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**Article — Published Version**

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# Two hearts beating in a research centers' chest: how scholars in interdisciplinary research settings cope with monodisciplinary deep structures

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## ABSTRACT

Interdisciplinary research is a popular mode of knowledge production that becomes intensively promoted by research centers all across the globe. Despite the facilitation of interdisciplinary research, however, scholars working in these centers are 'disciplined.' Career promotions, funding decisions and scientific publishing are based on peer-review procedures that tend to favor monodisciplinary research. This paper builds on a qualitative study with scholars in interdisciplinary research centers in Germany and asks how scholars cope with these monodisciplinary demands. After deriving a conceptual framework, the study identifies four coping strategies: disciplinary innovation, strategic compliance, niche-seeking, and field creation. Each of these strategies is characterized by a different degree of openness to knowledge bases of other disciplines and a different degree of proactivity towards monodisciplinary demands from the scientific field. The results illuminate how research agendas become disciplined despite interdisciplinary motivation and organizational support of interdisciplinary research.

## KEYWORDS

Interdisciplinarity; higher education; governance; management of research centers; coping strategies

## Introduction

Interdisciplinary research is widely regarded as a catalyst for disruptive innovations that help to solve twenty-first centuries 'grand challenges' and thus a popular and highly promoted mode of knowledge production (Gibbons 1994; Rhoten and Pfirman 2007). Within the last 30 years, funding organizations in most OECD countries have committed increasing amounts of resources for setting up problem-focused research centers with the mission of promoting interdisciplinary research (Biancani et al. 2018). These research centers facilitate interdisciplinary research – for example, by providing intellectual openness within departments (Lattuca 2002), establishing policies like joint appointments or special assessment and recruitment procedures (Porter et al. 2006), or installing interdisciplinary units (Sá 2008) (see Hellström, Brattström, and Jabrane [2018] for an overview). Despite these facilitations of interdisciplinary outcomes, however, the operative core of research centers is still 'disciplined' by demands from the scientific field: Staff hiring processes, career promotions, funding decisions, scientific publishing and academic prize-giving are based on peer-review procedures that tend to favor monodisciplinary research (Donina, Seeber, and Paleari 2017; Rhoten and Parker 2004; Mäkinen 2019).

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The monodisciplinary ‘deep structure’ of the scientific field is discussed as a reason for why research centers with the aim to facilitate interdisciplinary research are often more multi- than interdisciplinary on an operative level (Rhoten 2003). So far, only few scholars have investigated micro-level consequences of tensions between interdisciplinary research agendas and monodisciplinary field-level demands (Adler, Elmquist, and Norrgren 2009; Bernard de Raymond 2018). Research has usually focused either on meso- or group-levels and more on the Anglo-American context than on the European one (Donina, Seeber, and Paleari 2017). In the light of these gaps, current studies stress the importance of investigating micro-level experiences of the relationship between monodisciplinary field-level demands and interdisciplinary research agendas (Felt et al. 2016; Hessels and van Lente 2008; Kaplan, Milde, and Cowan 2017; Mäkinen 2019).

To advance knowledge on this under-researched topic, this article asks how scholars in interdisciplinary research centers behave towards monodisciplinary deep structures. Thereby we refer to the National Academies’ (2005) widely cited definition and understand interdisciplinary research as ‘research that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge (...)’ (2). We focus on how the interdisciplinary mission on the ‘front stage’ relates to research practices on the ‘back-stage’ by exploring micro-level experiences of the ‘rocky road’ of interdisciplinarity. After presenting our conceptual background, we present our research context and data and provide an analytical framework that helps us to identify obstacles in interdisciplinary research settings. In the results section, we illustrate how scholars deal with challenges to interdisciplinary research. Relying on a content analysis of 32 semi-structured interviews and three group discussions with scholars located in interdisciplinary research centers in Germany, we identify four coping strategies that refer to the different cognitive and behavioral efforts scholars apply in order to manage the perceived demands and conflicts caused by monodisciplinary deep structures. Finally, we discuss our results.

