarifying more clearly the micro-macro loop mechanism of the effectiveness of the management activities and their support. Since a number of entities have to be examined for that study, it is also essential to consider the suitable research methodology.

These proposed efforts further enhance the validity of the theory building and the practical implications.

Future Research Issues

In addition to the above, the author envisages the following future research issues for further development of this study.

First, in Section 4, employees of the management body are examined by focusing on their "role" because they are seen as one of the attributing factors related to the structure of an organization. However, looking back at the study in Section 3, employees of the management body are required to display sophisticated skills (e.g., implementing action research-based intervention to enhance self-reliance efforts toward collaborations, etc.). Moreover, looking back at the study in Section 2, it can also be pointed out that the public sector officials involved in building and operating the regional system play a role that requires professional skills. As Taatila (2004) situates that the attributing factor related to individual employees is one of the main contributors to organizational competence; the skills of these human resources are also essential for pursuing the goal of promoting regional industries through cross-sectoral collaborations. Based on this awareness of the issue, it is necessary to examine these human resources to elucidate the required skills, how they are cultivated, and how they are evaluated.

Second, this study explores the management approach of how to facilitate the self-organization process of cross-sectoral collaborations toward promoting regional industries by focusing on the regional system, management to facilitate, and the management body. Through the study, for further development, the author realized the need to study how to build the governance frameworks that can be effective means for directing, controlling, and coordinating autonomous entities toward a certain direction, thus, enhancing the effectiveness of the management above. Moreover, it is also recognized that the governance, which is deployed in multilevel (i.e., region, industry, and the management organization), is co-evolved through sustaining the organic linkage between the different levels to promote the regional industry. This view is supported by the argument that the concept of governance

is fundamentally about steering the economy and society toward collective goals (Pierre & Peters, 2016). Moreover, Morçöl (2014) discusses the complex governance network of self-organizing actors. Furthermore, Chandra and Hillegersberg (2017) study the dynamism of governance. These studies help to consider the governance that increases the effectiveness of the management for promoting the regional industries through cross-sectoral collaborations and explore how the governance is structured and co-evolved.

REFERENCES

Chandra, D. R., & van Hillegersbergb, J. (2017). Governance lifecycles of inter-organizational collaboration: A case study of the Port of Rotterdam. *Procedia Computer Science*, *121*, 656–663. doi:10.1016/j.procs.2017.11.086

Morçöl, G. (2014). Complex governance networks: An assessment of the advances and prospects. *Complexity Governance & Networks*, *1*(1), 5–16. doi:10.7564/14-CGN5

Peters, B. G., & Pierre, J. (2016). *Comparative governance: Rediscovering the functional dimensions of governing*. Cambridge University Press. doi:10.1017/CBO9781316681725

Taatila, V. (2004). *The concept of organizational competence: A foundational analysis.* Jyväskylä studies in computing [Doctoral dissertation, University of Jyvaskyla]. Jyväskylä University Digital Repository.

Compilation of References

Ache, P. (2002). North-Rhine Westphalia. In P. Raines (Ed.), *Cluster development and policy* (pp. 71–89). Routledge.

Amit, R., & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33–46. doi:10.1002mj.4250140105

Antivachis, N. A., & Angelis, V. A. (2015). Network organizations: The question of governance. *Procedia: Social and Behavioral Sciences*, *175*(12), 584–592. doi:10.1016/j.sbspro.2015.01.1241

Argyris, C., & Schone, D. (1991). Participatory action research and action science compared. In W. F. Whyte (Ed.), *Participatory action research* (pp. 85–96). Sage. doi:10.4135/9781412985383.n6

Arnaldi, S., & Neresini, F. (2019). The role of intermediary organizations in the mainstreaming of responsible research and innovation in the Italian industrial sector. *Journal of Responsible Innovation*, *6*(3), 361–367. doi:10.1080/23299460.2019.1608616

Arnkil, R., Järvensivu, A., Koski, P., & Piirainen, T. (2010). *Exploring quadruple helix: Outlining user-oriented innovation models, final report on quadruple helix research for the CLIQ project.* Työraportteja 85/2010 Working Papers, University of Tampere, Institute for Social Research, Work Research Centre.

Asheim, B. T., Boschma, R., & Cooke, P. (2011). Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases. *Regional Studies*, *45*(7), 893–904. doi:10.1080/00343404.2010.543126

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Research Policy*, *34*(8), 1173–1190. doi:10.1016/j.respol.2005.03.013

Asheim, B. T., & Isaksen, A. (2002). Regional innovation systems: The integration of local "sticky" and global "ubiquitous" knowledge. *The Journal of Technology Transfer*, *27*(1), 77–86. doi:10.1023/A:1013100704794

Atmanagara, J., & Deckers, E. (2017). *New ways for cooperation with German Southwest: The Baden-Württemberg cluster and networks*. In Australian – German Networking Research Symposium, Stuttgart, Germany.

Avery, G. C. (2004). Understanding leadership. *Sage (Atlanta, Ga.)*.

Baker, E., Kan, M., & Teo, S. T. T. (2011). Developing a collaborative network organization: Leadership challenges at multiple levels. *Journal of Organizational Change Management*, *24*(6), 853–875. doi:10.1108/09534811111175797

Baker, W. E. (1992). The network organization in theory and practice. In N. Nohria & R. G. Eccles (Eds.), *Network and organizations: Structure, form, and action* (pp. 397–429). Harvard Business School Press.

Bardt, H., & Lichtblau, K. (2020). *IW-analysen 139 industriepolitische herausforderungen: Horizontale ansätze und neue aufgaben für den staat* [IW analysis 139 industrial policy challenges: Horizontal approaches and new tasks for the state]. Köln: Herausgegeben vom Institut der deutschen Wirtschaft Köln e. V. https://www.iwkoeln.de/en/studies/hubertus-bardt-karl-lichtblau-industrial-policy-in-germany.html

Barnard, C. I. (1938). *The functions of the executive*. Harvard University Press.

Barysch, K. (2003). *Germany–The sick man of Europe?* Policy brief. Center for European Reform. https://www.cer.org.uk/sites/default/files/publications/attachments/pdf/2012/policybrief_germany_man_kb-5422.pdf

Bavarian Ministry of Economic Affairs, Regional Development and Energy. (2019). *Cluster initiative Bavaria: In the network to success.* Bavarian Ministry of Economic Affairs, Regional Development and Energy. https://www.cluster-bayern.de/fileadmin/user_upload/stmwi/Publikationen/2019/2019-01-30_Cluster-Initiative_Bavaria_2018.pdf

Bavelas, A., & Barrett, D. (1951). An experimental approach to organizational communication. *Personnel*, *27*(5), 366–371.

BIOCOM AG. (2022). *Guide to German medtech companies, 7.* BIOCOM AG. https://medtech-zwo.de/fileadmin/medtech-zwo/PDF/MedtechGuide_2022.pdf

BIOPRO. (2016). *Medical technology 2016 facts and figures for Baden-Württemberg*. https://www.gesundheitsindustrie-bw.de/application/files/8814/7859/1864/Biopro-Flyer-Medtech-EN-2016.pdf

Borseková, K., Petríková, K., & Vaňová, K. (2012). The methodology of use and building competitive advantage on the regional level. *Journal of Security and Sustainability Issues*, *2*(1), 41–50. doi:10.9770/jssi/2012.2.1(4)

Brioschi, M. S., Cassio, L., & Colombelli, A. (2005). *Common frameworks for regional competitiveness: Insight from a number of local knowledge economics* [Paper presentation]. ERSA 2005 45th Congress of the European Regional Science Association, Amsterdam, Netherlands.

