The Constitution of Boundaries How the Embeddedness of Organizational Users Structures the Transfer of their Knowledge[1]

Philip Roth* and Nadine Diefenbach**

** RWTH Aachen University.*

*** RWTH Aachen University.*

ABSTRACT

Private and organizational users are widely treated as equal in the literature on the integration of users in innovation projects. Based on a practice-theoretical perspective, we argue in this paper that this equation is inconsistent and inadequate. While users are conceptualized as competent and embedded when it comes to the genesis of their user knowledge, both factors are ignored when their involvement in the innovation process is considered. Drawing on empirical findings on interorganizational knowledge transfer, we show that the social, formal, and material embeddedness of organizational users crucially structures their integration. By elaborating the role of different structural dimensions in detail, we highlight the distinctive features of organizational users. In doing so, we further develop a heuristic that enables a detailed and adequate analysis of their integration.

Keywords: Organizational Users; Innovation, Boundaries; Knowledge Transfer; Social Context; Materiality.

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INTRODUCTION

The central idea of Open Innovation (OI) is that the deeper and earlier involvement of users in the innovation process can bring fresh creative impetus and a keen focus on user needs (Bogers *et al.*, 2010; Bogers *et al.*, 2017; von Hippel, 1986). Thereby, it is recognized that user knowledge is highly context-specific and implicit. Accordingly, with regard to their usage practices, users are conceived as structurally embedded, knowledgeable actors. In contrast, when it comes to the transfer of user knowledge, they are conceived as structurally unbound and obedient knowledge carriers (Bogers *et al.*, 2010; Schweisfurth, 2017).

We criticize this representation of users as being theoretically inconsistent and pro-innovation biased. Critical innovation studies have pointed out that research on innovation is often affected by a *pro-innovation bias* (Rogers, 2003, p. 92). Affected by this bias, the manageability of innovation processes by innovating companies is often overestimated, while resistance and opposition by affected and involved actors is underestimated (Godin & Vinck, 2017; Gold, 1969). In light of this bias, we challenge the assumption that knowledgeable acting users are ever willing to provide their knowledge to innovating firms. Further, Bogers *et al.* (2010, p. 866) have pointed out that OI research lacks a foundation in social theory and thus often draws on inconsistent assumptions. In line with practice-theoretical assumptions (Giddens, 1979), OI research emphasizes that user knowledge is practical and context-specific, making it valuable but difficult to transfer (Bogers *et al.*, 2010; von Hippel, 1994). With regard to their usage practices, users are accordingly conceived as structurally embedded, knowledgeable actors. In contrast, when it comes to the transfer of user knowledge, they are treated as structurally unbound and obedient knowledge carriers (Bogers *et al.*, 2010; Schweisfurth, 2017).

The theoretically inconsistent conception of users facilitates the pro-innovation biased depiction of user knowledge integration. This is especially true for organizational users. Since many products and services address organizational users, both private and organizational users have been considered in the OI literature from the very beginning (Bogers *et al.*, 2010; Bogers *et al.*, 2017). Because organizational user knowledge is typically distributed among several actors, it is considered to have a higher degree of complexity, which further complicates knowledge transfer. Thus, the involvement of organizational users is often realized in the form of long-term-interorganizational innovation projects. Apart from that, however, private and organizational users are thought of in strong analogy in the OI literature and are often not distinguished from each other at all (Bogers *et al.*, 2010; Brem *et al.*, 2018; Schweisfurth, 2017). By ignoring their structural embeddedness and its practical

significance, it is assumed that private and organizational users equally integrate into innovation processes.

Practice-theoretical research on interorganizational collaborations already suggests that the structural embedding of organizational users is highly relevant for the transfer of their (user) knowledge (Berends & Sydow, 2019; Windeler, 2001). Interorganizational collaborations are comparable to the involvement of organizational users in innovation projects, because here as well, autonomous organizations cooperate and share knowledge within the framework of temporary projects. Thereby, the core of our practice-theoretical approach is the *duality of structure and action* (Giddens, 1984, p. 14). This idea emphasizes that structures such as hierarchical relations or the formal organization of projects are produced by the practices of competent actors. At the same time, actors are bound to given structures that enable and constrain practices. Structures in the sense of rules and resources are therefore both the product and the precondition of practice (Giddens, 1984, p. 19).

In contrast to previous conceptions of user integration, which distinguished organizational and private users at best on the basis of the complexity of their knowledge, we thus emphasize the specific structural embedding of these actors. We argue that different dimensions of these structures in their practical interplay have a structuring effect on knowledge transfer processes and thus practically constitute boundaries between organizations insofar as they hinder or promote the transfer of user knowledge (Leonardi *et al.*, 2019; Levina & Vaast, 2005).

The paper makes the case for the significance of the structural embedding of organizational users. To this end, we proceed as follows. First, we will revisit in more detail how the transfer of organizational user knowledge is conceptualized in the OI-literature. Subsequently, we will reformulate the transfer of organizational user knowledge in terms of practice theory. To this end, we will first discuss the practice of knowledge transfer and its general preconditions. In the main part, we will then draw on rich findings from research on interorganizational knowledge transfer (Milagres & Burcharth, 2019; Nakauchi *et al.*, 2017) in order to demonstrate the relevance of different dimensions of organizational structures for the practical transfer of organizational user knowledge. Hence, we substantiate the basic argument in a nuanced way and furthermore develop a model that explicates diverse forms of structural embedding and its interactive effect in the transfer of organizational user knowledge. In doing so, we identify a multitude of causes for why organizational users limit their engagement in open innovation processes. We thus critically expose a blind spot in the OI literature, in which users are typically assumed to be highly motivated to participate in innovation processes (Bogers *et al.*, 2010; Godin & Vinck, 2017).

THE TRANSFER OF (ORGANIZATIONAL) USER KNOWLEDGE

In the literature on user knowledge transfer, three concepts are key to explaining the transfer process (West & Bogers, 2014). First, it is pointed out that user knowledge is *sticky* in the sense that it is mostly implicit and context-bound knowledge of action (Bhagat *et al.*, 2002; von Hippel, 1994; Inkpen, 2008). Users are thus unable to easily communicate the knowledge. Rather, greater effort is required to make the knowledge explicit for transfer. The literature recognizes that organizational user knowledge is particularly sticky because user practices in organizations are usually distributed among multiple individuals and are embedded in complex processes (West & Bogers, 2014). Secondly, the concept of *Absorptive Capacity* emphasizes that the knowledge held by the innovating organization and its organization are crucial for its ability to absorb new knowledge from the outside (Cohen & Levinthal, 1990; Zahra & George, 2002). Thirdly, the *Not-Invented-Here Syndrome* points out that the culture of the focal organization can be such that knowledge from outside is generally underestimated and rather rejected (Bogers *et al.*, 2017; Katz & Allen, 1982).