## Background

Scholars are traditionally embedded in a discipline, namely a unified and distinct set of methodological, theoretical and epistemological knowledge that is connected to specific area of expertise learned through instruction in courses of study and socialization in the academic profession (Hellström, Brattström, and Jabrane 2018; Silliman 1974; Guntau and Laitoko 1991). These disciplines structure scholars’ interpretations as well as their research decisions and activities (Whitley 1984). As languages, theoretical frames and methods of different disciplines differ from each other, it is demanding to integrate their knowledge sets (Leahey, Beckman, and Stanko 2017). Scholars conducting interdisciplinary research thus face cognitive barriers (Kaplan, Milde, and Cowan 2017). Studies illustrate that, due to these barriers, interdisciplinary research takes more time than conventional research as well as special effort and commitment (McBee and Leahey 2016) and that interdisciplinary research projects result in high communication and coordination costs because they lack a common language or because scholars are unfamiliar with the epistemic culture of other disciplines (Cummings and Kiesler 2005, 2007).

In addition to the ‘cognitive divide between disciplines’ (Kaplan, Milde, and Cowan 2017), traditional research governance poses challenges to interdisciplinary research (Mäkinen 2019; Whitley 1984). During peer-review procedures academic peers evaluate research in terms of its relevance, originality, methodological correctness, and plausibility (Chubin and Hackett 1990). The outcomes of these procedures constitute a scholars’ ‘market value,’ as they provide academic titles, publications, awards, and appointments (Mäkinen 2019; Shore and Wright 2000). Empirical evidence shows that quality standards reviewers use to assess their peers’ work differ from each other. The decisive criteria tend to be shaped by specific paradigms, and ontological and epistemological orientations of disciplinary communities (Birnbaum 1977; Lamont 2009; Leahey, Beckman, and Stanko 2017; Yegros-Yegros, Rafols, and D’Este 2015).

Studies have demonstrated that scholars anticipate external expectations of reviewers and monodisciplinary quality-criteria thus become benchmarks of their research activities (Alpert 1985; Biancani et al. 2018; Mäkinen 2019; Shore and Wright 2000). Scholars in organizations whose formal structure deviates from the classical disciplinary department structure thus find themselves in a dilemma (Rhoten and Pfirman 2007). Empirical evidence shows that their motivation to conduct interdisciplinary research and their willingness to take risks are relatively high (Rhoten and Parker 2004). Due to external demands, however, they are confronted with a 'tension between the scientific promise of the interdisciplinary path and the academic prospect of the tenure track' (Rhoten and Parker 2004, 2046). They are attracted to organizations committed to facilitate interdisciplinary research. When working in these environments, however, they face contradictory field-level requirements that become mediated through academic evaluation systems (Rhoten and Pfirman 2007). This tension causes conflicts like a role strain (Boardman and Bozeman 2007) or keeps scholars back from conducting real interdisciplinary research despite interdisciplinary research ideas (Geiger 1993). Even well-established interdisciplinary scholars are challenged by devaluation in peer-review processes (McBee and Leahey 2016).

The tension between scholars' interdisciplinary motivation and monodisciplinary field-level demands is discussed as a reason why research centers tend to be 'more multidisciplinary than interdisciplinary' and 'demonstrate more of an inclusion, rather than an integration, of different disciplines' (Rhoten 2003, 5), or that junior scholars in training programs aimed at fostering interdisciplinary research still move 'within the paradigm of normal science' (Hackett and Rhoten 2009, 426). Current studies stress limited understanding of the ways in which interdisciplinary research scholars cope with this tension and call for more extensive research on this topic (Felt et al. 2016; Hessels and van Lente 2008; Kaplan, Milde, and Cowan 2017; Mäkinen 2019). Against the background of this gap we aim to explore how the conflict between interdisciplinary research agendas and monodisciplinary field-level demands manifests on the micro-level during day-to-day research work.

## Methods

### *Research context*

We conducted our study with scholars working in non-university research centers in Germany. We chose five research centers that have the goal of facilitating interdisciplinary research. These research centers are jointly funded by the federal government and the federal states. They are structured around problem-oriented research fields instead of disciplinary lines. Every center we focused on provides intellectual openness by declaring in their mission statement to promote interdisciplinary research, the establishment of policies like joint interdisciplinary appointments and the installation of interdisciplinary research units. The centers integrate disciplines within the social sciences, i.e. political sciences, sociology, and economics.