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, *66*(s1), 44–55. doi:10.1111/j.1540-6210.2006.00665.x

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2015). Designing and implementing cross-sector collaborations: Needed and challenging. *Public Administration Review*, *75*(5), 647–663. doi:10.1111/puar.12432

Buhl, C. M., zu Köcker, G. M., & Sedlmayr, B. (2019). *Development of cluster initiatives in Germany from 2008 - 2018*. Institute for Innovation and Technology. https://www.researchgate.net/publication/337671892_Development_of_Cluster_Initiatives_in_Germany_from_2008_-_2018

Bullinger, H. J., Bannert, M., & Brunswicker, S. (2007). Managing innovation capability in SMEs - The Fraunhofer three-stage approach. *Tech Monitor,* 17-27.

Buntak, K., Drožđek, I., & Rašan, I. (2015). The interdependence of structural competence, organizational maturity and competitiveness. In *Proceedings, III International Conference Quality System Condition for Successful Business and Competitiveness.* Association for Quality and Standardization of Serbia.

Burnes, B. (2004a). Kurt Lewin and complexity theories: Back to the future? *Journal of Change Management*, *4*(4), 309–325. doi:10.1080/1469701042000303811

Burnes, B. (2004b). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, *41*(6), 977–1002. doi:10.1111/j.1467-6486.2004.00463.x

Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, *7*(2), 73–90. doi:10.1111/j.1468-2370.2005.00107.x

Burnes, B., & Cooke, B. (2013). Kurt Lewin's field theory: A review and re-evaluation. *International Journal of Management Reviews*, *15*(4), 408–425.

Camagni, R. (2002). On the concept of territorial competitiveness: Sound or misleading? *Urban Studies (Edinburgh, Scotland)*, *39*(13), 2395–2411. doi:10.1080/0042098022000027022

Carayannis, E. G., & Campbell, D. F. J. (2012). *Mode 3 knowledge production in quadruple helix innovation systems: Twenty-first-century democracy, innovation, and entrepreneurship for development*. Springer-Verlag. doi:10.1007/978-1-4614-2062-0

Cartwright, D. (Ed.). (1952). *Field theory in social science: Selected theoretical papers*. Tavistock Publications.

Cellini, R., & Soci, A. (2002). Pop competitiveness. *BNL Quarterly Review*, *55*(220), 71–101.

Chandra, D. R., & van Hillegersbergb, J. (2017). Governance lifecycles of inter-organizational collaboration: A case study of the Port of Rotterdam. *Procedia Computer Science*, *121*, 656–663. doi:10.1016/j.procs.2017.11.086

Charles, D., Perry, B., & Benneworth, P. (Eds.). (2004). *Towards a multi-level science policy: Regional science policy in a European context*. Regional Studies Association.

Chen, B. (2008). Managing inter-organizational partnerships: Preconditions, processes and perceived outcomes. In *Academy of Management Annual Meeting Proceedings.* Academy of Management.

Chesborough, H. (2003). *Open Innovation*. Harvard Business School Press.

Chesbrough, H. (2006). Open innovation: A new paradigm for understanding industrial innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), Open innovation: Researching a new paradigm (pp. 1-14). Oxford University Press.

Child, J., Faulkner, D., & Tallman, S. (2005). *Cooperative strategy: Managing alliances, networks, and joint ventures* (2nd ed.). Oxford University Press. doi:10.1093/acprof:oso/9780199266241.001.0001

Cluster Medizintechnik. (n.d.). https://www.cluster-medizintechnik.de/de/home.aspx

Clusterplattform Deutschland. (n.d.-a). *Search clusters*. https://www.clusterplattform.de/SiteGlobals/CLUSTER/Forms/Suche/EN/Clustersearch_Form.html?cl2Categories_Typ_name=gocluster&oneOfTheseWordsEN=Enter+search+term

Clusterplattform Deutschland. (n.d.-b). *The "go-cluster" programme*. https://www.clusterplattform.de/CLUSTER/Navigation/EN/NationalLevel/go-cluster/go-cluster.html

Clusterplattform Deutschland. (n.d.-c). *Germanys leading-edge clusters*. https://www.clusterplattform.de/CLUSTER/Redaktion/EN/Downloads/Publications/deutschlands_spitzencluster.html

Clusterportal Baden-Württemberg. (n.d.). *Cluster policy in Germany*. https://www.clusterportal-bw.de/en/cluster-policy/cluster-policy-in-germany/

Clusterportal Baden-Württemberg. (n.d.). *Mannheim Medical Technology Cluster.* https://www.clusterportal-bw.de/clusterdaten/clusterdatenbank/clusterdb/Clusterinitiative/show/clusterinitiative/mannheim-medical-technology-cluster/

Clusterportal Baden-Württemberg. (n.d.-a). *Cluster data.* https://www.clusterportal-bw.de/clusterdaten/

Clusterportal Baden-Württemberg. (n.d.-b). *Medical technology.* https://www.clusterportal-bw.de/clusterdaten/technologiefelder/technologiefelder-detailseite/medizintechnik/clusterdb/Innovationsfeld/show/

Clusterportal Baden-Württemberg. (n.d.-c). *Quality indicators.* https://www.clusterportal-bw.de/cluster-exzellenz/qualitaetsindikatoren/

CLUSTERS 4 FUTURE. (n.d.). https://www.clusters4future.de/

Cooke, P. (1992). Regional innovation systems: Competitive regulation in the new Europe. *Geoforum*, *23*(3), 365–382. doi:10.1016/0016-7185(92)90048-9

Cooke, P. (2002). Regional innovation systems: General findings and some new evidence from biotechnology clusters. *The Journal of Technology Transfer*, *27*(1), 133–145. doi:10.1023/A:1013160923450

Cooke, P., Asheim, B., Annerstedt, J., Blazek, J., Boschma, R., Brzica, D., Lindholm Dahlstrand, Å., Del Castillo Hermosa, J., Laredo, P., Moula, M., & Piccaluga, A. (2006). *Constructing regional advantage: Principles, perspectives, policies*. European Commission.

Cooke, P., & Leydesdorff, L. (2006). Regional development in the knowledge-based economy: The construction of advantage. *The Journal of Technology Transfer*, *31*(1), 5–15. doi:10.100710961-005-5009-3

Crosby, B. C., & Bryson, J. M. (2005). *Leadership for the common good: Tackling public problems in a shared-power world* (2nd ed.). Jossey-Bass.

