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Creating spaces for change: Boundary work in emerging agri-food value chains

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ABSTRACT

The article draws on the notion of boundary work to explore innovation in emerging agri-food value chains. Based on a six-year action research study, we examined boundary work among value chain actors and interventions that enabled the reconfiguration of boundaries through learning and collaboration. Illustrated by micro cases, the findings conceptualize three modes of boundary work, which include (1) uncovering knowledge to build a shared understanding of the local food sector, (2) creating and integrating domain knowledge to improve professional practices, and (3) negotiating and implementing shared strategies for value creation. Additionally, the article emphasizes the need for higher-level boundary work that enables practices for value creation through purposeful interventions, as a form of configurational boundary work. The study serves as an example of creating spaces for change in local agri-food systems and enhances the understanding of learning and innovation in such inter-organizational settings.

1. Introduction

Imagine you are in a school canteen in the German capital, Berlin. For lunch, there is a dish based on organic vegetables, produced locally in the region around Berlin. The availability of food with such attributes could be straightforward in a sustainable food system, but until recently, it has been the exception. Even though Berlin is surrounded by large agricultural areas, the demand for organic food in the city is higher than the local supply, particularly for vegetables. There are gaps in the local value chains for organic food, especially a lack of production capacity and of coordination between the agri-food businesses in the region, among other issues. Lately, however, things have been changing. Local organic vegetables have increasingly found their way into Berlin's canteens and grocery stores. This is an outcome of a facilitated co-creative process in which actors from the region explore new ways of working together.

The situation described here is an example of a local sustainability transformation in the food system. In this example, small and medium-sized farms worked together with other local food enterprises to create midscale value chains (Stevenson et al., 2011; Peterson et al., 2022) that are situated between low-volume direct marketing and large, international markets. Such initiatives can contribute to food security and the social and economic well-being of food producers while also maintaining a positive or neutral environmental impact. This is also the pathway that the states of the European Union have committed to in their Farm to Fork Strategy (European Commission, 2020). In the face of global crises, they seek to achieve a significant increase in organic agriculture, reduce long-haul transportation, and strengthen local value chains.

To build such value chains, farmers and other agri-food practitioners within a specific region work together across the boundaries of their individual enterprises—in the sense of inter-organizational collaboration (Gray, 1989; Huxham and Vangen, 2005). Collaboration has the potential to create synergies between the partnering organizations, allowing them to achieve something they would not be able to achieve individually, which has been conceptualized as collaborative advantage (Huxham, 1993). Specific advantages that collaborating organizations may seek are, for example, business development, risk sharing among participants, or supply chain efficiency. Collaborative advantage is not trivial to achieve, however, because emerging collaboration often bears high complexity and ambiguity, as it brings together diverse actors to negotiate a common strategy based on their individual goals, cultures,

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and resources. Therefore, collaboration is not an organizational state, but a dynamic social process, in which several organizations work towards a common goal (Huxham and Vangen, 2005; Gray and Purdy, 2018). Developing local agri-food value chains is an example of this process and requires negotiation among the actors in the chain to develop solutions that fit local circumstances. Depending on the local situation, value chains differ in market conditions, the capabilities of the actors involved, and the types of products the chain is expected to deliver. The negotiation processes among the value chain actors bring enterprises together in knowledge co-creation, thereby enabling joint entrepreneurship and innovation (Peterson, 2009).

There is a range of current initiatives in Europe aiming to build more sustainable value chains, including organic regions (e.g., Stotten et al., 2017; Mennig and Sauer, 2022) and other agricultural innovation programs (e.g., Gutiérrez and Macken-Walsh, 2022). In these initiatives, practitioners work with agricultural consultants, facilitators, or researchers on real problems of the sector. They are part of a wider family of initiatives and projects that create spaces for knowledge co-creation and innovation around specific, localized problems, e.g., in living labs or other multi-actor networks (Gamache et al., 2020; Körner et al., 2022). Such initiatives bring together people from diverse contexts and with different experiences and knowledge. The mechanisms that enable the participants of these initiatives to interact and to align their frames of reference, perceptions, and ideas, are the practices that these actors engage in at their boundaries, conceptualized as "boundary work" (e.g., Langley et al., 2019).

Our article contributes to this line of research with a practice-based perspective on innovation processes that are carried out in the interaction of farmers, food entrepreneurs, and other stakeholders of the agri-food system. We present results from an action research study that supported and investigated the development of vegetable value chains in the Berlin-Brandenburg metropolitan region. The research is primarily concerned with the mechanisms of learning and change in inter-organizational settings and less with the specific problems the individual actors experienced and the decisions they took when developing their value chains. Using the conceptual lens of boundaries and boundary work, the article explores the innovation processes in these settings. Specifically, it investigates (1) boundary work among value chain actors and (2) interventions that enabled the reconfiguration of boundaries in the emerging value chains. The present action research can therefore serve as an example of how innovation in local food systems can be supported through facilitation.

2. Boundaries and boundary work

Intrinsic to the relationships among actors of a value chain, and to the relationships with their environment, are boundaries that separate actors from each other and from the environment. From a general perspective, boundaries are conceptual distinctions that people make as they perceive and interpret the world around them, by categorizing objects, practices, people, or other entities (Lamont and Molnár, 2002). In the narrower sense of organizations, boundaries are demarcations among people or groups, i.e., the social structures that constitute organizational contexts (Santos and Eisenhardt, 2005; Zietsma and Lawrence, 2010). Boundaries manifest, for example, at the inter-organizational level in the collaboration among different enterprises in a value chain, or at the inter-personal level, in the different roles or professional backgrounds of people working together. Such boundaries are not considered to be static and fixed but are socially constructed and interpreted by people in a particular context (Lamont and Molnár, 2002; Zietsma and Lawrence, 2010). A process perspective emphasizes that boundaries are emergent and in flux, as they are produced and reproduced through interaction (Hernes, 2004; Langley et al., 2019).

Following this dynamic notion, boundaries can be influenced by actively managing the practices surrounding them. The purposeful efforts that create, maintain, or disrupt boundaries are commonly referred to as boundary work (Gieryn, 1983; Zietsma and Lawrence, 2010; Langley et al., 2019). Such activities treat boundaries as either "junctures" that create opportunities for emerging connections, or as "barriers" that create or maintain separation (Quick and Feldman, 2014). In this regard, boundary work is a balancing act between efforts directed at opening up and closing down boundaries, e.g., within or between groups, occupations, or organizations (Chreim et al., 2013; Langley et al., 2019). Such efforts are described as competitive boundary work when aimed at enforcing separation and as collaborative boundary work when aimed at reducing separation. These two types of boundary work are not mutually exclusive, but complementary (Langley et al., 2019). For example, a strategic business partnership may be understood as a juncture at which the partners engage in collaborative boundary work, but also as a barrier that the partners enact to exclude competing market actors.