### *Research design & data collection*

We used a qualitative research design in order to conduct an in-depth analysis of individual perceptions and behavior patterns. We conducted field-level visits and document analysis of the institutions we focused on. The main data set for our analysis, however, consists of 32 semi-structured interviews with scholars working in interdisciplinary research settings in five research centers with a focus on social sciences in Germany from October 2017 until April 2018. Each interview lasted between 60 and 90 minutes. We stopped gathering interview material when saturation occurred, i.e. when newly collected data were redundant (Glaser and Strauss 1967; Miles and Huberman 1994). All interviews were conducted with an interview guideline, recorded digitally, fully transcribed and coded using MAXQDA 12. Facial expressions and gestures were noted if they were

related to the interview. We interviewed senior scholars as well as post-doctoral students and paid close attention to keeping these two groups (senior scholars and junior scholars) balanced in the interests of maximum differentiation (Miles and Hubermann 1994). We included scholars who held leadership positions in formal units with an interdisciplinary focus. The interview guideline was designed in such a way that it was not necessary to adhere to a fixed sequence of given questions. We focused on the macro-, meso-, and micro-level of interdisciplinary settings and motivations. We did not presuppose a certain definition of interdisciplinarity and instead used the description given by the scholars themselves as anchors. We captured these definitions by asking questions like: ‘Could you please describe a project in which you have worked in an interdisciplinary way?’ followed by questions like ‘Could you please illustrate the typical characteristics of interdisciplinarity that could be found in this project?’ We encouraged our interview partners to respond freely by using open questions.

The candidness of our interview partners decisively influences the reliability of our results. Before every interview, we thus emphasized the anonymity of the material. In addition to scholars’ self-descriptions, we focused on how scholars think their colleagues perceive and handle reported problems.

### Analytical framework

For analytical purposes, we divided the process of interdisciplinary innovation into two stages by drawing on the Amabile et al.’s (1996) definition of innovation as ‘the successful implementation of creative ideas’ (Amabile et al. 1996, 1155). ‘The production of novel and useful ideas’ (Amabile et al. 1996, 1155), is thus the starting point for interdisciplinary scientific innovation. It refers to the acquisition and assimilation of external knowledge and, thus, the analysis, interpretation and understanding of external knowledge sources (Amabile 1988). We argue that cognitive barriers emerge during the production of interdisciplinary knowledge, because utilizing knowledge from other disciplines entails higher cognitive costs (Kaplan, Milde, and Cowan 2017). Scientists have to acquire knowledge about methods, theories and concepts of unfamiliar disciplines. The successful application of these ideas in peer-reviewed scientific outputs is the sufficient condition for interdisciplinary innovation (Amabile et al. 1996) and the second stage of our analytical framework. We regard ‘the visible consequences of successful research choices’ (Foster, Rzhetsky, and Evans 2015, 879), i.e. scholarly output units like peer-reviewed and published articles, as successful implementation of interdisciplinary ideas. During this stage, we argue, field-level barriers emerge, relating to the fact that ‘peer-review favors mono-disciplinary approaches’ (Yegros-Yegros, Rafols, and D’Este 2015, 4). Figure 1 visualizes our analytical framework. Despite the focus of this paper, it should be considered that interdisciplinary research tends to be suitable for other than traditional research outcomes. Studies illustrate, for example, that a research

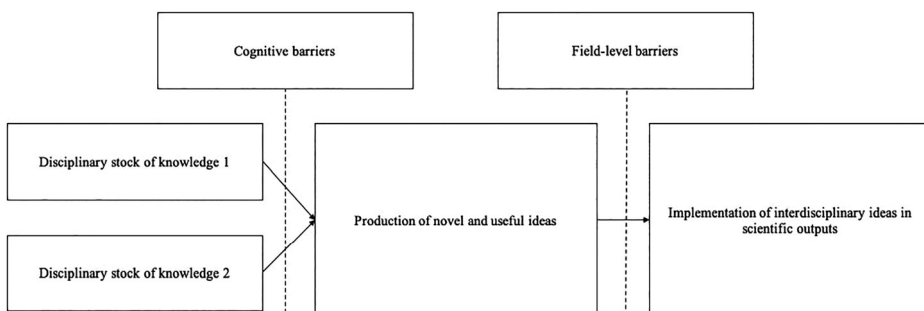


Figure 1. Barriers of interdisciplinary research.

centers' interdisciplinary focus fosters commercialization of research findings, patents, new inventions, media outreach and recognition in alternative areas of knowledge consumption (see Biancani et al. [2018] for an overview). The analysis conducted in this paper, however, aims at investigating the consequences of demands that become mediated through institutionalized peer-review procedures in the scientific field.