Crosby, B. C., & Bryson, J. M. (2010). Special issue on public integrative leadership: Multiple turns of the kaleidoscope. *The Leadership Quarterly*, *21*(2), 205–208. doi:10.1016/j.leaqua.2010.01.001

Data Commons. (n.d.-a). *North Rhine-Westphalia.* https://datacommons.org/place/nuts/DEA

Data Commons. (n.d.-b). *Bavaria.* https://datacommons.org/place/nuts/DE2

Data Commons. (n.d.-c). *Baden-Württemberg.* https://datacommons.org/place/nuts/DE1

Davis, J. P., & Eisenhardt, K. M. (2011). Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly*, *56*(2), 159–201. doi:10.1177/0001839211428131

deutschland.de. (n.d.). *Federal States of Germany.* https://www.deutschland.de/en/topic/politics/germany-europe/federal-states

Dickens, L., & Watkins, K. (1999). Action research: Rethinking Lewin. *Management Learning*, *30*(2), 127–140. doi:10.1177/1350507699302002

Donada, C., Nogatchewsky, G., & Pezet, A. (2016). Understanding the relational dynamic capability-building process. *Strategic Organization*, *14*(2), 93–117. doi:10.1177/1476127015615286

Dustmann, C., Fitzenberger, B., Schönberg, U., & Spitz-Oener, A. (2014). From sick man of Europe to economic superstar: Germany's resurgent economy. *The Journal of Economic Perspectives*, *28*(1), 167–188. doi:10.1257/jep.28.1.167

Dyer, J., & Kale, P. (2007). Relational capabilities: Drivers and implications. In C. E. Helfat, S. Finkelstein, W. Mitchell, H. Singh, D. Teece, & S. G. Winter (Eds.), Dynamic capabilities: Understanding strategic change in organizations (pp. 65-79). Blackwell Publishing.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550. doi:10.2307/258557

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25–32. doi:10.5465/amj.2007.24160888

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, *21*(10/11), 1105–1121. doi:10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

Elden, M., & Chisholm, R. F. (1993). Emerging varieties of action research: Introduction to the special issue. *Human Relations*, *46*(2), 121–142. doi:10.1177/001872679304600201

Etzkowitz, H., & Leydesdorff, L. (1997). *Universities and the global knowledge economy: A triple helix of university-industry-government relations*. Pinter.

European Association of Development Agencies. (n.d.). *Regional development agencies in Germany*. European Association of Development Agencies. https://www.eurada.org/fileadmin/user_upload/docs/RDAs-from-Germany.pdf

European Commission. (1995). *Green paper on innovation.* European Commission. https://op.europa.eu/en/publication-detail/-/publication/ad1d6f21-0b2e-423f-9301-c608035e906f

European Commission. Directorate-General for Regional and Urban Policy. (1999). *Sixth periodic report on the social and economic situation and development of the regions of the European Union*. Office for Official Publications of the European Communities. https://op.europa.eu/en/publication-detail/-/publication/b47f2f5b-5538-4475-acac-9f0c56da62c0

European Committee of the Regions, Volpe, M., Friedl, J., Cavallini, S., & Soldi, R. (2016). *Using the quadruple helix approach to accelerate the transfer of research and innovation results to regional growth*. Committee of the Regions. https://op.europa.eu/en/publication-detail/-/publication/6e54c161-36a9-11e6-a825-01aa75ed71a1

European Parliament. (2009). *Briefing note for the meeting of the EMPL Committee October 5 2009 regarding the exchange of views on the Lisbon Strategy and the E.U. cooperation in the field of social inclusion*. https://www.europarl.europa.eu/meetdocs/2009_2014/documents/empl/dv/lisbonstrategybn_/lisbonstrategybn_en.pdf

European Union. (2022). *Key figures on European business 2022 edition*. https://ec.europa.eu/eurostat/documents/15216629/15230677/KS-06-22-075-EN-N.pdf/930f2188-48cb-ef84-678e-e6f96682b072?t=1672841155329

European Union. (n.d.-a). *Country profile: Germany*. https://european-union.europa.eu/principles-countries-history/country-profiles/germany_en

European Union. (n.d.-b). *Facts and figures on the European Union economy*. https://european-union.europa.eu/principles-countries-history/key-facts-and-figures/economy_en

Eurostat. (n.d.-a). *Unemployment rate by age*. https://ec.europa.eu/eurostat/databrowser/view/tepsr_wc170/default/table?lang=en

Eurostat. (n.d.-b). *GDP and main components (output, expenditure and income)*. https://ec.europa.eu/eurostat/databrowser/view/nama_10_gdp/default/table?lang=en

Federal Ministry for Economic Affairs and Climate Action (BMWK). (2022). *Facts about German foreign trade*. Federal Ministry for Economic Affairs and Climate Action (BMWK). https://www.bmwk.de/Redaktion/EN/Publikationen/Aussenwirtschaft/facts-about-german-foreign-trade-2022.pdf?__blob=publicationFile&v=2

Federal Ministry for Economic Affairs and Climate Action (BMWK). (n.d.-a). *Competition policy: Protecting free competition*. https://www.bmwk.de/Redaktion/EN/Dossier/competition-policy.html

Federal Ministry for Economic Affairs and Climate Action (BMWK). (n.d.-b). *'Future of the German Mittelstand' action programme: SMEs are a recipe for success*. https://www.bmwk.de/Redaktion/EN/Dossier/sme-policy.html

Federal Ministry for Economic Affairs and Energy (BMWi). (2019a). *Industrial strategy 2030: Guidelines for a German and European industrial policy* -. Federal Ministry for Economic Affairs and Energy (BMWi). https://www.bmwk.de/Redaktion/EN/Publikationen/Industry/industrial-strategy-2030.pdf?__blob=publicationFile&v=7

Federal Ministry for Economic Affairs and Energy (BMWi). (2019b). *Valuing SMEs strengthening opportunities easing the burden the German SME strategy*. Federal Ministry for Economic Affairs and Energy (BMWi). https://www.bmwk.de/Redaktion/EN/Publikationen/Mittelstand/german-sme-strategy.pdf?__blob=publicationFile&v=3

Federal Ministry of Education and Research (BMBF). (2014). *The new high-tech strategy innovations for Germany*. Federal Ministry of Education and Research (BMBF). https://ec.europa.eu/futurium/en/system/files/ged/hts_broschuere_engl_bf_1.pdf

Federal Ministry of Education and Research (BMBF). (2018). *Research and innovation that benefit the people: The high-tech strategy 2025*. Federal Ministry of Education and Research (BMBF). https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/FS/31538_Forschung_und_Innovation_fuer_die_Menschen_en.pdf?__blob=publicationFile&v=7

Federal Ministry of Education and Research (BMBF). (n.d.). *Zukunftscluster-initiative (Clusters4Future)* [Future cluster initiative (Clusters4Future)]. https://www.bmbf.de/bmbf/de/forschung/zukunftsstrategie/zukunftscluster-initiative-clusters4future/zukunftscluster-initiative-clusters4future_node.html

Federal Ministry of Justice. (n.d.). *Competition act (Gesetz gegen wettbewerbsbeschränkungen - GWB)*. https://www.gesetze-im-internet.de/englisch_gwb/englisch_gwb.html#p0021

Federal Statistical Office of Germany (Destatis). (2022a). *Germany: Statistical country profile, edition 08/2022*. https://www.destatis.de/EN/Themes/Countries-Regions/International-Statistics/Country-Profiles/germany.pdf?__blob=publicationFile