The concept of stickiness emphasizes that users' knowledge is highly situational and implicit. This assumption is in line with practice-theoretical conceptions of actors. In tension with this theory are the remaining two concepts. They suggest that innovating organizations, if they have the appropriate capabilities, can absorb the knowledge of (passive) users. Thus, while users' knowledge is conceptualized as the product of situated everyday practices, knowledge transfer itself is not considered as a situated practice. Thus, the structural embeddedness of the actors and differences between organizational and private users in this respect are neglected when considering the transfer of user knowledge.

In contrast, from a practice-theoretical perspective, we assume that the structural embedding of the actors of the user organizations fundamentally structures the practice of knowledge transfer. Especially in the case of organizational users, the structural embedding of the actors seems significant. While private users can be widely integrated into the structures of the focal organization for knowledge transfer, organizational users are embedded in their own social, formal and material organizational structures (Carlile, 2002; Milagres & Burcharth, 2019). Depending on how compatible these structures of the heterogeneous organizations, especially SME, are with each other, conflicts can arise that can significantly impede the transfer of user knowledge. This is especially true because the transfer processes are particularly lengthy due to the high stickiness and require fine-scale coordination between the organizations. The structural embedding of organizational users is therefore of particular importance here.

At the center of our practice-theoretically informed reflections is the question of how the various organizational structures in practical interaction constitute more or less permeable boundaries between organizations (Leonardi *et al.*, 2019; Levina & Vaast, 2005). In order to understand the constitution of these boundaries from the interrelation of organizational structures, it is crucial to look at how these relations are practically created (Carlile, 2002). In the following, we will therefore specify the constitutive knowledge transfer practices in more detail drawing on findings from knowledge transfer research, and then ask how the interrelationship of organizational structures the constitution of boundaries between organizations. Hard boundaries hinder the involvement of organizational users in innovation processes. Contrary to the uncritical depiction of user integration practices, we thus elaborate various reasons why users are unwilling or unable to engage in innovation processes.

THE PRACTICE OF KNOWLEDGE TRANSFER

Boundaries between organizations are constituted by practices of sharing knowledge (Carlile, 2002; Leonardi *et al.*, 2019; Levina & Vaast, 2005). In order to understand the impact of organizational structures, we will discuss below requirements for the conduct of such practices. Although we subsequently refer to findings from innovation and knowledge transfer research, we do not assume that knowledge transfer and innovation are generally desirable and that boundaries between organizations are a problem in this respect. Rather, we are interested in describing the boundary defined constellations and their consequences without evaluating what would be desirable (Godin & Vinck, 2017).

Both innovating and using organizations can in principle be quite different types of organizations. However, the findings we refer to in the following mostly concern companies. In conclusion, we will discuss whether our argumentation can also be applied to other types of organizations. We will illustrate the requirements for the transfer of organizational user knowledge with an alienated example, which we will briefly introduce below.

Example: DigiWelder

The machine tool manufacturing company "Rabe" is striving to digitize its product portfolio in order to improve the performance of the machines, increase demand and thus ensure the long-term success of the company through innovation. After a number of failed innovation projects, the company management has become convinced that the potential users of their machines have to be involved at an early stage in order to align the development to their needs from the beginning and continuously. The aim

of the "DigiWelder" project is to develop a digital-technical support system for the loading of a welding machine and the manual alignment of the workpiece in production. This is intended to relieve the workers during work activities around and at the welding machine as well as to enable a higher precision of the alignment of the workpieces. "Rabe" has succeeded in acquiring three customer companies, which use Rabe-equipment in various fields of application, for the project. In addition to the prospect of machines improved to meet their own needs, a crucial factor in their willingness to participate was the fact that they managed to win government funding to compensate for the personnel costs. The collaboration project is scheduled to run for three years. Central to the collaboration are the moderated workshops hosted by "Rabe" and the three application companies. The main aim of these workshops is to tap into the distributed and highly implicit knowledge of the users. At the same time, "Rabe" representatives are eager to share their perspectives and needs in order to give users a sense of what information they need from them. Because of the distributed nature of user knowledge, experts from different areas of the organizations are brought in as needed, in addition to a core project team composed of representatives from the four organizations.

In the knowledge transfer literature, in particular three requirements are described as central to the transfer of tacit and complex knowledge. These are (1) belief in the value of the knowledge, (2) trust in the transfer partner, and (3) adequate channels and opportunities for transfer (Hansen *et al.*, 2005; Milagres & Burcharth, 2019). In the following, we will elaborate on the three prerequisites and illustrate them using the "DigiWelder" example.

Organizational user knowledge is complex and implicit to a greater extent. As a result, the recipients of the knowledge can only predict to a limited extent what exactly they will learn from the users and how the knowledge they have learned will be of benefit to them. The high transfer costs are thus incurred in uncertainty about the return. The crucial factor in determining whether the willingness to make a corresponding commitment arises and is maintained therefore depends on the attribution of value (Borgatti & Cross, 2003; Inkpen & Tsang, 2005).

In the "DigiWelder" project, for example, it would be conceivable that, despite the fact that management has expressed its appreciation for user knowledge, the technically skilled developers regard practitioners and their knowledge as less valuable because of their appearance and analytical skills and therefore make less of an effort to understand them. Conversely, machine operators take for granted to a large extent how to lift and rotate workpieces and fit them into the machine for further operations. Since they are not aware of the value of their practical knowledge of

everyday operations for the development process, they do not share it. We argue that value attribution and consequently engagement in the knowledge transfer process between organizational developer and organizational user is also influenced by structural differences between the organizations involved.

In contrast to the sender-receiver dichotomy, complex knowledge transfers are interactive processes in which both sides make themselves vulnerable to some extent. Two forms of vulnerability are addressed in the literature. First, people who open up make themselves vulnerable. When transferring everyday knowledge that is applied pre-reflexively, a particular challenge in the transfer of knowledge is to find out what is not self-evident to others. Such knowledge gaps, especially when it comes to expert knowledge, can be legitimate in principle. At the same time, gaps in knowledge can cause offence and loss of reputation, because they can also be interpreted as inadequacies. Furthermore, in this scanning interaction process, unquestioned assumptions are usually expressed, which upon closer examination, prove to be questionable or wrong. Here, again, there is the risk of offending and losing reputation. Users in the "DigiWelder" project, if they went deeper into their approach, would casually articulate their ideas about technical welding processes. However, they are not sure of the correctness of the underlying assumptions. Given the high level of expertise in this regard on the part of the Rabe developers, though, they might shy away from expressing themselves openly because the latter could recognize their lack of knowledge.