### **Data analysis**

We structured our findings by developing empirically grounded strategy types (Kluge 2000). Each strategy type consists of a combination of two identified dimensions. We refer to Kluge (2000) in assuming that empirically grounded types can only be formed through a combination of theoretical knowledge and empirical analysis. The analysis was therefore not carried out purely inductively.

During the qualitative type-building process, we drew on the four analysis steps described by Kluge (2000). First, we identified the comparative dimensions that allowed us to adequately capture and characterize similarities and differences between the cases we studied. In the second step, we integrated the cases based on the identified dimensions and analyzed the groups for empirical regularities. Since we aimed to understand the structure of the grouping, we analyzed the contextual relationships between the groups and the interdependencies between the comparative dimensions in the third step of our analysis. As part of this step, the two-dimensional space was redefined, and the groups were changed and sharpened. Our analysis thus progressed through several iterations that built on commonalities and differences between the comparative dimensions and the types. In the fourth step, we comprehensively characterized the strategy types on the basis of the combinations of features and their relationships.

In order to avoid a researcher perception bias, we collectively reflected on and discussed our interpretations and categorizations. In addition, the first results of the data analysis – i.e. a preliminary typology – were discussed during three group discussions with 20–30 scholars conducting research in interdisciplinary contexts from January to July 2018.

During our iterative analysis process, we identified two central comparative dimensions. The first dimension, i.e. 'Openness to the knowledge base of unfamiliar disciplines,' refers to the portrayed behavior towards the cognitive barriers in interdisciplinary research settings. We identified four levels of openness from our narrative interview material: No engagement with unfamiliar disciplines knowledge stocks (level 1); Engagement with unfamiliar disciplines knowledge stocks (level 2); Integration of a particular unfamiliar disciplines' knowledge stock (level 3); Integration of unfamiliar disciplines knowledge stocks (level 4).

The second dimension of our typology, i.e. 'Proactivity towards monodisciplinary demands from the scientific field,' captures how scholars behave towards monodisciplinary demands that become imposed on their research activities. A low degree of proactivity refers to adhering and just reacting to monodisciplinary demands while a high degree of proactivity refers to initiation of new structures and change-orientation. We identified four levels of proactivity from our narrative interview material: Adherence to monodisciplinary demands from the start (level 1); Adaptation to monodisciplinary demands (level 2); Active search for opportunities to realize a particular interdisciplinary research focus (level 3); Generation of new structures that provide the opportunity to realize interdisciplinary research (level 4).

The strategy types we built do not claim to describe the behavior of a specific empirical case holistically. As is typical for typologies, they reduce the complexity of social phenomena in order to study patterns and relationships (Delbridge and Fiss 2013). We use the typology as 'a form of social scientific shorthand' (Ragin 1987, 149) for organizing and exploring the relationship between academic deep structures and scholarly behavior in interdisciplinary research settings. Figure 2 visualizes the steps of our data analysis.



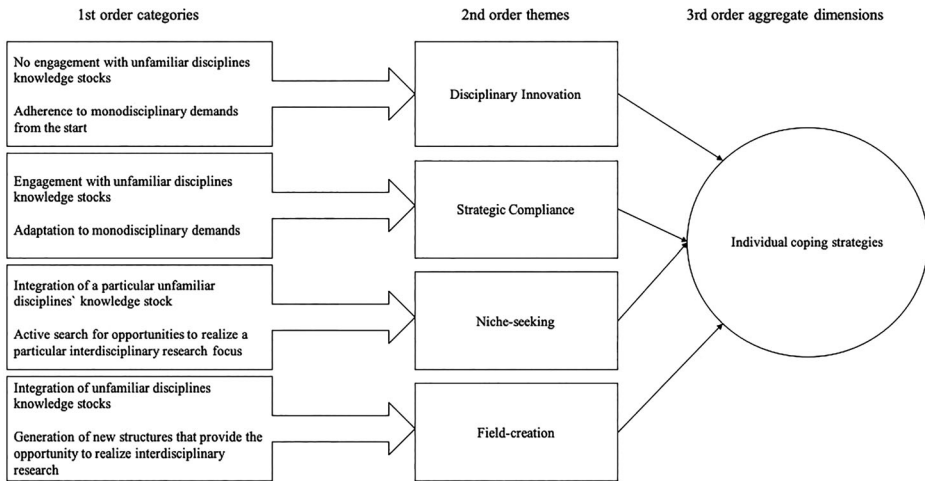


Figure 2. Data analysis.