Federal Statistical Office of Germany (Destatis). (2022b). *Fachserie 18 reihe 1.5, volkswirtschaftliche gesamtrechnungen, inlandsproduktberechnung, lange reihen ab 1970* [Subject series 18 series 1.5, national accounts, domestic product calculation, long series from 1970]. https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Publikationen/Downloads-Inlandsprodukt/inlandsprodukt-lange-reihen-pdf-2180150.pdf?__blob=publicationFile

Federal Statistical Office of Germany (Destatis). (n.d.-a). *Foreign trade: Overall developments*. https://www.destatis.de/EN/Themes/Economy/Foreign-Trade/Tables/lrahl01.html#242374

Federal Statistical Office of Germany (Destatis). (n.d.-b). *Exports and imports (special trade) by division of the national product classification for production Statistics 2022*. https://www.destatis.de/EN/Themes/Economy/Foreign-Trade/Tables/imports-exports.html

Federal Statistical Office of Germany (Destatis). (n.d.-c). *Industrial sector in Germany remains stronger than in many other E.U. member states*. https://www.destatis.de/Europa/EN/Topic/Industry-trade-services/Industry_GVA.html

Feldman, M. P., Francis, J., & Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, *39*(1), 129–141. doi:10.1080/0034340052000320888

Ferraro, G., & Iovanella, A. (2015). Organizing collaboration in inter-organizational innovation networks, from orchestration to choreography. *International Journal of Engineering Business Management*, *7*(24), 1–14. doi:10.5772/61802

Fiore, A., Grisorio, M. J., & Prota, F. (2011). Regional innovation systems: Which role for public policies and innovation agencies? Some insights from the experience of an Italian region. *European Planning Studies*, *19*(8), 1399–1422. doi:10.1080/09654313.2011.586173

Fjeldstad, Ø. D., Snow, C. C., Miles, R. E., & Lettl, C. (2012). The architecture of collaboration. *Strategic Management Journal*, *33*(6), 734–750. doi:10.1002mj.1968

Fligstein, N., & McAdam, D. (2011). Toward a general theory of strategic action fields. *Sociological Theory*, *29*(1), 1–26. doi:10.1111/j.1467-9558.2010.01385.x

Florida, R. (2002). *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. Basic Books.

Follet, M. P. (2013). The psychology of control. In H. C. Metcalf & L. Urwick (Eds.), Dynamic administration: The collected papers of Mary Parker Follett (pp.183-209). Harper & Brothers Publisher. (Original publication 1927)

Follet, M. P. (1918). *The new state: Group organization the solution of popular government*. Longmans, Green and Co.

Foray, D., Goddard, J., Goenaga Beldarrain, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., & Ortega-Argilés, R. (2012). *Guide to research and innovation strategies for smart specialisation (RIS 3).* European Commission, Smart Specialisation Platform. https://s3platform.jrc.ec.europa.eu/en/w/guide-on-research-and-innovation-strategies-for-smart-specialisation-ris3-guide-

Forum MedTech Pharma e. V. (n.d.). https://medtech-pharma.de/

Franks, R. P., & Bory, C. T. (2017). Strategies for developing intermediary organizations: Considerations for practice. *Families in Society*, *98*(1), 27–34. doi:10.1606/1044-3894.2017.6

Fraunhofer, I. W. M. (n.d.). *R & D for small and medium-sized enterprises*. https://www.iwm.fraunhofer.de/en/how-to-work-with-us/research-development-small-and-medium-sized-enterprises.html

Fraunhofer. (2018). The Fraunhofer model: Technology transfer from universities to industry. Commentary. *2018 Japanese-German Symposium.* https://www.janu.jp/eng/wp/wp-content/uploads/2021/04/20180426-jpde-presentation14.pdf

Fuchs, C. (2003). Structuration theory and social self-organization. *Systemic Practice and Action Research*, *16*(2), 133–167. doi:10.1023/A:1022889627100

George, A. L., & Benett, A. (2004). *Case studies and theory development in the social sciences*. MIT Press.

George, G., Zahra, S. A., & Wood, D. R. Jr. (2002). The effects of business–university alliances on innovative output and financial performance: A study of publicly traded biotechnology companies. *Journal of Business Venturing*, *17*(6), 577–609. doi:10.1016/S0883-9026(01)00069-6

Gerdes, T., Noegel, L., Buhl, C. M., Neugebauer, K., & Shajek, A. (2019). *Wissenschaftliche weiterbildung und clusterinitiativen: Wie clustermanagement-organisationen bei der entwicklung neuer angebote unterstützen können* [Scientific training and cluster initiatives: How cluster management organizations can support the development of new offers]. Institut für Innovation und Technik (iit). https://www.iit-berlin.de/iit-docs/b60ea32529d24773965e7fa18bdb4bf0_2019_09_02_Studie_Cluster_NEW_final.pdf

Germany Trade & Invest (GTAI). (2022). *Medical technology cluster in Germany.* Germany Trade & Invest. https://www.gtai.de/resource/blob/64176/0b820ca68223cf736433b4eb60d921c9/20221019_FS_MedTech_WEB.pdf

Germany Trade and Invest (GTAI). (2021). *Facts & figures economic overview Germany: Markets, productivity, innovation*. Germany Trade & Invest. https://www.gtai.de/resource/blob/686860/41221e6729bb71ea7300fb8dbab8343c/Economic_Overview_Germany_2021_GTAI.pdf

Gilbert, N., Anzola, D., Johnson, P., Elsenbroich, C., Balke, T., & Dilaver, O. (2015). Self-organizing dynamical systems. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (pp. 529–534). Elsevier. doi:10.1016/B978-0-08-097086-8.43086-2

Gill, R. (2003). Change management—Or change leadership? *Journal of Change Management*, *3*(4), 307–318. doi:10.1080/714023845

Giuliani, E., & Bell, M. (2005). The micro-determinants of meso-level learning and innovation: Evidence from a Chilean wine cluster. *Research Policy*, *34*(1), 47–68. doi:10.1016/j.respol.2004.10.008

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, *91*(3), 481–510. doi:10.1086/228311

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems*. Jossey-Bass.

Gray, B. (2008). Intervening to improve inter-organizational partnerships. In S. Gropper, M. Ebers, C. Huxham, & P. S. Ring (Eds.), *The Oxford handbook of inter-organizational relations* (pp. 664–690). Oxford University Press.

Greenberg, J., & Baron, R. A. (2000). *Behaviour in organizations*. Prentice–Hall.

Gulati, R. (1995). Social structure and alliance formation patterns: A longitudinal analysis. *Administrative Science Quarterly*, *40*(4), 619–652. doi:10.2307/2393756

Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, *19*(4), 293–317. doi:10.1002/(SICI)1097-0266(199804)19:4<293::AID-SMJ982>3.0.CO;2-M

Gulati, R., & Gargiulo, M. (1999). Where do interorganizational networks come from? *American Journal of Sociology*, *104*(5), 1439–1493. doi:10.1086/210179

Hamel, G. (2000). *Leading the revolution*. Harvard University Business School Press.

Handy, C. (1999). *Understanding organizations* (4th ed.). Penguin Books.