In addition to collaborative and competitive boundary work, Langley et al. (2019) define a higher-level practice related to boundaries, which is configurational boundary work. Configurational boundary work impacts a system from the outside by creating spaces in which new forms of interaction can take place, through organizing or re-arranging boundaries. Such interventions can, for example, link different fields or domains of activities, or separate conflicting individuals (Zietsma and Lawrence, 2010; Langley et al., 2019). Spaces for configurational boundary work can be embodied through boundary organizations that bring together different actors and engage them around specific issues (Guston, 2001; O'Mahony and Bechky, 2008). Examples of boundary organizations are multi-actor networks and other institutions that fulfill intermediation functions related to learning or innovation in agri-food systems (e.g., Klerkx and Leeuwis, 2009; Tisenkopfs et al., 2015; Clark et al., 2011; Kivimaa et al., 2019). A related concept is boundary objects (Star and Griesemer, 1989), which are artifacts or abstract concepts that actors use to engage in boundary work. Boundary objects can be, e.g., shared documents, tools, or narratives that help actors from different backgrounds to work together on a common issue or project at or across boundaries. These objects are flexible enough to be shared among actors from different sides of a boundary (Star and Griesemer, 1989) and help the actors create common ground by representing, transforming, and sharing knowledge (Carlile, 2002; Bechky, 2003).

A focus on the ways in which people and organizations engage at boundaries has been widely adopted in social and organizational sciences (e.g., Lamont and Molnár, 2002; Langley et al., 2019). Boundaries are used as a theoretical lens to enhance understanding of the interaction in different organizational settings, for example, how people with different professional backgrounds work together (e.g., Kellogg et al., 2006; Hale et al., 2022) or how organizations interact with and separate from their environment (e.g., Santos and Eisenhardt, 2005; Velter et al., 2020). We bring this perspective into the inter-organizational context of value chains, by focusing on the boundaries between the participating actors, and how the boundaries can be configured to enable collaborative advantages for sustainable value chains.

3. Research design

The focus of the study is on emerging agri-food value chains, investigated through a qualitative research design. We did not follow a singular methodology but rather combined several strategies to create practice-oriented theory from process data. At the core was an action research approach that produced rich data through interventions in practice (Eden and Huxham, 1996). This research was conducted in a learning network that supported emerging value chains in the Berlin-Brandenburg region in Germany over a period of five years (2018–2022), with an additional year of preparation (2017). For conceptualization, we integrated a process research strategy (Langley, 1999) with a grounded theory approach (Corbin and Strauss, 2015) to dissect and analyze detailed longitudinal data collected over the six-year

period. A qualitative approach is particularly useful for complex and emerging processes, such as sustainability transitions in the agri-food sector, because it can capture the dynamics of socially constructed systems (Bitsch, 2005; Peterson, 2011).

3.1. Action research setting

Action research creates a setting in which practitioners and researchers engage in a joint learning process to address a problem of practice (Shani and Coghlan, 2021). This approach aims to develop practical solutions and to deepen the understanding of the problem for both academia and practice. The role of the researcher differs from that in more positivist approaches as action researchers actively participate in the learning process, for example, as facilitators or process consultants. Rather than being mere observers, action researchers engage with the participants of a study (Huxham, 2003). Action research is an established strand of organizational and management research (e.g., Eden and Huxham, 1996; Shani and Coghlan, 2021), and has been used in the study of agri-food systems (e.g., Conner et al., 2010; Moschitz and Home, 2014) to facilitate and explore innovation and change processes. In the present study, action research was conducted in the context of a learning network supporting the development of value chains.

The learning network comprised a core group of practitioners from approximately 20 agri-food enterprises and a team of facilitators that supported them throughout the duration of the study. The participating enterprises were not selected purposefully but joined the network based on an open call for participation. They included farms, traders, and food processing companies that sought to develop local value chains and to better exploit the market potential for organic vegetables in the region. Most of the participants did not know each other personally before the formation of the network, and there were hardly any established business relations between them. In addition to these core members, other stakeholders of the local agri-food system took part in open network activities, for example, other market actors, industry experts, policymakers, and nonprofit organizations. Concrete motives for participating in the learning network were, for example, to generate better insights into local markets, to connect with other actors, and, in the case of farmers and other practitioners, to improve market access and build professional competencies. The learning network's activities were funded through the European Union's EIP-AGRI program (see Braun et al., 2022, on the network formation).

The facilitation team consisted of process facilitators, agricultural consultants, and researchers, with professional backgrounds in practical agriculture, agri-food business, and communication sciences. Some of them were trained in group dynamics, coaching, and process facilitation methods. The team's tasks included network building, organizing and facilitating network activities (interventions), and providing access to specific resources, such as project infrastructure and targeted consulting. As facilitators of the change process, the team supported practitioners in making well-informed decisions and implementing them but remained neutral with regard to the outcome of the process. The interventions were designed in close collaboration with the participating practitioners, based on their practical problems and needs. In her role as an action researcher, the first author of the present article was a member of the facilitation team. To ensure scientific rigor and practical relevance in the action research, the present study maintained a clear division of responsibilities within the facilitation team and included systematic data collection and analysis as well as continuous reflection on the action research approach and the facilitators' role in the process (Braun et al., 2022).

3.2. Conceptualization from process data

A special feature of action research is that data is collected at the moment of action and thus about "theories-in-use" rather than based on the participant's own description of their behavior in past events (Argyris and Schön, 1989; Huxham, 2003). The insider position in the facilitation team and the participation in learning activities and other interventions enabled the collection of rich and in-depth data, throughout the process. The longitudinal nature of the research design allowed data to be collected naturally in recurrent situations and preliminary findings to be fed back iteratively, for validation and further planning (Langley, 1999; Huxham, 2003). The material used for analysis included interview transcripts and field notes, as well as documents and other artifacts created in the process, including meeting documentation, photos, and project reports.

For this article, data were analyzed in three phases, using a combination of different strategies to build theory from process data, as proposed by Langley (1999), specifically visual mapping, narrative strategy, and grounded theory. In the first phase of the data analysis, we created a timeline of activities, special events, and outcomes of the learning network. This timeline served as a visual representation of the data collected over time, allowing for a clear and comprehensive overview of the process (Fig. 1). The second phase of the data analysis included a two-day workshop with facilitators and supporting staff of the learning network (8 participants). During the workshop, the timeline was validated as participants reflected on the process and developed narratives of important situations, events, and experiences. The identified narratives were not singular, isolated incidents but overlapped and influenced each other. They formed early analytical units that served as a starting point for in-depth analysis.