## Results

We identified four dominant strategies that capture the different cognitive and behavioral efforts (Coyne, Aldwin, and Lazarus 1981) scholars make to manage perceived demands and conflicts. Each strategy is characterized by a specific level of openness and one corresponding field behavior pattern. Figure 3 locates the four strategies along the two dimensions 'Openness to the knowledge base of unfamiliar disciplines' ('Openness'; Dimension 1) and 'Proactivity towards monodisciplinary demands from the scientific field' ('Proactivity'; Dimension 2). We illustrate the four strategy types in the following sections.

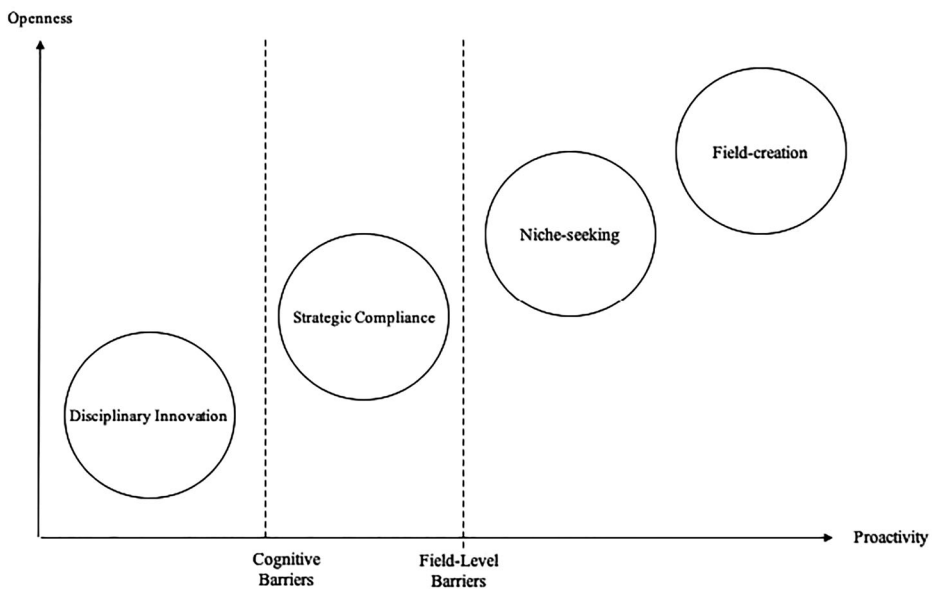


Figure 3. Coping strategies.



## Disciplinary innovation

### Definition

Scholars who employ this strategy solely focus on generating new disciplinary knowledge and do not engage with unfamiliar disciplines knowledge stocks. They adhere to monodisciplinary demands from the start and reproduce monodisciplinary structures.

### Description

Disciplinary innovation is characterized by a reactive behavior towards existing disciplinary field structures. Scholars focus on contributing to the discourses of their own discipline. One scholar states:

Even if (...) findings from psychology, educational science, sociology, economics and sometimes even from political science are theoretically important for my work, I cannot speak in these five disciplines. And that's why the strategy is more: I take care of the sociology, bring in my perspective there, and also represent it as one of the perspectives in this field. (I15: 8)

Research problems are derived from disciplinary discourses. Theories and methods are selected from the familiar disciplinary canon. Interdisciplinarity is understood as multidisciplinary, i.e. a coexistence of scholars from different disciplines within a certain institutional context rather than as concrete integration of different knowledge stocks.