Second, once knowledge has been transferred, it cannot be withdrawn, so that control over the transferred knowledge is relinquished to a certain extent. It is then possible that organizational knowledge is not used in the interest of the respective organization or group of organizational members. For example, users in the "DigiWelder" project are asked to reveal the physical strain they feel when loading the system and aligning the workpiece. However, comments in this regard can also be interpreted as a user's lack of resilience. Furthermore, the application of the equipment should be considered in its embedding in the organizational processes of the application organization during the workshops. This requires the disclosure of competition-critical knowledge that could be used to the disadvantage of the user organization.

At the same time, openness is an important prerequisite for the successful transfer of organizational user knowledge. Because openness bears risks, it presupposes trust. Thus, for knowledge transfer to succeed, the actors involved must develop trust in each other (Hansen *et al.*, 2005; Inkpen & Tsang, 2005; Nilsson, 2019). We will argue that trust formation is influenced by structural differences between organizations and hence structures the transfer of organizational user knowledge.

After all, knowledge transfers do not succeed simply because actors are interested in knowledge and willing to open up. Rather, they must be carried out interactively. This requires appropriate communication channels and opportunities. Because of its special richness, face-to-face communication is considered to be extremely helpful for the transfer of tacit knowledge (Daft & Lengel, 1986; Nilsson & Mattes, 2015). In addition, however, it is argued that different forms of media-mediated communication also offer advantages for specific dimensions of knowledge transfer (Dennis *et al.*, 2008; Leonardi & Vaast, 2017). In the "DigiWelder" project, for example, the opportunities to meet in person at short notice are distributed differently due to spatial distances. Contact with the more distant application partners is more often realized via media. But even here, certain channel related inequalities are apparent, for example because individual user companies do not provide their employees with the required hardware (cameras for video telephony) or certain applications are not allowed to be used for security reasons (cloud services). We state that discontinuities between organizational structures may limit communication channels and opportunities and thereby influence the transfer of user knowledge.

We argue that trust building, value attribution, and channels and opportunities for communication enable the conduct of knowledge transfer practices. By influencing these requirements, organizational structures structure the conduct of knowledge transfer practices and thus the constitution of boundaries between organizations. Accordingly, the constitution of boundaries can be used to work out that and why users are unwilling or unable to engage in open innovation processes.

BOUNDARIES BETWEEN ORGANIZATIONS

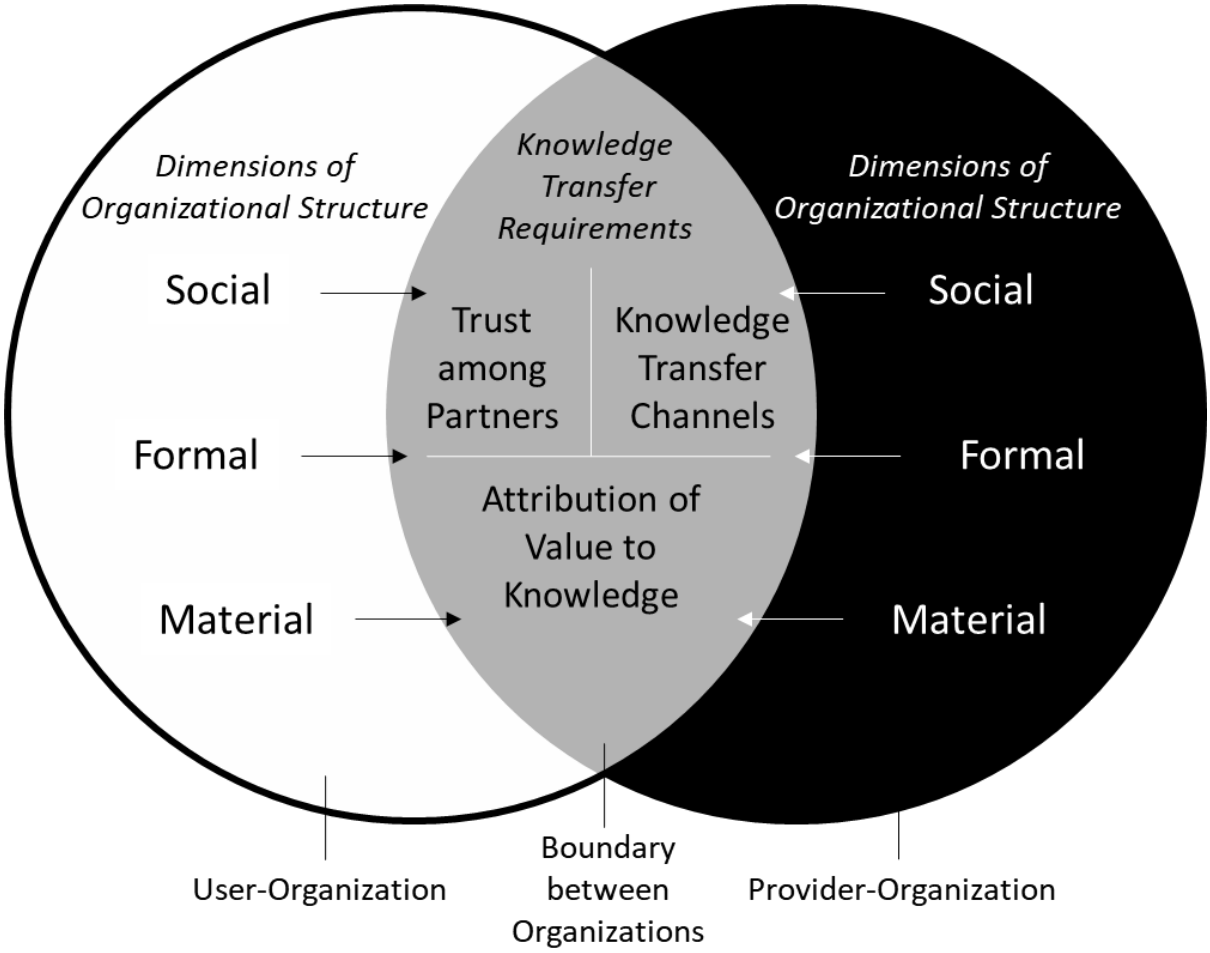
Below, we will draw on findings from research on interorganizational knowledge transfer and translate them in our practice-theoretical conception. We assume that organizational boundaries are defined by the structural embeddedness of the individuals involved in knowledge transfer and the practical meaning of this context (Lamont & Molnár, 2002; Leonardi *et al.*, 2019). Thus, we account for the fact that not all members of an organization are equivalently embedded in every dimension of the organizational structure, because organizations are not homogeneous entities in every respect.