The third, in-depth phase of the analysis employed an abductive-iterative process of conceptualization following a grounded theory approach (Bitsch, 2005; Corbin and Strauss, 2015). The narratives identified earlier were refined based on the source data, labeled and annotated in an open coding process, and gradually developed into a system of categories through constant comparison. This analysis moved iteratively between the source material, previously constructed categories, and background concepts from the literature. The conceptualization was focused on the development of "local", practice-based theory, which is derived from this specific situation and context but is also, to a certain degree, analytically transferrable to similar scenarios and phenomena (Bitsch, 2005; Peterson, 2011).

The analysis resulted in three final categories that describe different modes of work at the boundaries of value chain actors, and higher-level themes that conceptualize the general practice of value chain development. For the presentation of the findings, we constructed three micro cases from the material to zoom in and to illustrate the identified modes of boundary work comprehensively and vividly through thick description of participants, events, and specific situations. The detailed account of the micro cases and their further conceptualization aims to enable potential users of the research to evaluate the transferability of the findings to their respective contexts (Langley, 1999; Bitsch, 2005).

4. Results and discussion

Findings are presented as micro cases, exemplifying boundaries and boundary work instrumental to value chain development in the learning network (Table 1). The focal point of each micro case is one of the three modes of boundary work we identified. The cases place the modes in the overall context of the study and ground the findings in the source material through brief vignettes. They present selected actors and sequences of events from the process.

4.1. Micro case I: Uncovering market-related knowledge

In this micro case, we elaborate on work at boundaries concerning the market-related knowledge necessary to effectively participate in local value chains. Early in the change process, it became clear that a core problem was the lack of a shared understanding regarding the local market situation. Publicly available market data was scarce, and there was limited information sharing among actors in the region. The

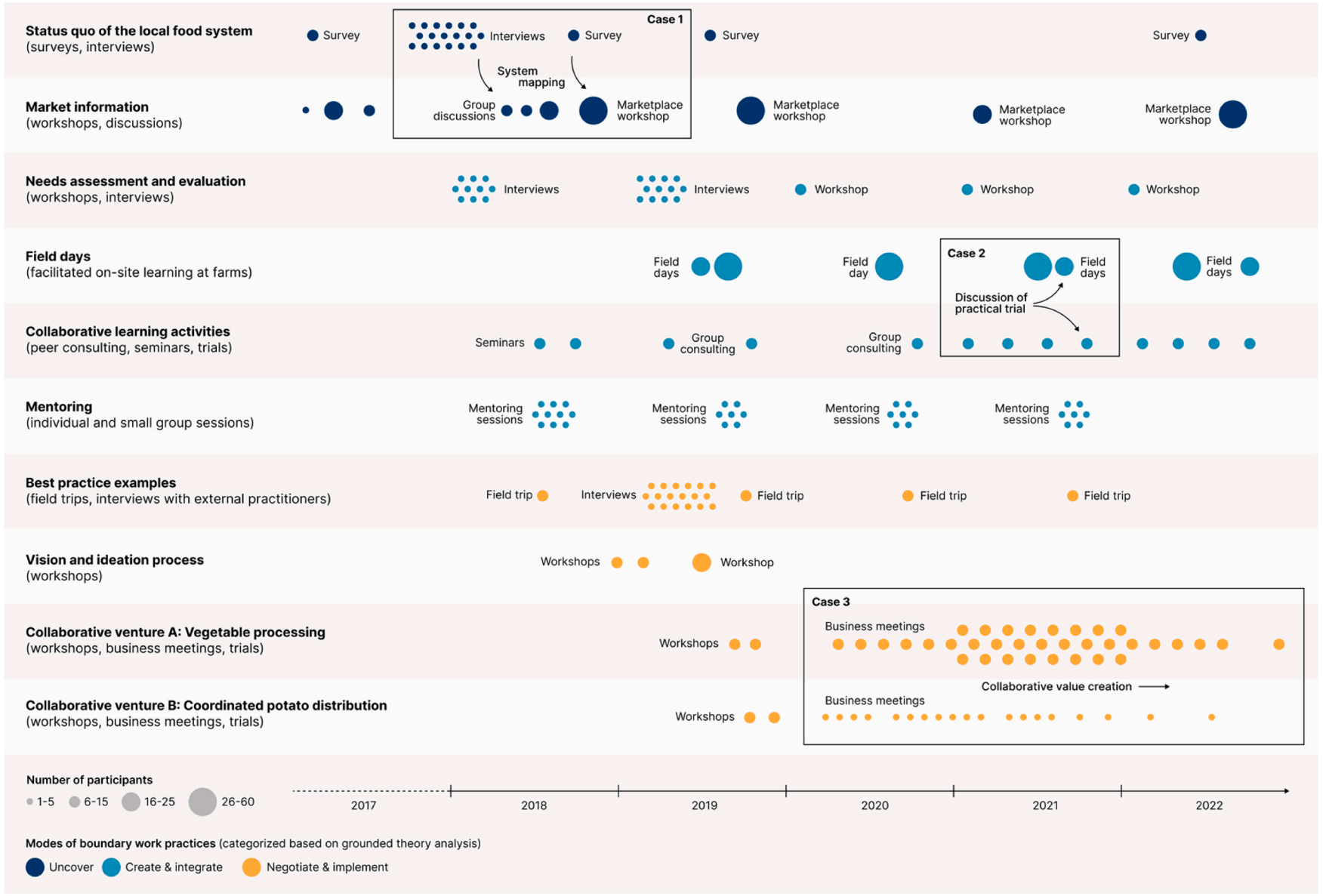

Fig. 1. Process timeline based on visual mapping.

Table 1
Overview of boundary work activities and modes.

	Micro case 1	Micro case 2	Micro case 3
Objectives	Create a shared understanding of the market situation (vertically)	Extend and improve professional practices (horizontally)	Develop and pursue a common business strategy (collaborative)
Boundaries	Boundaries among market actors and between other stakeholders of the local food system (broad group)	Boundaries among farmers; boundaries between farmers and consultants, mentors, as well as other agri-food experts (small and broad groups)	Boundaries among value chain actors (small groups)
Interventions	System mapping, marketplace workshops	Field days, variety trials, other group-based learning activities	Strategy and business development workshops, practical trials
Activities at boundaries	Collaborative inquiry into market knowledge and experiences, reflecting on present business practices, discussing challenges and opportunities of the market	Knowledge co-creation and transfer, reflecting on professional practices, sharing problems and experiences, experimenting with cultivation and production	Exploring possibilities of collaboration, developing business ideas, negotiating shared strategy, experimenting with business processes, establishing partnerships
Primary mode of boundary work	*Uncovering*—making knowledge visible at boundaries	*Creating and integrating*—co-creating knowledge and sharing it at boundaries	*Negotiating and implementing*—establishing new ways of working together at boundaries
Outcomes	Revised presumptions and shared understanding of the market situation (e.g., market transparency, potentials)	New domain knowledge and improved practices (e.g., production processes, techniques)	Individual business decisions and shared strategies (e.g., business models, collaboration)

following vignettes illustrate the isolation of actors through boundaries related to their organizations and immediate spheres of action, expressed in different experiences, business interests, and perspectives on the market.