Interdisciplinarity is a way to engage in a dialogue with society, to point out the complexity and different perspectives on phenomena, that there is an economic view on the field, that there is a social scientific view on this field, perhaps that there is a health scientific or psychological view on this field and that perhaps there is also a democratic theoretical discourse on this topic. (...) But science and the struggle for knowledge work on a different principle. (I3: 66)

In a narrow understanding, this strategy implies that tensions were dissolved by a clear focus on disciplinary structures. The existence of interdisciplinary institutions and projects just provides opportunities to get inspiration and new perspectives.

### Context

Disciplinary innovation is employed by established senior scholars (mostly professors). Often, they hold several leadership positions in different scientific institutions. These scholars have exclusively experienced their academic socialization in the German chair-based system. They consider the predominant disciplinary structure of the sciences that is reflected in the German higher education system as highly important. One scholar states:

I (...) believe that the idea, "We are opening our own field now, (...), from any elements of other fields" does not quite fit to the architecture of the science system, where everything is based on peer review. And we have, so to speak, the highest quality standards. The peer review system achieves its highest quality standards in the core discipline, yes. There is no interdisciplinary audience that has the same quality standards. (I25: 12)

An intensive engagement with knowledge stocks of other disciplines is not regarded as a rational strategy. Scholars point out that the mastery in one discipline is the key to reach success. Interdisciplinary research is viewed as more immature compared to disciplinary research and, accordingly, of less value:

In my opinion, interdisciplinarity (...) is not the way to achieve innovation and find more holistic explanations. You actually get the worst of all disciplines. You have such a weird mix somehow. You cannot do anything right. (...) It is the mediocrity in all disciplines because you cannot manage to stay up to date in a single discipline. (I15: 10)

The institutionalization of interdisciplinary study programs is considered inferior to disciplinary courses. One scholar elaborates on the establishment of gender studies courses as follows: 'When it comes to a course of studies, (...) research-oriented study programs, (...) then I think it makes no sense. I'm also not sure what you're actually doing with a degree program in gender studies, honestly' (I15: 14).

Scholars are firmly convinced of the functionality of the disciplinary structures and pass on this orientation to the young researchers they supervise. A scholar in a leadership role states: 'We're not trying to turn sociologists into pseudo-interdisciplinary researchers. So, we have four disciplines – psychology, educational science, sociology and economics. And the scholars should each be experts in their disciplines (...)' (I15: 8). Scholars applying disciplinary innovation define their professional identity through their disciplinary affiliation. A scholar states: 'I am a dedicated sociologist and correct that too, if people call me economist or something (...)' (I3:11) and continues 'If you work as a social scientist at an institute where you (...) have to deal primarily with economists, there is a danger of bastardization (...)' (I3:11). Another scholar states in a similar vein: 'I am an economist, very clearly, first. Well, I would not say I'm a behavioral economist. I am principally an economist' (I25: 8).

Beside research activities, scholars employing disciplinary innovation focus on reproducing the structures of the scientific field. They serve as editors of journals and members of professional associations.

## **Strategic compliance**

### **Definition**

Scholars engage with unfamiliar disciplines knowledge stocks and go through creative processes that are triggered by this engagement. However, when monodisciplinary demands become imposed on their interdisciplinary research approaches, they adapt their research to these demands.

### **Description**

Scholars applying strategic compliance report being motivated in solving certain problems without any fixation on one theoretical or methodological canon. Although one's own discipline or an occupation held prior to the academic career path forms the basis for solving problems, there is a high openness toward the perspectives and knowledge of other disciplines. The openness manifests itself in the appropriation of unfamiliar knowledge stocks, conference visits or the search for and/or the establishment of scientific networks. One scholar elaborates on the motivation for her proactive engagement with ethnology and anthropology perspectives stating: 'The debate (...) is advanced – but only in this subfield. In my main peer group or mainstream or whatever, that's not recognized' (I6: 23). She describes her proactive behavior against this background as follows:

Last year I was sitting with my ethnologist friends in Paris for two months. It was about the development of the global health field. So, where that (global health, her scientific field) is really researched up and down is anthropology. And they just do it differently. You have to understand at some point, how they actually think. Why is it relevant to me now? Why not? But really great, really great research. (I6: 80)

The same scholar refers to this openness by framing it as a problem and stating: 'I'm always ready (...) to let me point in some direction (...) and that's what I find terribly exciting then' (I6: 46). However, strategic compliance is characterized by an alignment of research designs and publications. A reflection on the publication culture in an interdisciplinary project reveals strategic compliance:

I spent a lot of time with this article thinking about what journal I can send it to, so that it fits on my CV for my career. But not only that, also cognitively ... So what debate am I picking up on from those I have on the screen? And that took a long time. So now the article is under revision in a journal from my discipline. I finally got myself back in line (...). (I6: 17)

In this case, the perceived requirements of the disciplinary journal the scholar aims to publish in form the coordinates along which his research is aligned. Scholars employing strategic compliance chose the research path that promises the highest benefit for individual career goals. Although active engagement with knowledge from other disciplines promotes creativity, the home discipline determines the direction of research.

## Context

Strategic compliance is employed by junior scholars with fixed-term contracts, often on a project basis, pursuing career goal – a doctorate, habilitation or appointment to a professorship. The dependency relationship with senior scholars is often referred to as the reason for strategic behavior.

This relationship exists, on the one hand, with the supervisor or head of the organizational unit in which they are based, and with the scientific field, namely with those scholars who evaluate their performance. One scholar states: ‘I think that’s really a problem (...) what journals you now publish in so that it’s somehow crucial to your career. (If you) have an eye on a chair of psychology, but only published in sociology a journal, that’s just problematic’ (I14: 142). Another scholar describes his behavior as follows:

At some point you have to decide: where do I want to publish? (...) It makes sense, I think, as a young researcher, when you first have a core discipline, yes, where you know, okay, I now identify with it, I also want to publish here, (...) I play according to these rules the game. (I2: 14)

The scholar continues stating ‘I think you have to think in terms of opportunity costs’ (I2: 16). The perceived scientific career structures and assessment patterns prevent the ‘reasonable’ scholar from exploiting the interdisciplinary ideas in their pure form. Often there is an awareness of the issues and causes of strategic behaviors, and scholars report that they are not satisfied with these circumstances. Limited resources and a lack of time due to career goals are stated as reasons for the passivity to the field structures.

## Niche-seeking

### Definition

Scholars go through creative processes that are triggered by interdisciplinary settings and integrate a particular unfamiliar disciplines knowledge stock. When monodisciplinary demands become imposed on their interdisciplinary research approaches they search for alternative opportunities to realize their interdisciplinary research focus without adhering to these demands.

### Description

Scholars applying niche-seeking are characterized by a strong interest in the integration of unfamiliar knowledge. They are adventurous in the pursuit of their research interests. If the obvious structures of the scientific field do not initially provide opportunities, scholars employ niche-seeking for finding new ways. A scholar with a strict interdisciplinary focus on business and art describes his choice of career decisions as follows:

(Small private university X) was (...) a very experimental environment. When I said to them at the beginning, ‘So when I come, then, as far as my research is concerned, I will do this business-and-art thing.’ They said, ‘Yes, great, great, yes, fine.’ (...) So in that sense, several career decisions have always been that I somehow had a relatively clear idea of what I wanted and made the others compatible with it. (I1: 6)

Scholars do not take the perceived demands of the scientific field into account when following their preferred research path. A post-doctoral scholar reflects on his career as follows:

Around the end of the PhD I figured out that it’s going to be like that for a very long time if I don’t do something about it. So I had to specialize at some point. (...) But I did not really want to specialize. I found it kind of a bit boring. So there was this other option which is: Accept it and play with it really and say, ‘Okay, I am an interdisciplinary researcher.’ (I30: 60)

The strategy follows the logic of avoiding competition. A scholar describes the advantages of this strategy as follows:

Of course, there is a niche advantage, a specialization advantage. You have a field that you do not have to share with too many actors. Of course, from both directions you have a certain field of your own. This is of course interesting if you think of creating your own research profile. (I29: 28)

Niche-seeking scholars publish special issues in journals or establish groups of interested scholars. Once they have created their niche, they stick to it during their career.

### **Context**

Scholars who apply niche-seeking hold a professorship or post-doc position in a small scientific field. They are relatively independent and therefore their actions are not significantly influenced by career goals and resource or time constraints. Scholars who apply niche-seeking are not strongly involved in professional organizations or committees. They are not engaged in costly, proactive engagement to transform field structures. Their activities rather aim to bring about intellectual self-realization. Scholars applying niche-seeking employ their subject-specific networks, which provide them possibilities to realize their own research focus. However, these new niche topics are not (yet) relevant enough to attract a broader community. Still, niches can be the starting point of new fields.