If we consider the reputation of an organization or formal standards that equally affect all members of an organization, organizational boundaries can be determined rather independently of individuals. However, if we look at hierarchical and functional embeddedness, it seems less useful to look at the overall structure to understand how boundaries are defined. Instead, it is crucial to consider the specific embeddedness of the individuals involved. Only in consideration of the positions in

the organizational structures and the resulting relationship, the specific configuration of the boundary between the organizations becomes comprehensible, which can influence the transfer of organizational user knowledge. Thus, the relational understanding of boundaries between organizations means thinking about the social, formal, and material embeddedness of the actors involved in the transfer of user knowledge in order to better understand the transfer process. Drawing on this practice-theoretical understanding of organizational boundaries, we will subsequently highlight different dimensions of these organizational structures and show how they structure the transfer of organizational user knowledge and hence constitute corresponding boundaries. Thereby, we focus primarily on the constitution of hard boundaries. Hard boundaries make the interorganizational transfer of user knowledge more difficult and have been neglected in research on user integration.

With regard to the categorization of the context dimensions, we follow the outline of Pirkkalainen and Pawlowski (2014). Accordingly, we distinguish different social, formal, and material dimensions of boundaries between organizations. The clear distinction between dimensions that do not actually exist independently of one another, serves here solely as a heuristic device to enable a concise presentation of the various findings and to highlight the influence of organizational boundaries in the knowledge transfer process. In the following section, we will take a closer look at one dimension after the other along the heuristic and work out their significance for knowledge transfer. For this purpose, we will relate them to the three conditions mentioned for the success of knowledge transfer: (1) belief in the value of knowledge, (2) trust in the transfer partner, and (3) adequate channels and opportunities for conducting the transfer (see Figure 1).

Figure 1: The Entanglement of Organizational Structures Constitutes the Boundaries between Organizations

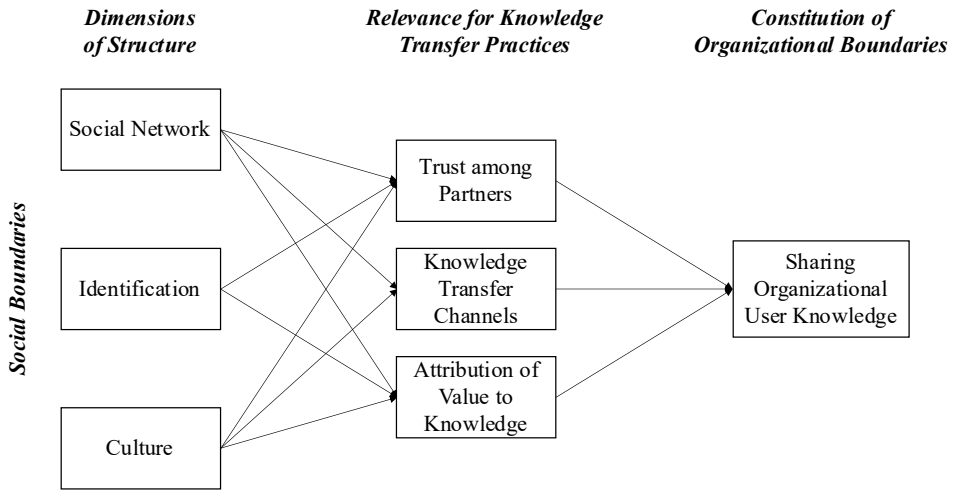


Source: elaborated by the authors (Roth & Diefenbach, 2022).

Social Boundaries between Organizations

Organizational research has shown that formal processes, insofar as they are carried out by interacting people, are permeated, and flanked by social processes. In organizations, therefore, social structures develop and shape their operations. In the following, we will argue that the embedding of individuals in organizational social structures can constitute social boundaries between organizations and thereby influence the transfer of organizational user knowledge. In doing so, we will elaborate on three aspects: Social Networks, Identification, and Culture (see Figure 2).

Figure 1: Social Boundaries between Organization influence the transfer of organizational user knowledge



Source: elaborated by the authors (Roth & Diefenbach, 2022).

Social Networks

Social networks are understood as the interweaving of personal relationships and have proven to be a particularly important social structure in organizations (Kilduff & Tsai, 2011; McEvily *et al.*, 2014). The configuration of the social networks of individual organizational members is especially effective as social capital. In the corresponding literature, three mechanisms are highlighted (Inkpen & Tsang, 2005; Lin, 2001). First, relationships can be understood as channels through which knowledge flows. A broad network that connects an actor with people from different areas of the organization enables the supply of correspondingly diverse information (Burt, 2004; Granovetter, 1973). In contrast, local networks that focus on people from a particular area are more likely to lead to redundant information and thus to a more limited supply of information (Roth, 2022). Second, social networks act as social capital because social relationships are associated with reciprocal obligations (Cook *et al.*, 2013; Cropanzano *et al.*, 2017). Through his relationships, an actor therefore has access to the resources of his partners to a certain extent. Third, positive social relationships have a reputation-enhancing effect because evaluating actors orient themselves to one another (Lin, 1999; Rivera *et al.*, 2010). Many positive relationships therefore prompt the attribution of trustworthiness and competence. This is especially true when there are indirect positive relationships between individuals. Because people value the

person who maintains a relationship with another person, the relationship is particularly beneficial to the person's reputation (Borgatti & Cross, 2003). In addition, third parties can actively share information about a person known to them that enables a particularly reliable (positive) image of that person to be formed (Burt & Knez, 1995; Granovetter, 1985; Uzzi, 1997).

Both the social networks of an actor within the organization and between the interorganizational transfer partners effect the transfer of organizational user knowledge (Drach-Zahavy, 2011; Seo, 2020; Tortoriello *et al.*, 2012). The networks within the organization are significant, primarily because the people in the project act as representatives of their organizations. How well they can inform about organizational processes and disseminate the information they receive within their own organization depends on their internal networks. In addition, internal networks define to some extent the influence they can exert in their own organization. This influence is significant for the transfer partner in that it can, for example, persuade colleagues to participate in a more detailed investigation. For the transfer partner, the influence based in the personal network is important because it makes it easier to mobilize resources that are significant for the application of the transferred user knowledge. Finally, trust in the goodwill and competence of transfer partners is also significant for internal knowledge transfer. Since an actor's reputation is enhanced by direct and indirect positive relationships, the internal organizational network also affects how well an organization's representative can transfer knowledge about or into his or her own organization as part of an interorganizational user knowledge transfer project. Accordingly, the internal networking of those responsible for transferring organizational user knowledge fundamentally affects whether knowledge transfer succeeds because it defines the organizational boundary. Whereas internally well-networked actors soften the boundaries and enable external parties to have wide-ranging access, poorly connected partners create a hard boundary.