Retailer A is a regional category manager at a major chain of retail stores with several stores in the Berlin-Brandenburg region. To differentiate from competitors, the retail chain plans to expand the product range to include organic food from local suppliers. Retailer A expects that these products will be more expensive than products that are not local and organic, but he also believes that through good marketing, they can still "boost sales." However, he lacks insight into organic vegetable production in the Brandenburg region. Through the learning network, he wants to get in touch with farmers and see if he can source the necessary qualities and quantities in the region.

For many years, Processor A has been running a branch of a food company that produces ready-to-eat salads sold in supermarkets, at various locations in Germany and abroad. His company covers the full range of primary production, processing, packaging, and logistics, either in-house or with close partners. So far, they have only handled conventional food products, but they seek to build a new line of business around organic food. However, he knows little about the organic food sector in the region and in general.

Caterer A runs a school catering operation that prepares 7,000 meals per day. In Berlin school meals, the use of a certain percentage of organic food is mandatory, so Caterer A already purchases organic food, usually through large wholesalers. Like most large-scale kitchens, her operations build on preprocessed ingredients, like potatoes that are provided in vacuum-sealed packs, peeled and cut. Personally, she thinks there should be more local and organic food served in schools, but it comes down to price and availability. Preprocessed ingredients that are both organic and local are often too expensive or simply not available from her wholesalers.

Together with a partner, Farmer A runs a farm that grows a variety of organic vegetables on 16 ha, specializing in root vegetables. At six years old, the farm is a relatively young enterprise. So far, they have marketed mainly through an organic wholesaler in the region. This has worked quite well, but they want to diversify their distribution channels. Through the learning network, he wants to establish contacts with other market actors and explore opportunities for new projects and collaborations.

The learning network provided a platform in which market actors from different stages of the agri-food sector engaged. The activities were

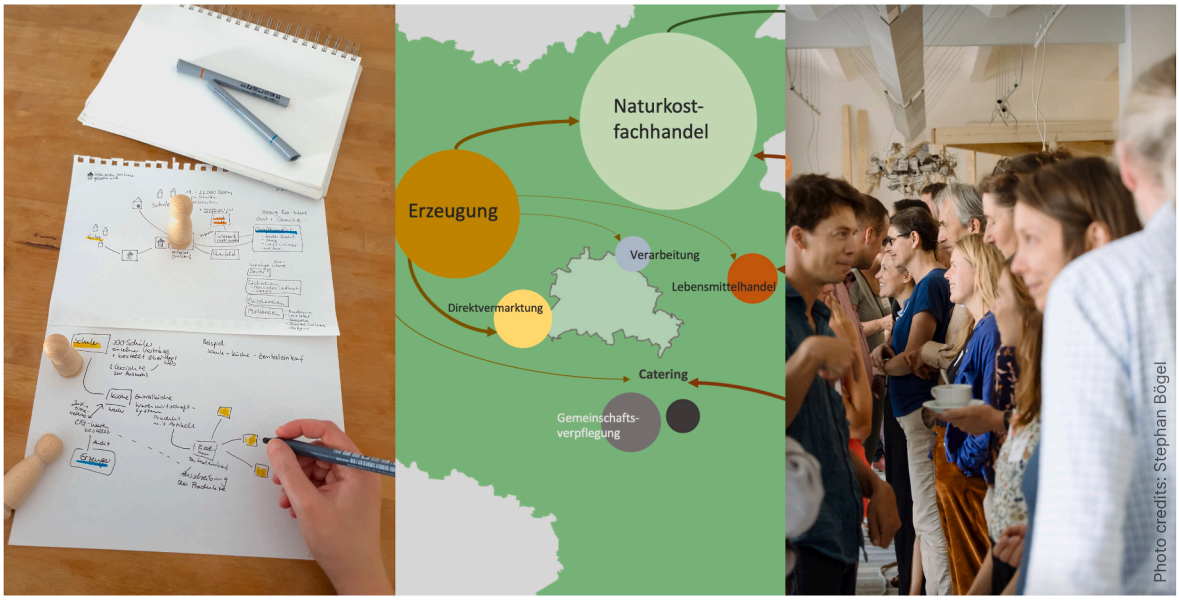

Fig. 2. Examples of activities: System mapping and discussion at marketplace workshop.

aimed at sharing market-related knowledge and experiences, by reflecting on and discussing challenges and opportunities of the market. This category of interventions also included the initial network building and annual workshops that were used to discuss current developments. The workshops were open to value chain actors and other stakeholders, e.g., policymakers and members of nonprofit organizations. The following summary of the first marketplace workshop provides an example of this mode of boundary work.

> *In 2018, after the formation of the network, a public workshop brought the practitioners and many other local stakeholders together in interactive marketplace activities for identifying supply and demand in the region. The preparation of the workshop was supported by system mapping activities, in which facilitators worked with practitioners to identify the relevant enterprises in the region and the connections between them through collaborative sketching activities in group discussions and interviews. In the marketplace workshop, the resulting map of the local market was used by the participants to discuss the problems they saw in the system and their ideas for solving them (Fig. 2). The participants identified several gaps in the organic vegetable market for the Berlin-Brandenburg region, as well as potential for development at these gaps. Specifically, participants identified a lack of infrastructure, e.g., for bundling, logistics, and processing, as well as a lack of production know-how that prevented them from further developing the sector.*

This micro case underlines that the actors' knowledge about the local market was primarily implicit and embedded in their day-to-day practices. Each individual actor's understanding is also incomplete and largely defined by their own organizational boundaries and their own immediate market activities. The visual map of the local food system, which was created and refined in group discussions and workshops, served as a boundary object in that it engages the actors to communicate about issues of the local food sector and contrast their own understanding with that of other actors, to challenge and verify it, in a process of "co-creating common ground" (Bechky, 2003). The continuous development of the map during the process emphasizes the dynamic nature of such objects, as it changes in the interaction of the participants and, over time, as their common understanding evolves (Kellogg et al., 2006; Langley et al., 2019).