Hantsch, S., Kergel, H., Lämmer-Gamp, T., zu Koecker, G. M., & Nerger, M. (2013). *Cluster management excellence in Germany: German clusters compared with European peers*. European Secretariat for Cluster Analysis (ESCA). https://www.iit-berlin.de/iit-docs/21e1a4a8b3de460b8ca5170991d08314_cluster-management-excellence.pdf

Hartman, R. L., & Johnson, J. D. (1990). Formal and informal group communication structures: An examination of their relationship to role ambiguity. *Social Networks*, *12*(2), 127–151. doi:10.1016/0378-8733(90)90002-Q

Heidenreich, M., & Krauss, G. (2004). The Baden-Württemberg production and innovation regime: Past successes and new challenges. In P. Cooke, M. Heidenreich, & H. J. Braczyk (Eds.), *Regional Innovation Systems: The role of governance in a globalized world* (2nd ed., pp. 186–213). Routledge.

Heise, D. R. (1989). Modeling event structures. *The Journal of Mathematical Sociology*, *14*(2-3), 139–169. doi:10.1080/0022250X.1989.9990048

Helfat, C., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal*, *15*(S1, s1), 63–84. doi:10.1002mj.4250150906

Hendry, C. (1996). Understanding and creating whole organizational change through learning theory. *Human Relations*, *49*(5), 621–641. doi:10.1177/001872679604900505

Hessels, L. K. (2013). Coordination in the science system theoretical framework and a case study of an intermediary organization. *Minerva*, *51*(3), 317–339. doi:10.100711024-013-9230-1 PMID:23950615

Hestermeyer, H. P. (2015). The implementation of European Union law in Germany. In E. De Wet, H. Hestermeyer, & R. Wolfrum (Eds.), *The implementation of international law in Germany and South Africa* (pp. 444–467). Pretoria University Law Press.

Heylighen, F. (2008). Complexity and self-organization. In M. J. Bates & M. N. Maack (Eds.), Encyclopedia of Library and Information Science (3rd ed., pp. 1-20). Taylor & Francis.

Heylighen, F. (2013). Self-organization in communicating groups: The emergence of coordination, shared references and collective intelligence. In A. Massip-Bonet & A. Bastardas-Boada (Eds.), *Complexity perspectives on language, communication and society* (pp. 117–149). Springer. doi:10.1007/978-3-642-32817-6_10

Hibbert, P., Huxham, C., & Ring, P. S. (2010). Managing collaborative inter-organizational relations. In S. Cropper, M. Ebers, C. Huxham, & P. Ring (Eds.), *Handbook of interorganizational relations* (pp. 390–416). Oxford University Press.

Hilbert, J., Nordhause-Janz, J., Rehfeld, D., & Heinze, R. G. (2004). Industrial clusters and the governance of change: Lessons from North Rhine-Westphalia. In P. Cooke, M. Heidenreich, & H. J. Braczyk (Eds.), *Regional innovation systems: The role of governance in a globalized world* (2nd ed., pp. 234–258). Routledge.

Hogg, M. A., Van Knippenberg, D. V., & Rast, D. E. III. (2012). Intergroup leadership in organizations: Leading across group and organizational boundaries. *Academy of Management Review*, *37*(2), 232–255. doi:10.5465/amr.2010.0221

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy*, *35*(5), 715–728. doi:10.1016/j.respol.2006.03.005

Huxham, C., & Vangen, S. (2005). *Managing to collaborate: The theory and practice of collaborative advantage*. Routledge.

Imada, T. (2008). *Self-organization and society*. Springer.

Imai, K., & Kaneko, I. (1988). *Nettowa-ku soshikiron [Theory of network organization]*. Iwanami Shoten.

Institut für Mittelstandsforschung (IfM) Bonn. (2022). *Der Mittelstand im überblick* [The Mittelstand at a glance]. https://www.ifm-bonn.org/fileadmin/data/redaktion/ueber_uns/ifm-flyer/IfM-Flyer-2022.pdf

International Trade Administration. (n.d.). *Germany - Country commercial guide: Healthcare and medical technology*. https://www.trade.gov/country-commercial-guides/germany-healthcare-and-medical-technology

Invest in Bavaria & Bavarian Ministry of Economic Affairs and Media. Energy and Technology. (2020). *Life sciences in Bavaria.* Munich: Invest in Bavaria & Bavarian Ministry of Economic Affairs and Media, Energy and Technology. https://cms.invest-in-bavaria.com/fileadmin/media/documents/Flyer_broshures/Life_Sciences_in_Bavaria_2020.pdf

ISO 9004. (2009). *Managing for the sustained success of an organization: A quality management approach*. International Organization for Standardization.

Itami, K. (1999). *Ba no manejimento: Keiei no shinparadaimu (Managing "ba": New paradigm for management)*. NTT Publishing.

Ivanova, I. (2014). Quadruple helix systems and symmetry: A step towards helix innovation system classification. *Journal of the Knowledge Economy*, *5*(2), 357–369. doi:10.100713132-014-0201-z

Iwamoto, K. (2015). Hitorigati no Doitu kara Nihon no chiho/chushokigyo heno sisa: Doitu genchichosa kara [Suggestion from sole-winning Germany to local regions/small and medium-sized enterprises in Japan: From field survey in Germany]. *RIETI Policy Discussion Paper Series,* 15-P-002, 1-59.

Japan Agency for Medical Research and Development. (2020). *Ikorenkeiniyoru iryokikijigyoka gaidobukku [Guidebook for medical device commercialization through medical-engineering collaboration]*. Japan Agency for Medical Research and Development.

Jiang, X., & Li, Y. (2008). The relationship between organizational learning and firms' financial performance in strategic alliances: A contingency approach. *Journal of World Business*, *43*(3), 365–379. doi:10.1016/j.jwb.2007.11.003

Joham, C., Talukder, M., & Aseeri, M. (2014). Innovation through a self-organization lens. *Journal of Computational Science*, *10*(12), 2374–2382. doi:10.3844/jcssp.2014.2374.2382

Joyce, W. F., Nohria, N., & Roberson, B. (2003). *What really works: The 4+2 formula for sustained business success*. Harper Business.

Kaats, E., & Opheji, W. (2014). *Creating conditions for promising collaboration: Alliances, networks, chains, strategic partnerships*. Springer. doi:10.1007/978-3-642-41443-5

Kanter, R. M. (1994, July-August). Collaborative advantage: The art of alliances. *Harvard Business Review*, *72*(4), 96–108.

Kapucu, N. (2014). Complexity, governance, and networks: Perspectives from public administration. *Complexity*. *Governance & Networks*, *1*(1), 1–10. doi:10.7564/14-CGN3

Katz, D., & Kahn, R. L. (1966). *The social psychology of organizations*. John-Wiley & Sons.

Kawabata, Y. (2016). Facilitating inter-organizational collaboration initiated by small- and medium-sized enterprises for promoting a medical device industry in Fukushima Prefecture. *Asia Pacific Business & Economics Perspectives*, *4*(1), 51–73.

Kawabata, Y. (2017). *Chiikishinsangyo no shinko ni muketa soshikikanrenkei: Iryoukikikanrenbunya niokeru jigyokasuisin heno torikumi [Inter-organizational collaborations for promoting new regional industry: Creating business in medical technology industry-]*. Nakanishiya Shuppan.