In addition, the network-structural embedding of the transfer partners also affects the knowledge transfer between them in the transfer project (Seo, 2020; Tortoriello *et al.*, 2012). On the one hand, intra-organizational networks can have a reputation-building effect within the project, if they are indicated to the project partners. In addition, however, the joint network of transfer partners is also important. First of all, this concerns the direct relationships between transfer partners. Such build trust and act as transfer channels because specific communication practices are established and routinized in relationships (Borgatti & Cross, 2003; Hansen, 2002). In the same way, indirect relationships continue to have an effect, which can exist and become effective through other members of the interorganizational project-team, but also independently of this, by creating trust or suggesting competence (Burt & Knez, 1995; Drach-Zahavy, 2011; Granovetter, 1985). Knowledge transfers between partners

without strong or indirect relationships therefore require more coordination effort and are more likely to fail. The boundaries between organizations are thus also defined by the personal networks between them. The weaker and smaller the relationships between members of organizations, the more likely they are to create and reinforce boundaries between them, making the transfer of organizational user knowledge between organizations difficult. In contrast, network effects are not as relevant for the integration of individual private users.

Identification

Research on interorganizational projects shows that conflicts of role and interest can arise in such (Margolis, 2020; Nakauchi *et al.*, 2017). The reason for this is that the members of such projects usually take on roles in their own organization as well as in the interorganizational project-team that are associated with specific interests. Sometimes these interests are conflicting. In the case of "DigiWelder", this becomes apparent when the employees have to prioritize between the tasks in the project, e.g. participation and preparation for a workshop in the company "Rabe", and the work on company-specific projects in the respective company, as well as decide how much time and energy they should invest in each task. To the extent that interorganizational knowledge transfers are time-consuming, their success also depends on the extent to which a project partner prioritizes the corresponding task. Research shows that commitment also depends on how much a project partner identifies with the interorganizational knowledge transfer project (Brake *et al.*, 2020; Chen *et al.*, 2021; Drach-Zahavy, 2011). In addition to commitment, it is also important that the partners trust and open up to each other since a lack of openness leads to an incomplete transfer of information. Low identification with the interorganizational user knowledge transfer project thus means hard boundaries, while high identification establishes weak boundaries.

In research on the development of identification, four explanations are offered (Brake *et al.*, 2020; Drach-Zahavy, 2011; Margolis, 2020). First, identification with an interorganizational project-team depends on an actor's further activities. If he/she is also engaged in numerous other projects with other tasks, conflicts are more likely and the average identification with each individual team is lower. Second, identification is determined by the recognition of the project in the home organization. If recognition there is high, an employee can increase status and self-esteem in his or her own organization through his or her performance in the interorganizational project. If, on the other hand, recognition is low, a conflict arises in this respect and average identification is lower. Third, identification at the project-team level is favored by positive narratives concerning the collective. In particular, the definition of a common past and common goals, which are shared within the project-team and

substantiated by experience, are crucial here. Fourth, identification is constituted at the personal level. The greater the cumulative identification with individual team members, the stronger the identification with the project-team. Identification with other team members is developed interactively and categorically. Personal relationships are developed through interactions. The stronger the cohesion of the network of relationships in a team, the more likely actors are to identify with the project-team as a whole (Brake *et al.*, 2020; Drach-Zahavy, 2011). Categorization, on the other hand, describes the assignment of people to social groups on the basis of personal characteristics (Joshi & Roh, 2009). Identification between individuals is more likely the more significant the shared categories are in the categorization process and the greater the number of shared categories. In this context, home organizations can also play a role if the types of organizations are used as categories. Identification is then more likely, for example, if organizations operate in the same or comparable industries. Low identification with interorganizational project-teams can harden the boundaries between organizations, make the transfer of organizational user knowledge more difficult, and thus distinguishes organizational from individual private users.

Culture

To some extent, every organization has its own local culture, which is rooted in knowledge that is shared and taken for granted (Morrill, 2008). First, organizational culture results from the specific intersection of influences that converge in the organization. For example, specific organizations recruit employees primarily from specific regions and departments. Employees carry their cultural knowledge into the organization and thus shape the organization's culture. Furthermore, the culture of an organization is influenced by its members interacting with the members of certain other organizations and thus unquestioningly carrying knowledge into their own organization. The culture of the organization is thus shaped by the industry in which it is active, for example (DiMaggio & Powell, 1983). Second, cultures are (further) developed idiosyncratically in social collectives in which actors repeatedly interact with each other (Fine, 1979). As a result, organizational processes follow culture-specific logics that differ from one another to a greater or lesser extent. If they differ strongly, this complicates the transfer of organizational user knowledge in two respects. First, the transfer of organizational user knowledge requires the explication of tacit knowledge. Some of this tacit knowledge is also cultural knowledge. For example, it is reported that organization-specific styles exist in the development of equipment, which determine, for example, which materials are used or which target dimensions (safety, durability, etc.) are given particularly high priority. These culture-specific styles can strongly influence the use of a product and are thus part of user knowledge. The more similar organizational cultures are, the larger the shared

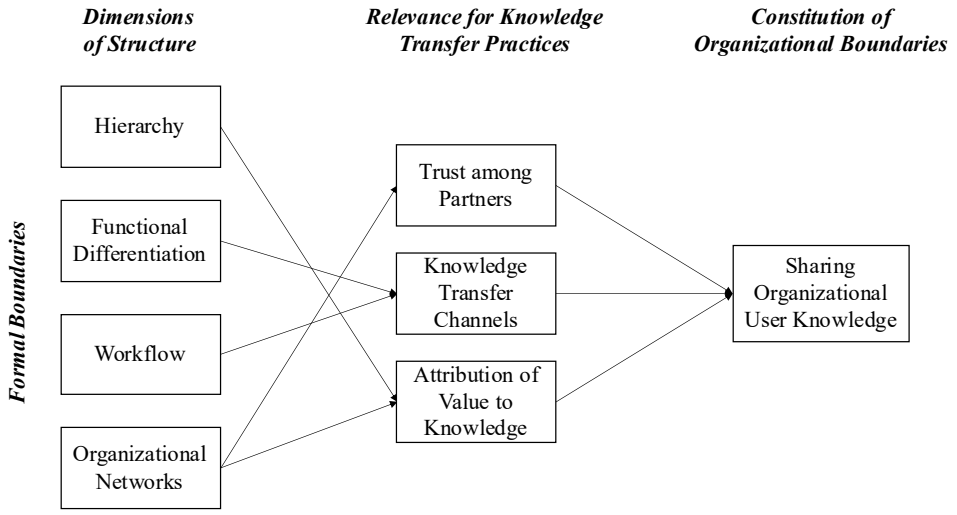
knowledge base and the smaller the proportion of tacit knowledge that must be made explicit and transferred in order to achieve the transfer goal. Differences between organizational cultures can therefore make transfer more difficult because the user knowledge is more distant and the required transfer effort is therefore greater (Bhagat *et al.*, 2002; Milagres & Burcharth, 2019; Seus, 2020, p. 11). Second, culture-specific tacit knowledge may not only affect the use of the focused product, but also cooperation in the interorganizational project. Such organization-specific idiosyncrasies can, for example, concern technical language or the definition and weighting of punctuality. Cultural differences can cause difficulties and conflicts here because they cause misunderstandings and disappointed expectations (Inkpen & Tsang, 2007; Milagres & Burcharth, 2019; Nakauchi *et al.*, 2017). The relations of organizational cultures can affect all three knowledge transfer conditions. The extent to which cultures ground shared language and communicative practices, in a sense, influences the channel of communication. In addition, cultural differences can give rise to mistrust because, for example, the way one prepares knowledge or dresses is culturally associated with social status and respectability. Differences between organizational cultures in this respect can accordingly lead to partners appearing less competent and respectable, and their knowledge being valued less highly. Cultural differences between organizations can thus constitute hard boundaries between organizations and make the transfer of organizational user knowledge more difficult.