In our analysis, we categorize the primary mode of boundary work in the present case as "uncovering", i.e., explicating knowledge at boundaries. The activities the participants engaged in were centered around opening up at boundaries to enable an exchange of perspectives across different domains of the value chain and across organizational boundaries. In that sense, the social space created through the shared activities can be understood as a juncture (Quick and Feldman, 2014) at which actors address issues in a structured setting. Through work at that boundary, it was possible to develop a common picture of the market in the region, which served as a point of departure for increasing value creation.

4.2. Micro case II: Creating and integrating knowledge to improve domain practices

The second micro case presents boundary work related to the improvement of professional practices, specifically in agriculture. Based on the results from the previous case, a core challenge was to increase agricultural production to serve the mid-scale value chains that actors aimed to build in the region. Some of the farms involved in the learning network were newly entering vegetable production, while others were working on diversifying and further professionalizing their existing production. To better understand their need for specific domain knowledge, a needs assessment was conducted based on interviews with farmers. In the following, two participating farmers are presented as examples to illustrate the demand for expertise.

Fig. 3. Examples of activities: Practical trials and group consulting.

> *Farmer B has many years of experience in organic agriculture and runs a well-established farming operation with several permanent employees and additional seasonal workers on about 300 ha of farmland, one-third of which is cultivated with organic vegetables. That makes him one of the major actors in organic vegetable production in Brandenburg. Recently, he has recognized the potential of growing potatoes, in addition to his existing range of crops and has decided to invest in new production technology. Farmer B is aware that effective potato production requires know-how that he has yet to build. He has very specific questions about sorting and packing technology, and about the suitability of certain varieties for his location.*

> *Farmer C is in his mid-twenties and preparing to take over the family farm his parents have run for several decades. During his vocational training, he worked on different farms, and he is now highly motivated to take responsibility for his own business. Farmer C is aware that he needs to make some changes to the farm to make sure it is economically viable, but he does not have a clear picture yet. Organic vegetables seem profitable, and he has started to grow different crops on a small plot, but he is not sure how to market them. Farmer C also has many other questions—not just about vegetable production, but also about operational management and farm succession.*

These examples highlight a need for boundary work to create and share domain knowledge. Farmers sought to improve their professional practice, in general, or had questions about specific issues they encountered in their work. The learning network brought local farmers together and connected them with agricultural consultants, researchers, and experienced practitioners from other regions. This resulted in boundary work at two distinct levels, at the organizational boundaries among farmers learning from each other, and between farmers and the wider environment of the agricultural sector, as consultants, researchers, and other experts brought new knowledge into the network. Activities focused on both the more traditional format of knowledge transfer, from agricultural consultants to practitioners, and on activities of knowledge co-creation, such as practical experiments, peer consulting, mentoring, and other collaborative learning activities. This is illustrated by the following descriptions of two formats:

> *A recurring element of the learning network was group consulting events, which were, depending on topics, held either online or took place on-site at participating farms. In June 2021, for example, one such event was hosted by Farmer A. Twelve members of the learning network met at his production site to discuss specific issues in field crop production, particularly how to manage pests by adjusting crop rotation. This topic was derived from actual issues that Farmer A had encountered in his work. The event included a presentation by an agricultural consultant, a tour of the farm, and a facilitated peer consulting session around the questions at hand. The practitioners worked out possible courses of action together with an expert, which they could later apply at their farms.*

> *Another recurring format were practical trials aimed at choosing suitable crop varieties and at building knowledge about cultivation under local*

Fig. 4. Examples of activities: Joint production trials and product development.

conditions. These trials were conducted by farmers and supervised by agricultural consultants and researchers. Farmer B was one of the three farmers who provided plots on their farms and worked with researchers who conducted the trials. In this way, Farmer B was able to build new knowledge for his own professional practice and to share it with other participants, as the results were discussed within the network at field days and group consulting events (Fig. 3).

These activities served primarily as a mechanism to build know-how and to distribute it among the participating practitioners. We categorized this mode of boundary work as "creating and integrating" knowledge, in the sense of improving the professional practice of the participating actors, but also of building shared expertise within the region. The concept of knowledge integration has been used in previous literature to refer to the management of knowledge in groups of diverse actors (Tell et al., 2017). Applied to the present case, it involved the creation of specialized knowledge among multiple practitioners, which in turn fed into their professional practice on an individual level. Boundaries are opened intermittently when actors come together for a learning activity, to produce new knowledge and share experiences. There is collaboration in the process of knowledge creation, but the participants' objective is primarily the use of the knowledge thus gained, "at home" in their individual organizations (see also Rigg et al., 2021). In the example presented in this micro case, the knowledge domain was agriculture, but similar kinds of knowledge integration are necessary on other value chain levels, e.g., related to food processing.

4.3. Micro case III: Negotiating and implementing value chain collaboration

The third micro case focuses on work at boundaries to develop concrete partnerships and patterns of collaboration in the value chain. The learning network supported several small groups of actors in exploring opportunities for value chain collaborations. The groups were formed following a vision and ideation process, which was informed by insights gained from the system mapping described in the first case, and by studying best practice examples from other regions, at field trips, and through interviews. The following example illustrates how actors explored new ways of working together in the value chain.

In 2019, two main groups formed to work on specific collaborative projects, to address certain gaps in the value chains for organic vegetables. Processor A planned to set up a vegetable processing operation with Farmer A and five other farmers from the network, while Farmer B worked with Farmer C and others to bundle their potato production and to eventually supply Retailer A. The actors worked closely together on the development and implementation of the projects in facilitated business meetings from 2020 through 2022.

In the case of the vegetable processing venture built by Processor A and Farmer A, the process went through several stages. Following an exploratory phase, in which the participants experimented with product development and production processes, they developed a business plan and negotiated contracts that ultimately led to the founding of a joint enterprise in the summer of 2020. Subsequently, the actual operation was set up with, e.g., employee recruitment, product development, and finally, the start of production and distribution to retailers in the summer of 2021 (Fig. 4). In early 2022, the new enterprise extended the product range and began to also supply canteen kitchens, like that of Caterer A, with pre-processed vegetables. Since the founding of the joint enterprise, Farmer A has had a new role. He no longer is simply an independent farmer but also a co-owner of a food processing enterprise. Processor A also has a new role. As managing director of the new company, he not only runs the day-to-day operations but also manages relations with his partners.

Boundary work took place at the organizational boundaries of the involved enterprises, both horizontally, i.e., between actors of the same value chain stage, and vertically, i.e., across different stages of the chain, as in the collaboration of Farmer A and others with Processor A's food processing company. The activities described in this example formed the space in which actors negotiated concrete changes in their business practices, made decisions for their individual companies, and for the strategic direction of the chain. Also, some actors left the group in the process, because they decided to rather pursue other business strategies. The facilitators not only helped actors uncover or create knowledge about how to collaborate but put them in a "trading zone" (Kellogg et al., 2006), in which actors explored, negotiated, and eventually committed to partnerships and coordinated actions in the value chain. The actors who found a common basis for collaboration developed joint strategies, which can be understood as boundary objects that connect the actors. In the process, these objects took different forms, for example, as a joint business plan, the design specifications of a new product, or the shareholder agreement for a new enterprise. A strategy statement made explicit in this way is a "shared meta-strategy" (Huxham, 1993), containing the common goals and individual responsibilities agreed upon.