Kawabata, Y. (2019). Building and operating a system to promote regional competitive industries through cross-sectoral collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *9*(1), 42–63.

Kawabata, Y. (2020). Managing to facilitate cross-sectoral inter-organizational collaborations: Findings from the experience in Germany. *International Journal of Systems and Service-Oriented Engineering*, *10*(2), 13–41.

Kelley, D. J., & Rice, M. P. (2002). Advantage beyond founding: The strategic use of technologies. *Journal of Business Venturing*, *17*(1), 41–57. doi:10.1016/S0883-9026(00)00053-7

Kergel, H., zu Köcker, G. M., & Nerger, M. (2014). *New approaches to improve the performance of cluster management organisations in Europe*. European Secretariat for Cluster Analysis (ESCA).

Kergel, H., zu Köcker, G. M., Nerger, M., & Ziegler, O. (2018). *Cluster management excellence in the Danube region*. European Secretariat for Cluster Analysis (ESCA) c/o VDI/VDE Innovation + Technik GmbH.

Kerry, C., & Danson, M. (2016). Open innovation, Triple helix and regional innovation systems: Exploring CATAPULT centres in the U.K. *Industry and Higher Education*, *30*(1), 67–78. doi:10.5367/ihe.2016.0292

Kiese, M. (2019). Regional cluster policies in Germany: Challenges, impacts and evaluation practices. *The Journal of Technology Transfer*, *44*(6), 1698–1719. doi:10.100710961-017-9589-5

Kilduff, M., & Tsai, W. (2003). Social networks and organizations. *Sage (Atlanta, Ga.)*.

Kim, J. (2006). Networks, network governance, and networked networks. *International Review of Public Administration*, *11*(1), 19–34. doi:10.1080/12294659.2006.10805075

Kirjavainen, P., & Laakso-Manninen, R. (2000). *Strategisen osaamisen johtaminen (Strategic competence management)*. Oy Edita Ab.

Kitson, M., Martin, R., & Tyler, P. (2004). Regional competitiveness: An elusive yet key concept? *Regional Studies*, *38*(9), 991–999. doi:10.1080/0034340042000320816

Klerkx, L., & Leeuwis, C. (2009). Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy*, *33*(3), 260–276. doi:10.1016/j.foodpol.2007.10.001

Knoke, D. (2001). *Changing organizations: Business networks in the new political economy*. Westview Press.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383–397. doi:10.1287/orsc.3.3.383

Koschatzky, K., & Kroll, H. (2009). Multi-level governance in regional innovation systems. *EKONOMIAZ. Revista vasca de Economía, Gobierno Vasco / Eusko Jaurlaritza / Basque Government, 70*(1), 132-149.

Koschmann, M. A., Kuhn, T. R., & Pfarrer, M. D. (2012). A communicative framework of value in cross-sector partnerships. *Academy of Management Review*, *37*(3), 332–354. doi:10.5465/amr.2010.0314

Landry, R., Amara, N., & Lamari, M. (2002). Does social capital determine innovation? To what extent? *Technological Forecasting and Social Change*, *69*(7), 681–701. doi:10.1016/S0040-1625(01)00170-6

Lazzarini, S. G., Miller, G. J., & Zenger, T. R. (2008). Dealing with the paradox of embeddedness: The role of contracts and trust in facilitating movement out of committed relationships. *Organization Science*, *19*(5), 709–728. doi:10.1287/orsc.1070.0336

Lee, M., Park, S., & Lee, K. S. (2019). What are the features of successful medical device start-ups? Evidence from Korea. *Sustainability*, *11*(7), 1948. doi:10.3390u11071948

Lefebvre, V. M., Molnár, A., & Gellynck, X. (2012). The role of network administrative organizations in the development of social capital in inter-organizational food networks. *International Journal on Food System Dynamics*, *3*(3), 228–242.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, *13*(S1, s1), 111–125. doi:10.1002mj.4250131009

Lewin, K. (1951). *Field theory in social science: Selected theoretical papers*. Harper & Brothers.

Lewin, K. (1946). Action research and minority problems. In G. W. Lewin (Ed.), *Resolving social conflict* (pp. 34–46). Harper & Row.

Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. *Human Relations*, *1*(1), 5–41. doi:10.1177/001872674700100103

Lipnack, J., & Stamps, J. (1993). *The TeamNet Factor: Bringing the power of boundary crossing into the heart of your business*. Oliver Wright Publications.

Logsdon, J. M. (1991). Interests and interdependence in the formation of social problem-solving collaborations. *The Journal of Applied Behavioral Science*, *27*(1), 23–37. doi:10.1177/0021886391271002

Lorenzen, M. (Ed.). (1998). *Specialization and localized learning: Six studies on the European furniture industry*. Copenhagen Business School Press.

Mannheim Medical Technology Cluster. (n.d.-a). https://medtech-mannheim.de/

Mannheim Medical Technology Cluster. (n.d.-b). *Executive board.* https://medtech-mannheim.de/de/cluster-management/executive-board

Martin, R. M. (1964). On atomic sentential forms and theory construction. In R. Cox, W. Alderson & S. J. Shapiro (Eds.), Theory in marketing (pp. 68-83). Richard D. Irwin, Inc.

Maskell, P. (1998). Successful low-tech industries in high-cost environments: The case of the Danish furniture industry. *European Urban and Regional Studies*, *5*(2), 99–118. doi:10.1177/096977649800500201

McEvily, B., & Zaheer, A. (2004). Architects of trust: The role of network facilitators in geographical clusters. In R. Kramer & K. Cook (Eds.), *Trust and distrust in organizations* (pp. 189–213). Russell Sage Foundation.

MedEcon Ruhr GmbH/e. V. (n.d.). https://medecon.ruhr

MedTech Europe. (2021). *The European medical technology industry in figures 2021*. MedTech Europe. https://www.medtecheurope.org/wp-content/uploads/2021/06/medtech-europe-facts-and-figures-2021.pdf

MedTech Europe. (n.d.). *Medical devices and pharmaceuticals: Two different worlds in one health setting.* https://www.medtecheurope.org/news-and-events/news/medical-devices-and-pharmaceuticals-two-different-worlds-in-one-health-setting/

Mejtoft, T., Lindahl, O., Öhberg, F., Pommer, L., Jonzén, K., Andersson, B. M., Eklund, A., Wåhlin, A., & Hallberg, P. (2022). Medtech innovation guide: An empiric model to support medical technology innovation. *Health and Technology*, *12*(5), 911–922. doi:10.100712553-022-00689-0

Mieki, H. (2016) Doitsu NRW shu no kurasuta seisaku (Cluster policy in NRW, Germany). In Institute for International Trade and Investment (Ed.), *Chiikikeizai no hatten ni koken suru Doitsu no kurasuta* [German industrial cluster which contributes to the development of regional economy] (pp. 48-62). Institute for International Trade and Investment. https://www.iti.or.jp/report_24.pdf

Mignon, I., & Kanda, W. (2018). A typology of intermediary organizations and their impact on sustainability transition policies. *Environmental Innovation and Societal Transitions*, *29*, 100–113. doi:10.1016/j.eist.2018.07.001

Miles, R. E., & Snow, C. C. (1995). The new network firm: A spherical structure built on a human investment philosophy. *Organizational Dynamics*, *23*(4), 5–18. doi:10.1016/0090-2616(95)90013-6

Ministry of Economic Affairs. Labor and Housing, Baden-Württemberg. (2016). *Regional cluster atlas Baden-Württemberg 2016: Overview of cluster-related networks and initiatives*. Ministry of Economic Affairs, Labor and Housing, Baden-Württemberg. https://www.clusterportal-bw.de/fileadmin/_migrated/news_uploads/Clusteratlas_2016_englisch.pdf

Mintzberg, H., Quinn, J. B., & Ghoshal, S. (1998). *The strategy process* (Revised European edition). Prentice Hall Europe.