Formal Boundaries between Organizations

Formal boundaries between organizations are defined by the relationship between the embedding in formal structures of the individuals involved in knowledge transfer. On the one hand, this refers to the embedding in one's own organization, whereby the formal structures here can be homogeneous or heterogeneous. They can be homogeneous, for example, with regard to formal processes that apply equally to all employees. The relationship of these structures between organizations is therefore independent of individuals. If, however, the structures in the organizations are heterogeneous, as is the case, for example, with hierarchies, the position of the individuals is more crucial. In both cases, however, the focus is on the formal structural embedding of the individuals in the home organization. On the other hand, cooperation between organizations is also typically regulated by formal structures. Individuals are thus (additionally) embedded in these structures and boundaries are also defined by them. In the following, we will consider formal hierarchies, the functional differentiation of organizations, the concrete design of formal processes and structures in organizations, and the embeddedness of organizations in terms of

their importance for the constitution of boundaries between organizations (see Figure 3).

Figure 2: Formal Boundaries between Organization influence the transfer of organizational user knowledge



Source: elaborated by the authors (Roth & Diefenbach, 2022).

Hierarchies

Hierarchies are central elements of organizational structures, as they define functions, competencies, and responsibilities of individual positions in organizations. With regard to the transfer of user knowledge between organizations, hierarchies are significant in two respects (Hu *et al.*, 2017; Inkpen & Tsang, 2005; Seus, 2020) First, it is significant what hierarchical positions the individuals directly involved in interorganizational knowledge transfer occupy in their own organization. Because organizational user knowledge is generally more distributed, the transfer requires the commitment of the various carriers. The higher an actor stands in the hierarchy, the more likely he or she is to be able to persuade the relevant employees to share their knowledge and to make the necessary resources available for this purpose. Boundaries are thus harder the lower the position of the involved individuals in the organizational hierarchy. Second, with regard to identification, we had already pointed out that conflicts of interest may exist between the goals of one's own organization and the interorganizational project (Seus, 2020; Tsang, 2002). These conflicts can be exacerbated in terms of formal structure, by employees being directed both in their own organization, and in the interorganizational project. If the manager in one's own

organization formally has more far-reaching competencies and pursues interests that run counter to the interorganizational project, this makes the transfer of organizational user knowledge more difficult. How individuals involved in the knowledge transfer project are integrated into formal hierarchies therefore influences the chances of success of the knowledge transfer project. Boundaries between organizations are accordingly the harder, the less central and weighty the project management is positioned in the hierarchical structure in the boundary area of the participating organizations.

Functional Differentiation

We already pointed out that organizational user knowledge is generally more complex than private user knowledge because it is usually more distributed. How distributed it is, however, also varies due to how an organization is structured based on the division of labor. The more specialized individual employees are and the more people are involved in individual processes, the more difficult it is to transfer the corresponding user knowledge (Phelps *et al.*, 2012; Spanos *et al.*, 2015). Due to the strong differentiation of various divisions of work and the related "knowledge in practice" (Carlile, 2002), the boundaries within a company can make internal knowledge transfer more challenging. For example, management employees in a manufacturing organization are not only further removed from its shopfloor level in terms of content, but often have a different logic than their colleagues at the machines. This distance from specific practice makes the transfer process of tacit knowledge more difficult (Carlile, 2002; Phelps *et al.*, 2012). The tacit knowledge can only reach the person in charge of interorganizational transfer through a successful intraorganizational transfer. Since the extent of labor division correlates with the size of an organization, internal knowledge transfer is typically less costly in smaller companies (Spanos *et al.*, 2015). Here, because few people are less specialized and working more closely together, the processes of the organization are more transparent to each employee. Moreover, functional differentiation can be caused by the complexity of organizational processes themselves. Irrespective of its drivers, research shows that high functional differentiation of organizations makes the transfer of user knowledge between organizations more difficult because the distributed knowledge must first be transferred and integrated in the user organization. High functional differentiation thus leads to hard boundaries between organizations, while low differentiation, which is more common in smaller organizations, leads to softer boundaries that facilitate the transfer of user knowledge.

Workflow

In addition to the extent of functional differentiation of organizations, it is also relevant for knowledge transfer how similar formal processes and structures of organizations

involved in a knowledge transfer are. Dissimilarity in this respect is a hindrance to the transfer of organizational user knowledge for two reasons (Dyer & Hatch, 2006; Milagres & Burcharth, 2019; Zahra & George, 2002).

First, differences in this regard make mutual understanding more difficult. As already pointed out when discussing organization-specific cultures, the context of application of the user's knowledge must also be transported. This is easier in the case of formal structures in that they are more explicit. Nevertheless, formal differences can also be a barrier to knowledge transfer. In order to understand the concrete processes, the formal context must be understood and shared (Dyer & Hatch, 2006; Phelps *et al.*, 2012). This is easier if these resemble the structures and processes known from one's own organization. Dissimilarity, on the other hand, again leads to lower trust and a lower attribution of value and thus to harder boundaries.

Second, the differences in formal structure in the immediate cooperation become effective in the interorganizational knowledge transfer project itself. A particular challenge in interorganizational cooperation is the development of a *modus operandi* on the basis of which individual actors interact in a coordinated manner.