From a boundary work perspective, a new boundary is manifested in the process of negotiating and implementing the shared strategy. Through this boundary, the collaborating actors engage and, at the same time, separate themselves from other market actors. Despite their partnership, the collaborating actors maintain a degree of autonomy and rearrange their individual boundaries to protect their economic interests in other areas, i.e., by maintaining a competitive relationship with regards to products or distribution channels outside of the area, in which they collaborate. We conceptualize this mode of boundary work as "negotiating and implementing", in the sense of bringing actors together to establish new ways of working together across the chain. It includes both collaborative and competitive aspects of boundary work. The results highlight that, for the participants of an emerging value chain, this mode of boundary work is a balancing act between their individual

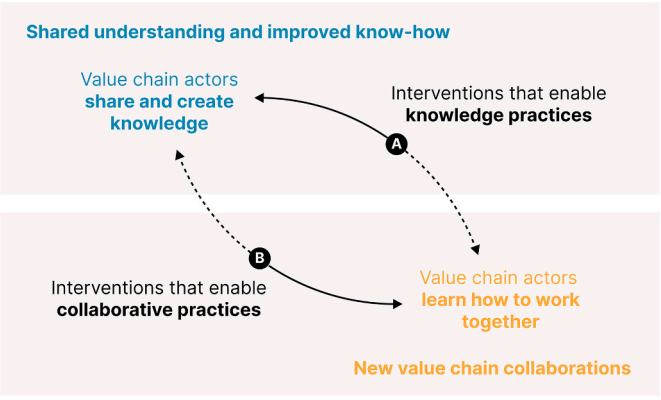

Fig. 5. Configurational boundary work for value chain collaboration.

business interests and the collaborative advantage of pursuing a shared meta-strategy with others.

4.4. Configurational boundary work in emerging value chains

The boundary work categories established in the previous part of this article are instrumental in the development of local value chains. They are modes of boundary work rather than phases of a process, in the sense that they do not necessarily run sequentially, but are, to some extent, concurrent, interdependent, and intertwined. This leaves the question of how this complex process can be facilitated in an appropriate manner. A special feature of newly emerging value chains is that they are inter-organizational settings in which formal partnerships or common organizational structures still need to be formed. As a result, there often is neither explicit leadership nor a focal company that could manage the change process or make decisions for the entire chain, which is a common challenge in emerging inter-organizational settings (Huxham and Vangen, 2005; Gray and Purdy, 2018).

In our study, it was the learning network that, through facilitation, engaged the value chain actors in boundary work. As value chain developers (Braun et al., 2023), the facilitators of the learning network set up the scaffold, within which the participants were enabled to build collaborative structures. In doing so, the value chain developers performed different functions, depending on the mode of boundary work. While in the first micro case, their focus was primarily on networking and facilitating collaborative inquiry, in the second case, the focus was on organizing learning activities, facilitating co-creation and transfer of knowledge, and providing access to domain experts. In the third micro case, the role of the value chain developers was to facilitate negotiations for shared strategies and to assist in organizing and evaluating practical trials. The learning network can thus be understood as an intermediary supporting sustainability transitions (e.g., Kivimaa et al., 2019), or, more specifically, as a boundary organization (Guston, 2001; O'Mahony and Bechky, 2008). The learning network created temporary spaces that supported effective interaction among participants, through shaping and re-shaping of boundaries, in the sense of configurational boundary work (Langley et al., 2019). Our findings suggest that this type of higher-level boundary work is the defining feature of value chain development.

Configurational boundary work in value chains enables both knowledge practices and collaborative practices (Fig. 5). Component A concerns interventions that have a primary focus on knowledge creation, in which the participating actors share and create specialized knowledge across organizational boundaries. This results in improved domain practices and understanding among value chain actors. Component B refers to interventions that focus on collaborative practices, where actors learn how to work together, which can lead to new value chain collaborations. In the process, there is a recursive relationship between knowledge and collaborative practices. By learning to collaborate, value chain actors also improve the capacity for knowledge co-creation in the value chain. Conversely, by sharing and creating knowledge, e.g., about the situation of the local food system or new strategies, they build the basis for value chain collaboration.

The configurational boundary work described here is similar to that in other practice-based research into learning networks or multi-actor settings in agri-food systems (e.g., Tisenkopfs et al., 2015; Rigg et al., 2021). In contrast to our study, that body of research has a primary focus on boundary work aimed at creating new knowledge. The participants of such networks work together on various practical issues and then implement the knowledge thus gained, but primarily on an individual basis, in the context of their own organizations (Rigg et al., 2021). As our findings suggest, configurational boundary work in value chain contexts involves not only the co-creation of domain knowledge, as illustrated in the second micro case (create and integrate). It also entails the development of local market knowledge, as illustrated in the first micro case (uncovering), combined with the negotiation of strategic collaboration in the value chain, as illustrated in the third case (negotiating and implementing).

The configurational boundary work, in its parallel creation of knowledge and collaboration, is an ongoing process that has no predetermined end, emphasizing the notion by Langley et al. (2019) that boundary work is, by its very nature, open-ended and continuous. Through the combination of the described interventions, existing value chain practices and boundaries are challenged in a process that can, over time, reshape local food systems. While ideally, the need for external facilitation in value chain contexts diminishes in the long term, the process of re-configuration continues as chains evolve and adapt to shifting conditions—with changing objectives and intensity, depending on the situation and future challenges in the value chains.

5. Conclusions

In this article, we used boundary work as a lens to conceptualize the nature of value chain development in local food systems. Over a period of six years, we conducted action research in a learning network of small and medium-sized agri-food enterprises in the Berlin-Brandenburg region, identifying several modes in which participants of emerging value chains engage at their boundaries. These modes include uncovering knowledge to build a shared understanding of the local food sector, creating and integrating domain knowledge to improve professional practices, as well as negotiating and implementing shared strategies for value creation. We also outlined how the configurational boundary work enabled new patterns of collaboration and knowledge co-creation in the value chain.