Monge, P. R., & Contractor, N. S. (2001). Emergence of communication networks. In F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research and methods* (pp. 440–502). Sage Publications. doi:10.4135/9781412986243.n12

Morçöl, G. (2014). Complex governance networks: An assessment of the advances and prospects. *Complexity Governance & Networks*, *1*(1), 5–16. doi:10.7564/14-CGN5

Morrison, J. H., & O'Hearne, J. J. (1977). *Practical transactional analysis in management*. Addison-Wesley.

Mumford, A. (1985). A review of action learning. *Management Development*, *11*(2), 3–18.

Nicotera, A. M. (2013). Organizations as entitative beings: Some ontological implications of communicative constitution. In D. Robichaud & F. Cooren (Eds.), *Organization and organizing: Materiality, agency and discourse* (pp. 66–89). Routledge.

OECD Better Life Index. (n.d.). *Germany*. https://www.oecdbetterlifeindex.org/countries/germany/

OECD Data. (n.d.). https://data.oecd.org/

OECD. (1997). *General cartel bans: Criteria for exemption for small and medium-sized enterprises 1996*. OECD Publishing. https://www.oecd.org/competition/cartels/1920345.pdf

OECD. (2020). *OECD economic surveys: Germany 2020*. OECD Publishing.

Pessoa, A. (2008). *Tourism and regional competitiveness: The case of the Portuguese Douro Valley*. FEP Working Papers 299, Universidade do Porto, Faculdade de Economia do Porto.

Pessoa, A. (2013). Competitiveness, clusters, and policy at the regional level: Rhetoric vs. practice in designing policy for depressed regions. *Regional Science Inquiry Journal*, *5*(1), 101–116.

Peters, B. G., & Pierre, J. (2016). *Comparative governance: Rediscovering the functional dimensions of governing*. Cambridge University Press. doi:10.1017/CBO9781316681725

Pinch, S., Henry, N., Jenkins, M., & Tallman, S. (2003). From "industrial districts" to "knowledge clusters": A model of knowledge dissemination and competition in industrial agglomerations. *Journal of Economic Geography*, *3*(4), 73–88. doi:10.1093/jeg/lbg019

Plesnila-Frank, C., & Vogler-Ludwig, K. (2003). *Medical technologies benchmarking report for Germany*. ECONOMIX Research & Consulting. https://economix.org/a55ets/publications/Medical%20Technologies%20-%20Benchmarking%20Report.pdf

Plowman, D. A., Solansky, S., Beck, T. E., Baker, L., Kulkarni, M., & Travis, D. V. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, *18*(4), 341–356. doi:10.1016/j.leaqua.2007.04.004

Podolny, J. M., & Page, K. L. (1998). Network forms of organization. *Annual Review of Sociology*, *24*(1), 57–76. doi:10.1146/annurev.soc.24.1.57

Porter, M. (1990). *The competitive advantage of nations*. Macmillan. doi:10.1007/978-1-349-11336-1

Porter, M. (1998). Clusters and the new economics of competitiveness. *Harvard Business Review*, *76*(6), 77–90. PMID:10187248

Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*, *12*, 295–336.

Provan, K. G., Isett, K. R., & Milward, H. B. (2004). Cooperation and compromise: A network response to conflicting institutional pressures in community mental health. *Nonprofit and Voluntary Sector Quarterly*, *33*(3), 489–514. doi:10.1177/0899764004265718

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration: Research and Theory*, *18*(2), 229–252. doi:10.1093/jopart/mum015

Provan, K. G., & Milward, H. B. (2001). Do networks really work? A framework for evaluating public-sector organizational networks. *Public Administration Review*, *61*(4), 414–423. doi:10.1111/0033-3352.00045

Pyka, A., & Windrum, P. (2003). The self-organisation of strategic alliances. *Economics of Innovation and New Technology*, *12*(3), 245–268. doi:10.1080/10438590290025561

Radin, B. A., Agranoff, R., Bowman, A., Buntz, C. G., Ott, J. S., Romzek, B. S., & Wilson, R. (1996). *New governance for rural America: Creating intergovernmental partnerships*. University Press of Kansas. doi:10.17161/1808.32697

Raelin, J. (1999). Preface. *Management Learning*, *30*(2), 115–125. doi:10.1177/1350507699302001

Ranga, M., & Etzkowitz, H. (2013). Triple Helix systems: An analytical framework for innovation policy and practice in the knowledge society. *Industry and Higher Education*, *27*(4), 237–262. doi:10.5367/ihe.2013.0165

Razak, A. A., & White, G. (2015). The Triple Helix model for innovation: A holistic exploration of barriers and enablers. *International Journal of Business Performance and Supply Chain Modelling*, *7*(3), 278–291. doi:10.1504/IJBPSCM.2015.071600

Reason, P., & Bradbury, H. (2001). Introduction. In P. Reason & H. Bradbury (Eds.), *The Sage handbook of action research: Participative inquiry and practice* (pp. 1–10). Sage.

Ring, P. S., Doz, Y. L., & Olk, P. M. (2005). Managing formation processes in R&D consortia. *California Management Review*, *47*(4), 137–156. doi:10.2307/41166320

Roberts, N. C., & Bradley, R. T. (1991). Stakeholder collaboration and innovation: A study of public policy initiation as the state level. *The Journal of Applied Behavioral Science*, *27*(2), 209–227. doi:10.1177/0021886391272004

Saariluoma, P. (2002). *Ajattelu työelämässä. Erehdyksistä mahdollisuuksiin [Thinking in working life. From mistakes to opportunities]*. WSOY.

Saarnio, A., Puttonen, V., & Eronen, A. (2000). Omistajalähtöinen johtaminen [Owner-driven management]. Ekonomia-sarja. WSOY.