The formal structures of interorganizational projects are usually not very precise with regard to concrete procedures and therefore unsuitable for the coordination of everyday cooperation practices. For each individual actor, it is obvious to transport the formal structural rules known from their own organizations into the interorganizational project. The more similar the formal structures of the participating organizations are, the more likely the application of these will lead to a coordinated and thus smooth process. If, on the other hand, the formal self-similarity of organizations is low, frictional losses result (Dyer & Hatch, 2006; Seus, 2020, p. 11). Differences in the formal structures relevant to the coordination of the project accordingly make it more difficult to develop efficient communication channels between the organizations and thus create hard boundaries.

Organizational Networks

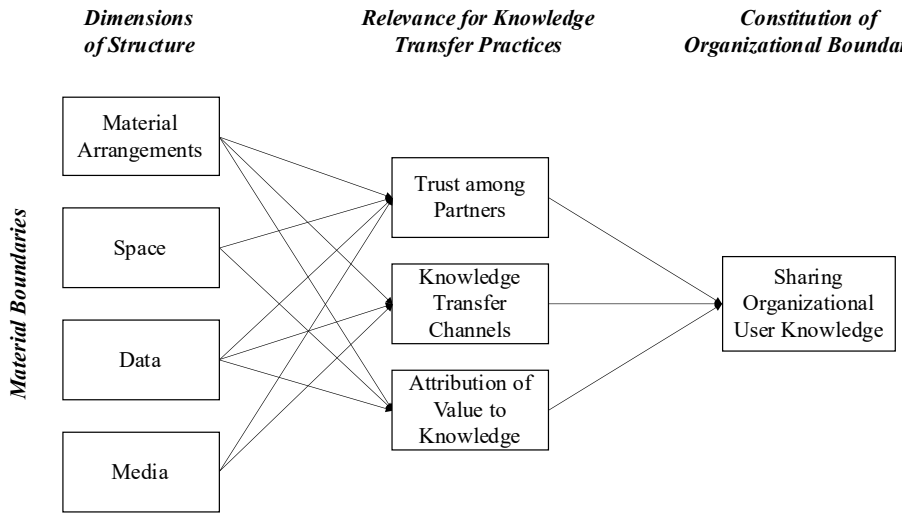
Organizations are generally not only internally structured, but also embedded in structures. They maintain formal relationships with other organizations, which result in corresponding networks. Companies, for example, usually operate in a relatively stable network of suppliers, partners and customers. If there is a high degree of similarity between the structural embedding of organizations and if they are active in a competitive environment, it is possible that they perceive each other as competitors to a certain extent or in certain areas. To the extent that the possibility is seen that user knowledge intended for transfer contains competition-critical knowledge, there is reason for concern. Actors involved in knowledge transfer then tend to be less open, making the knowledge transfer process as a whole more difficult (Hu *et al.*, 2017;

Leonard-Barton, 1992; Milagres & Burcharth, 2019). Organizations that are in a competitive relationship through their formal external relationships thus develop harder boundaries with each other, making the transfer of organizational user knowledge more difficult.

Material Boundaries between Organizations

Organizational practices are not only distributed among people, but they are also materially distributed and constituted (Orlikowski & Scott, 2021). In the following, we present how material arrangements structures the constitution of boundaries between organizations (see Figure 4). We will focus on four types of materiality: the material arrangements in which user practices are embedded, space as the geographical distances between organizations, data as the digital dimension of an organization, and media as communication channels.

Figure 3: Material Boundaries between Organization influence the transfer of organizational user knowledge



Source: elaborated by the authors (Roth & Diefenbach, 2022).

Material Arrangements

Users' knowledge is tied to practices that relate to material arrangements in an organization as an accumulation and arrangement of things (Carlile *et al.*, 2013;

Orlikowski, 2002). In the interaction between organizational users and the material environment knowledge is generated, stored, and transformed. Paths that are walked, data that is shared in a certain way and machines that are operated in specific ways, to name just a few points, testify to a materialization of knowledge. To transfer this tacit user knowledge, their usage practices have to be considered in their material embedding. A shared understanding of user practices is facilitated by the physical presence of related objects and their arrangement (Star & Griesemer 1989; Leonardi *et al.*, 2019). Thus, shared material arrangements can foster the development of a common language for understanding the innovation project and form a project identity (Carlile, 2002, p. 451-452). It can be noted that organizational boundaries are particularly hard when the knowledge of organizational users is strongly bound to the material environment in the respective arrangements.

The structural boundaries of organizations and their contextual factors also affect the exchange of knowledge about material arrangements. As the arrangements contain information about materialised actions and processes, they often also represent knowledge that is critical for competition. Hence, trust is a prerequisite for making accessible the material organization. If organizational users cannot grant other transfer partners insight into the material arrangements, they are thrown back on other communication channels for knowledge transfer, through which the tacit knowledge contained in the material arrangements becomes more difficult to convey. If trust between partners is low, the boundaries between the respective organizations are correspondingly hard, because the material contexts of user practices are not made accessible for partners and the transfer of tacit knowledge is impaired.

Space

Material boundaries between organizations are also created by spatial distances (Knoben & Oerlemans, 2006; Nilsson & Mattes, 2015; Small & Adler, 2019). As described in the previous section, it is crucial for the transfer of organizational user knowledge to consider the material embeddedness of user practices. Therefore, it is particularly important to transfer knowledge into and through the material arrangement of the organization.

In the "DigiWelder" example, this is evident from the effect of the different spatial distances between "Rabe" and the three customer companies. While the two partners several hundred kilometers away are only visited personally for a workshop, the "Rabe" developers visit the customer from the same region time and again spontaneously in order to discuss questions and problems on site and on the actual devices and workpieces.

On site, the partners gain mutual insights into the complex and specific material arrangements. Furthermore, the higher complexity of organizational user

knowledge means that its transfer is more demanding. Private users are easier to reach in this respect, as the practices that are central to their case are embedded in less complex and specific arrangements. Belief in the value of knowledge, trust in the transfer partner and appropriate channels for knowledge transfer are therefore particularly important. Knowledge transfer research shows that personal contacts are particularly conducive to all three factors. Personal encounters at the places where organizational user knowledge is used are therefore crucial for its transfer. To make such repeated encounters possible, the spatial distances between the different partner organizations must be overcome again and again. The spatial relationships, which are defined not only by physical distance but also by transport infrastructure connectivity (Torre & Rallet, 2005), thus determine the boundaries between organizations and influence how easily knowledge can be transferred between them. The harder the boundaries are, the greater the distance and the poorer the connectivity between organizations.