The present article contributes to the literature on innovation in local food systems (e.g., Stotten et al., 2017; Gamache et al., 2020; Gutiérrez and Macken-Walsh, 2022) by showing how the concept of boundary work can be used to explore learning and change in emerging value chains. Expanding on this prior work, our study demonstrated a pathway that took a group of agri-food practitioners from learning together to strategic business partnerships in the chain. We suggest that a boundary work perspective is appropriate for studying such emerging inter-organizational settings because it enables a dual focus on both the structures (boundaries) and the practices (boundary work) that shape the settings over time. While the practice-based theory we developed is limited to the specific context of our research, further research could transfer the findings and analytical approach to similar change processes, for example, in other sustainability-oriented value chains in the agricultural sector.

Our findings emphasize the crucial role of facilitated spaces in emerging value chains. With regards to practical implications, value chain developers and other facilitators can use the presented modes of boundary work as a guideline for designing such spaces, tailoring interventions to the specific problems of their region and the needs of the value chain actors they work with. Interventions towards more collaboration in the chain should not, however, be an end in itself. The objective of configurational boundary work is to help actors make well-founded decisions that enable sustainable business practices, which may, or may not, culminate in formal partnerships. Rather than prioritizing the creation of formal patterns of collaboration, configurational boundary work in value chains is about consciously exploring whether and how the actors can achieve a collaborative advantage through new ways of working together. Participating in an emerging value chain requires practitioners to challenge existing business practices and to develop and implement new strategies (Braun et al., 2023). It meant building capacity for knowledge-creation and collaboration, and effective changes in the individual enterprises. The development of value chains is, therefore, an essential part of their strategic organizational development.

For the value chain collaborations developed in the present learning network, it remains to be seen how the actors involved will be able to sustain and to further develop the established partnerships, which will

have to be evaluated in the future. Currently, a number of new initiatives for the development of local agri-food systems are underway in different regions of Germany and across Europe. In Germany, policymakers have acknowledged the need to support local value chains, for example, to supply public catering services with organic produce (Federal Office for Agriculture and Food, 2023). The implementation of such programs must be embedded in the regions to address the specific situations and issues on a local level. Local initiatives, politicians, and public administrators can play an important part because they can set the course for the re-localization of food systems at the level of municipalities or micro-regions, for example, by promoting local sourcing in public catering services, participating in innovation programs, or installing value chain developers in their regions. A remaining challenge is that many of the existing and planned programs are temporary and project-based. It would be important to also create more permanent boundary organizations that can facilitate newly emerging value chains and help existing value chains to continuously adapt to changing conditions, to support innovative local agri-food systems in the long term.

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CRediT authorship contribution statement

Charis Linda Braun: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization, Project administration. **Vera Bitsch:** Conceptualization, Methodology, Writing – review & editing, Resources, Supervision. **Anna Maria Häring:** Writing – review & editing, Resources, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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References

Argyris, C., Schön, D.A., 1989. Participatory action research and action science compared: a commentary. Am. Behav. Sci. 32, 612–623. https://doi.org/10.1177/0002764289032005008.

Bechky, B.A., 2003. Sharing meaning across occupational communities: the transformation of understanding on a production floor. Organ. Sci. 14, 312–330. https://doi.org/10.1287/orsc.14.3.312.15162.

Bitsch, V., 2005. Qualitative Research: a grounded theory example and evaluation criteria. J. Agribus. 23, 75–91. https://doi.org/10.22004/AG.ECON.59612.

Braun, C.L., Bitsch, V., Häring, A.M., 2022. Behind the scenes of a learning agri-food value chain: lessons from action research. Agric. Hum. Val. 39, 119–134. https://doi.org/10.1007/s10460-021-10229-7.

Braun, C.L., Bitsch, V., Häring, A.M., 2023. Developing agri-food value chains: learning networks between exploration and exploitation. J. Agric. Educ. Ext. 29, 417–438. https://doi.org/10.1080/1389224X.2022.2082499.

Carlile, P.R., 2002. A Pragmatic View of knowledge and boundaries: boundary objects in new product development. Organ. Sci. 13, 442–455. https://doi.org/10.1287/orsc.13.4.442.2953.

Clark, W.C., Tomich, T.P., van Noordwijk, M., Guston, D., Catacutan, D., Dickson, N.M., McNie, E., 2011. Boundary work for sustainable development: natural resource management at the consultative group on international agricultural research (CGIAR). Proc. Natl. Acad. Sci. U.S.A. 113, 4615–4622. https://doi.org/10.1073/pnas.0900231108.

Chreim, S., Langley, A., Comeau-Vallée, M., Huq, J.-L., Reay, T., 2013. Leadership as boundary work in healthcare teams. Leadership 9, 201–228. https://doi.org/10.1177/1742715012468781.

Conner, D.S., Abate, G., Liquori, T., Hamm, M.W., Peterson, H.C., 2010. Prospects for more healthful, local, and sustainably produced food in school meals. J. Hunger Environ. Nutr. 5, 416–433. https://doi.org/10.1080/19320248.2010.527276.

Corbin, J., Strauss, A., 2015. Basics of Qualitative Research: Techniques and Procedures for Developing Grounded, fourth ed. SAGE Publications, Los Angeles.

Eden, C., Huxham, C., 1996. Action research for management research. Br. J. Manag. 7, 75–86. https://doi.org/10.1111/j.1467-8551.1996.tb00107.x.

European Commission, 2020. A farm to fork strategy for a fair, healthy and environmentally-friendly food system. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381. (Accessed 2 July 2023).

Federal Office for Agriculture and Food, 2023. Maßnahmenvorschläge im Bereich „Auf- und Ausbau von Bio-Wertschöpfungsketten“ [Proposed measures for the development of organic value chains]. https://perma.cc/Y5AV-ZGGV. (Accessed 2 July 2023).

Gamache, G., Anglade, J., Feche, R., Barataud, F., Mignolet, C., Coquil, X., 2020. Can living labs offer a pathway to support local agri-food sustainability transitions? Environ. Innov. Soc. Transit. 37, 93–107. https://doi.org/10.1016/j.eist.2020.08.002.

Gieryn, T.F., 1983. Boundary-work and the demarcation of science from non-science: strains and interests in professional ideologies of scientists. Am. Socio. Rev. 48, 781. https://doi.org/10.2307/2095325.

Gray, B., 1989. Collaborating: Finding Common Ground for Multiparty Problems. Jossey-Bass, San Francisco.

Gray, B., Purdy, J.M., 2018. Collaborating for Our Future: Multistakeholder Partnerships for Solving Complex Problems. Oxford University Press, Oxford.

Guston, D.H., 2001. Boundary organizations in environmental policy and science: an introduction. Sci. Technol. Hum. Val. 26, 399–408. https://doi.org/10.1177/016224390102600401.

Gutiérrez, J.A., Macken-Walsh, Á., 2022. Ecosystems of collaboration for sustainability-oriented innovation: the importance of values in the agri-food value-chain. Sustainability 14, 11205. https://doi.org/10.3390/su141811205.