Schachter, S. (1951). Deviation, rejection, and communication. *Journal of Abnormal and Social Psychology*, *46*(2), 190–207. doi:10.1037/h0062326 PMID:14841000

Schotter, A. P. J., Mudambi, R., Doz, Y. L., & Gaur, A. (2017). Boundary spanning in global organizations. *Journal of Management Studies*, *54*(4), 403–421. doi:10.1111/joms.12256

Sharfman, M. P., Gray, B., & Yan, A. (1991). The context of interorganizational collaboration in the garment industry: An institutional perspective. *The Journal of Applied Behavioral Science*, *27*(2), 181–208. doi:10.1177/0021886391272003

Sheth, J. N., & Parvatiyar, A. (1992). Towards a theory of business alliance formation. *Scandinavian International Business Review*, *1*(3), 71–87. doi:10.1016/0962-9262(92)90012-U

Sørensen, E. (2006). Metagovernance: The changing role of politicians in processes of democratic governance. *American Review of Public Administration*, *36*(1), 98–114. doi:10.1177/0275074005282584

SPECTARIS. (2021). *Industry profile: Medical technology*. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Steckbrief_Medical_Technology_2021.pdf

SPECTARIS. (2022). *Die Deutsche medizintechnik-industrie: SPECTARIS jahrbuch 2022/2023 (The German medical technology industry: SPECTARIS yearbook 2022/2023)*. SPECTARIS. https://www.spectaris.de/fileadmin/Content/Medizintechnik/Zahlen-Fakten-Publikationen/SPECTARIS_Jahrbuch_2022-2023_01-2023_Lesezeichen_3.pdf

Sroka, W., & Hittmár, Š. (2013). *Management of alliance networks: Formation, functionality, and post operational strategies*. Springer. doi:10.1007/978-3-642-34246-2

Statista. (n.d.). *Unemployment rate in Germany by federal state*. https://de.statista.com/statistik/daten/studie/36651/umfrage/arbeitslosenquote-in-deutschland-nach-bundeslaendern/

Statista. (n.d.-a). *The 20 countries with the largest gross domestic product (GDP) in 2021*. https://www.statista.com/statistics/268173/countries-with-the-largest-gross-domestic-product-gdp/

Statista. (n.d.-b). *Leading export countries worldwide in 2021*. https://www.statista.com/statistics/264623/leading-export-countries-worldwide/

Statista. (n.d.-c). *The 20 countries with the highest trade surplus in 2021*. https://www.statista.com/statistics/256642/the-20-countries-with-the-highest-trade-surplus/

Stewart, J., & Ayres, R. (2001). Systems theory and policy practice: An exploration. *Policy Sciences*, *34*(1), 79–94. doi:10.1023/A:1010334804878

Taatila, V. (2004). *The concept of organizational competence: A foundational analysis* [Doctoral dissertation, University of Jyvaskyla]. Jyväskylä University Digital Repository.

Taloustieto. (1995). *Kirjanpito—ja tilinpäätössanasto* [Glossary of accounting and financial statements] (2nd ed.). Taloustieto Oy.

Tayama, R. (2016) Baierun shu no kurasuta seisaku [Cluster policy in Bavaria]. In Institute for International Trade and Investment (Ed.), *Chiikikeizai no hatten ni koken suru Doitsu no kurasuta* [German industrial cluster which contributes to the development of regional economy] (pp. 34-47). Institute for International Trade and Investment. https://www.iti.or.jp/report_24.pdf

Taylor, J. R., Cooren, F. A., Giroux, N., & Robichaud, D. (1996). The communicational basis of organization: Between the conversation and the text. *Communication Theory*, *6*(1), 1–39. doi:10.1111/j.1468-2885.1996.tb00118.x

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319–1350. doi:10.1002mj.640

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533. doi:10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Termeer, C. J. A. M., Dewulf, A., Breeman, G., & Stiller, S. J. (2012). Governance capabilities for dealing wisely with wicked problems. *Administration & Society*, *47*(6), 680–710. doi:10.1177/0095399712469195

The Bundeskartellamt. (2007). *Information leaflet of the Bundeskartellamt on the possibilities of cooperation for small and medium-sized enterprises*. https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Merkblaetter/Leaflet%20-%20Cooperation%20for%20SMUs.pdf?__blob=publicationFile&v=3

The Medical Valley EMN e. V. (n.d.). https://www.medical-valley-emn.de/en/

Thomson, A. M., & Perry, J. L. (2006). Collaboration processes: Inside the black box. *Public Administration Review*, *66*(6), 20–32. doi:10.1111/j.1540-6210.2006.00663.x

Todnem, R. (2019). New year's resolution. *Journal of Change Management*, *19*(1), 1–5. doi:10.1080/14697017.2019.1565125

Tödtling, F., Trippl, M., & Brathl, H. (2005). Networking and project organisation in the Styrian automotive industry. In A. Lagendijk & P. Oinas (Eds.), *Proximity, distance and diversity: Issues on economic interaction and local development* (pp. 89–107). Ashgate.

Toffler, A. (1980). *The third wave*. William Morrow & Company.

Turner, R. H. (1962). Role-taking: Process versus conformity. In A. M. Rose (Ed.), *Human behavior and social processes: An interactionist approach* (pp. 20–40). Routledge and Kegan Paul.

United Nations Development Programme. (n.d.). *Human development report*. https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

Viassone, M. (2008). Regional Competitive Index as a tool to improve regional foresight: Theory and evidence from two Western-Europe Regions. In *Proceedings of the 8th Global Conference on Business & Economics*. Association for Business & Economics Research (ABER).

Wachhaus, T. A. (2012). Anarchy as a model for network governance. *Public Administration Review*, *72*(1), 33–42. doi:10.1111/j.1540-6210.2011.02481.x

Wakabayashi, N. (2009). *Nettowa-ku soshiki: Shakainettowa-kuron karano aratana soshikizou [Network organization: New vision from social network perspective]*. Yuhikaku.

Whetten, D. A. (1981). Interorganizational relations: A review of the field. *The Journal of Higher Education*, *52*(1), 1–28. doi:10.2307/1981150

Winch, G. M., & Courtney, R. (2007). The organization of innovation brokers: An international review. *Technology Analysis and Strategic Management*, *19*(6), 747–763. doi:10.1080/09537320701711223

Wolf, T. D., & Holvoet, T. (2005). Emergence versus self-organisation: Different concepts but promising when combined. In S. A. Brueckner, G. Di Marzo Serugendo, A. Karageorgos, & R. Nagpal (Eds.), *Engineering self-organising systems: Methodologies and applications* (pp. 1–15). Springer. doi:10.1007/11494676_1

Wood, D. J., & Gray, B. (1991). Toward a comprehensive theory of collaboration. *The Journal of Applied Behavioral Science*, *27*(2), 139–162. doi:10.1177/0021886391272001

World Economic Forum. (2019). *The global competitiveness report 2019*. https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Yawson, R. M. (2009). *The ecological system of innovation: A new architectural framework for a functional evidence-based platform for science and innovation policy* [Paper presentation]. The Future of Innovation Proceedings of XX ISPIM 2009 Conference, Vienna, Austria.

Yin, R. (2003). *Case study research: Design and methods* (3rd ed.). Sage Publications.

Zhao, K., Yen, J., Ngamassi, L. M., Maitland, C., & Tapia, A. H. (2012). Simulating inter-organizational collaboration network: A multi-relational and event-based approach. *Simulation*, *88*(5), 617–633. doi:10.1177/0037549711421942

Zhao, Y., & Xu, W. (2013). On countermeasures of specification and development of social intermediary organizations. In W. Du (Ed.), *Informatics and management science II: Lecture notes in electrical engineering 205* (pp. 413–419). Springer. doi:10.1007/978-1-4471-4811-1_54

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