Data

The transfer of organizational user knowledge in interorganizational projects is also determined by the digitalization of each individual organization (Cepa & Schildt, 2019). More specifically, the increasing (re)networking of organizational processes produces data, which in turn leads to a datafication of the organization (Leonardi & Treem, 2020). The storage of data from and to organizational users in databases or even their representation at the interfaces between humans and machines leads to their materialization (Häußling, 2020), with consequences for the entire knowledge transfer process. In this respect, it is not only relevant to illuminate which data are produced and stored in what way to be able to link to them, but also how data is transferred in the first place. Thus, the materialization of data in relation to the boundaries between organizations in the interorganizational knowledge transfer process is of particular importance.

This contextualizing has an impact on organizational boundaries in the different organizations and thus on the knowledge transfer process. The changed materiality of the knowledge to be transferred not only affects the knowledge itself, but also provides additional information about the respective organization. For example, data logs or even technical drawings materialize when they are stored, read or interpreted (Häußling, 2020). In their specific representation (Häußling, 2020), they represent, among other things, not only the specific knowledge about a project, but also the knowledge about the organizational user of a project partner organization and its technological prerequisites. Thus, they also have an influence on the knowledge transfer practices of individual organizational users in the sense of Orlikowski and Scott (2021). While individual private users might be better integrated into the existing

structures of an organization, so that it becomes clearer which data are shared and how they are processed, data of project partner organizations and at the same time of organizational users are, among other things, the result of organizational and thus also far-reaching decisions, e.g. for a certain technology and its settings. Moreover, data represent what is possible through a technology (Flyverbom *et al.*, 2016). This alone demonstrates the sensitivity of data and its sharing, and further illustrates that knowledge transfer across organizational boundaries can be complicated. For all the sensitivity of the data, the added value of transferring it across organizational boundaries must outweigh the risk of transferring it in the context of the inter-organizational project. A lack of insight into how data is viewed and further processed by project partner organizations can lead to mistrust. But also, the data storage of the sensitive data itself can promote this and thus constitutes hard boundaries between the partner organizations.

Media

Typically, user knowledge is also transferred medially. Which communication media is chosen and how it is used fundamentally structures the transfer of knowledge (Levina & Vaast, 2005; Orlikowski, 2000). Three structural characteristics of the organizational embedding of the actors are particularly crucial for the media selection (Leonardi *et al.*, 2019). First, organizations regulate which media members may use and how. Second, the use of specific media is linked to technical requirements such as proper equipment or licensed software, which are available to varying degrees in different organizations. Third, the everyday use of communication media differs systematically between organizations and, as a result, so do the competencies of the actors. Accordingly, which media is used how differs based on the legal, technical and practical structures of the organizations.

When transferring user knowledge between organizations, the respective structures of the organizations involved limit which media can be used for transfer between them and how (Leonardi *et al.*, 2019; Orlikowski, 2000). Different types of media offer different means of expression (Dennis *et al.*, 2008). For example, video telephony allows non-verbal signals and personal information to be conveyed casually, as well as follow-up questions to be asked and answered immediately due to synchronicity, whereas all of this is not possible, or only possible to a limited extent, in writing or by telephone. Conversely, writing enables greater precision and repeated reception of messages. The media use practices that emerge between organizations affect the transfer of organizational user knowledge first, in that channels are more or less likely to convey the relevant dimensions of such knowledge (Leonardi *et al.*, 2019; Levina & Vaast, 2005). Further, communication media can impede the transfer of trust-building information (Nilsson, 2019; Nilsson & Mattes, 2015). The aforementioned

structures of the participating organizations thus structure the quality of the medial relationship between them, and by influencing the transfer of knowledge, they also structure the constitution of boundaries (Levina & Vaast, 2005). Moreover, this specific embedding of organizational users also distinguishes them from private users.

CONCLUSION

Until now, the integration of private and organizational users in innovation processes has hardly been distinguished from each other (Bogers *et al.*, 2010; Piller & West, 2017; Schweisfurth, 2017). Starting from a practice-theoretical perspective, we have challenged this equation by revealing the inconsistency of the previous conceptualization. While user knowledge is conceptualized as the outcome of situated practices, the practices that underlie the transfer of this knowledge and the structures that structure these practices are neglected. Especially in the case of organizational user knowledge, however, the structural embeddedness of actors appears to be highly relevant, since in this case not only the innovating actors act embedded in the material, social and formal structures of their organization, but also the users. By practically confronting the respective structures, the actors constitute specific boundaries between the organizations and thus structure the transfer of organizational user knowledge.

Our primary contribution is to highlight the need for a more precise distinction between private and organizational users when addressing the integration of their knowledge. On the one hand, we have highlighted the relevance of this distinction by pointing to the inconsistency in social theory between the conception of user knowledge as situated and implicit and the conception of the transfer process as independent of the structural embeddedness of the actors involved. On the other hand, we have substantiated our argument by integrating empirical findings on the importance of different social, formal and material structures for knowledge transfer between organizations. Following on from this, it seems extremely fruitful to differentiate users in further empirical research on the basis of their relational structural embeddedness.

Table 1: Boundaries between Organization structure the transfer of organizational user knowledge

	Dimensionen of Structure	*Trust among Partners*	*Knowledge Transfer Channels*	*Attribution of Value to Knowledge*
Social Boundaries	Social Network	x	x	x
	Identification	x		x
	Culture	x	x	x
Formal Boundaries	Hierarchy			x
	Functional Differentiation		x	
	Workflow		x	
	Organizational Networks	x		x
Material Boundaries	Material Arrangements	x	x	
	Space		x	x
	Data	x	x	x
	Media	x	x	

Source: elaborated by the authors (Roth & Diefenbach, 2022).

A second contribution is that by systematically integrating the literature on interorganizational knowledge transfer, we have modeled in detail how different dimensions of organizational structure shapes the transfer of user knowledge and thus constitute boundaries between organizations (see Table 1). The systematization can be used to consider forms of structural embedding in a nuanced way in further empirical research on user integration. It should be emphasized, however, that the relationships we have not described here can also be attributed to the fact that they have not been studied so far. This also includes that other structural dimensions are of importance that we have not considered (such as the legal and contractual conditions of collaboration). It therefore seems particularly worthwhile to critically review the gaps in our depiction in further research.

A third contribution of the paper concerns practice-theoretical research on the constitution of boundaries (Leonardi *et al.*, 2019; Levina & Vaast, 2005). In the case of material boundaries, we could build on an elaborated state of research. In contrast, in the case of social and especially formal boundaries, we have done some translation work. Since we were only able to illuminate the individual dimensions of structure in a very superficial way here, but nevertheless clarified their relevance, it seems very productive for further practice-theoretical research on the constitution of boundaries to take a closer look at social and formal boundaries.

Fourth, the paper extends critical studies of innovation (Godin & Vinck, 2017; Gold, 1969). In previous research on users in the innovation process, it was often assumed that users are generally motivated to engage in innovation processes. We have used boundaries to shed light on various reasons why this might not be the case.

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