Hale, E.H., Jadallah, C.C., Ballard, H.L., 2022. Collaborative research as boundary work: learning between rice growers and conservation professionals to support habitat conservation on private lands. Agric. Hum. Val. 39, 715–731. https://doi.org/10.1007/s10460-021-10283-1.

Hernes, T., 2004. Studying composite boundaries: a framework of analysis. Hum. Relat. 57, 9–29. https://doi.org/10.1177/0018726704042712.

Huxham, C., 2003. Action research as a methodology for theory development. Pol. Polit. 31, 239–248. https://doi.org/10.1332/030557303765371726.

Huxham, C., 1993. Pursuing collaborative advantage. J. Oper. Res. Soc. 44 https://doi.org/10.1057/jors.1993.101.

Huxham, C., Vangen, S., 2005. Managing to Collaborate: the Theory and Practice of Collaborative Advantage. Routledge, London.

Kellogg, K.C., Orlikowski, W.J., Yates, J., 2006. Life in the trading zone: structuring coordination across boundaries in postbureaucratic organizations. Organ. Sci. 17, 22–44. https://doi.org/10.1287/orsc.1050.0157.

Kivimaa, P., Boon, W., Hyysalo, S., Klerkx, L., 2019. Towards a typology of intermediaries in sustainability transitions: a systematic review and a research agenda. Res. Pol. 48, 1062–1075. https://doi.org/10.1016/j.respol.2018.10.006.

Klerkx, L., Leeuwis, C., 2009. Establishment and embedding of innovation brokers at different innovation system levels: insights from the Dutch agricultural sector. Technol. Forecast. Soc. Change 76, 849–860. https://doi.org/10.1016/j.techfore.2008.10.001.

Körner, J., Thornton, P., Klerkx, L., 2022. How to swarm? Organizing for sustainable and equitable food systems transformation in a time of crisis. Global Food Secur. 33, 100629 https://doi.org/10.1016/j.gfs.2022.100629.

Lamont, M., Molnár, V., 2002. The study of boundaries in the social sciences. Annu. Rev. Sociol. 28, 167–195. https://doi.org/10.1146/annurev.soc.28.110601.141107.

Langley, A., 1999. Strategies for theorizing from process data. Acad. Manag. Rev. 24, 691. https://doi.org/10.2307/259349.

Langley, A., Lindberg, K., Mørk, B.E., Nicolini, D., Raviola, E., Walter, L., 2019. Boundary work among groups, occupations, and organizations: from cartography to process. Acad. Manag. Ann. 13, 704–736. https://doi.org/10.5465/annals.2017.0089.

Mennig, P., Sauer, J., 2022. Promoting organic food production through flagship regions. Q Open 2. https://doi.org/10.1093/qopen/qoac010.

Moschitz, H., Home, R., 2014. The challenges of innovation for sustainable agriculture and rural development: integrating local actions into European policies with the Reflective Learning Methodology. Action Res. 12, 392–409. https://doi.org/10.1177/1476750314539356.

O'Mahony, S., Bechky, B.A., 2008. Boundary organizations: enabling collaboration among unexpected allies. Adm. Sci. Q. 53, 422–459. https://doi.org/10.2189/asqu.53.3.422.

Peterson, H.C., 2009. Transformational supply chains and the "wicked problem" of sustainability: aligning knowledge, innovation, entrepreneurship, and leadership. J. Chain Netw. Sci. 9, 71–82. https://doi.org/10.3920/JCNS2009.x178.

Peterson, H.C., 2011. An epistemology for agribusiness: peers, methods and engagement in the agri-food bio system. Int. Food Agribus. Manag. Rev. 14 https://doi.org/10.22004/ag.econ.119968.

Peterson, H.H., Feenstra, G., Ostrom, M., Tanaka, K., Brekken, C.A., Engelskirchen, G., 2022. The value of values-based supply chains: farmer perspective. Agric. Hum. Val. 39, 385–403. https://doi.org/10.1007/s10460-021-10255-5.

Quick, K.S., Feldman, M.S., 2014. Boundaries as junctures: collaborative boundary work for building efficient resilience. J. Publ. Adm. Res. Theor. 24, 673–695. https://doi.org/10.1093/jopart/mut085.

Rigg, C., Coughlan, P., O'Leary, D., Coghlan, D., 2021. A practice perspective on knowledge, learning and innovation – insights from an EU network of small food producers. Enterpren. Reg. Dev. 33, 621–640. https://doi.org/10.1080/08985626.2021.1877832.

Santos, F.M., Eisenhardt, K.M., 2005. Organizational boundaries and theories of organization. Organ. Sci. 16, 491–508. https://doi.org/10.1287/orsc.1050.0152.

Shani, A.B. (Rami), Coghlan, D., 2021. Action research in business and management: a reflective review. Action Res. 19, 518–541. https://doi.org/10.1177/1476750319852147.

Star, S.L., Griesemer, J.R., 1989. Institutional ecology, 'translations' and boundary objects: amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39. Soc. Stud. Sci. 19, 387–420. https://doi.org/10.1177/030631289019003001.

Stevenson, G.W., Clancy, K., King, R., Lev, L., Ostrom, M., Smith, S., 2011. Midscale food value chains: an introduction. J. Agric. Food Syst. Comm. Dev. 1, 1–8. https://doi.org/10.5304/jafscd.2011.014.007.

Stotten, R., Bui, S., Pugliese, P., Lamine, C., 2017. Organic values-based supply chains as a tool for territorial development: a comparative analysis of three European organic regions. Int. J. Sociol. Agric. Food 24. https://doi.org/10.48416/ijsaf.v24i1.120.

Tell, F., Berggren, C., Brusoni, S., Van de Ven, A.H. (Eds.), 2017. Managing Knowledge Integration across Boundaries. Oxford University Press, Oxford.

Tisenkopfs, T., Kunda, I., šūmane, S., Brunori, G., Klerkx, L., Moschitz, H., 2015. Learning and innovation in agriculture and rural development: the use of the concepts of boundary work and boundary objects. J. Agric. Educ. Ext. 21, 13–33. https://doi.org/10.1080/1389224X.2014.991115.

Velter, M.G.E., Bitzer, V., Bocken, N.M.P., Kemp, R., 2020. Sustainable business model innovation: the role of boundary work for multi-stakeholder alignment. J. Clean. Prod. 247, 119497 https://doi.org/10.1016/j.jclepro.2019.119497.

Zietsma, C., Lawrence, T.B., 2010. Institutional work in the transformation of an organizational field: the interplay of boundary work and practice work. Adm. Sci. Q. 55, 189–221. https://doi.org/10.2189/asqu.2010.55.2.189.

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