Scholars applying niche-seeking have experienced a crucial part of their academic socialization in the Anglo-saxon system. This phase was decisive for the choice of their interdisciplinary research focus and is positively associated and accordingly described as memorable.

### **Field-creation**

#### **Definition**

Scholars engage with the integration of other disciplines knowledge stocks 'out of interest, enjoyment, or a personal sense of challenge' (Amabile 2013, 134); they go through creative processes that are triggered by this engagement. They integrate knowledge stocks of several disciplines. When monodisciplinary demands become imposed on their interdisciplinary research approaches they generate new structures that provide the opportunity to realize interdisciplinary research.

#### **Description**

The starting point of field creation is the researchers own discipline and familiar epistemological view. Thus, there is a great epistemological flexibility with regard to the research projects. Compared to niche-seeking field creation implies a greater openness towards unfamiliar knowledge. Scholars are interested in integrating different disciplines; they are not restricted to a limited set of disciplinary approaches for scientific problem-solving. The selection of possible theories and methods is purpose-oriented. A scholar states:

I think Open Government Data is a nice example. So: How do we manage to provide public data? This was initiated by the Federal Ministry but set up via the federal structures throughout Germany. And at the point it was not just about: How do I build a technical data infrastructure, a data portal? But: What do I need procedurally, regulatory, maybe even legally, to enable open administrative data? And yes, in the study we were just together with the University X. That's where the lawyers came from. Here, in our institute, we also have political scientists, communication scientists and then we technicians have tried, so to speak, to develop what is feasible from here. (I13: 31)

Scholars have usually developed a vision for a new scientific field during early stages of their career. Field creation is characterized by performing risk-intensive activities that aim at fostering new structures offering opportunities to pursue a certain focus. These activities may include, for example, building new cross-disciplinary networks, engagement in activities to obtain major grants for new institutes or taking on leadership positions in (new) journals and scientific associations in order to advance the institutionalization of interdisciplinary fields. A scholar who is engaged in research on digital transformation and building up structures for this field elaborates on his motivation stating: 'The topic – digital transformation – is so big that you can probably only really have the idea, you have the thing completely in front of the lens in a team with scholars of other disciplines' (I 10: 60). He elaborates on his field-creation stating:

A real long-term effect is only created when you build a network of scholars who work interdisciplinary at the institute and then get appointed as professors at universities across the country or even internationally and transfer what they have learned (...) from there. (...) Our institute has to contribute to this process. (I 10: 58)

### Context

Field creation is employed by established senior scientists as well as by post-doc scholars. Often, they hold a professorship and several leadership positions in different scientific institutions.

Scholars employing field creation have experienced a crucial part of their academic socialization in the Anglo-American higher science systems. This phase is often described as very memorable and inspiring. In several cases, the experiences abroad shape their commitment towards field creation. The organization of the institutions in the Anglo-American systems is perceived as a role model for the institutional framework. One scholar, for example, described with great enthusiasm the experimental and innovative organizational structure of a world-renowned research institution in the United States (I11: 66).

What is decisive for the commitment of these scholars are perceived deficits of the current conditions within the system. One scholar refers to her motivation stating that it is important 'to break new ground. And new territory can be found in between disciplines' (I13: 154). This particular interdisciplinary field is thus regarded as highly relevant for both actors inside and outside the sciences.

Table 1 summarizes the strategies of main characteristics.

### Discussion and conclusion

Research centers all across the globe are committed to promote interdisciplinary knowledge production. They facilitate interdisciplinary research by providing contextual precursors. However, research on interdisciplinary knowledge production indicates a tension between the motivation of scholars working in these centers and monodisciplinary field-level demands that become enforced through peer-review procedures. Against the background of these findings current studies point to an urgent need for understanding micro-level implications of tensions between interdisciplinary research agendas and monodisciplinary expectations. In our article, we thus asked how scholars in interdisciplinary research centers cope with these tensions. After describing our conceptual background, our research context, our empirical material, our qualitative content analysis methods and our analytical framework, we introduced four strategies scholars use to cope with cognitive and field-level barriers of interdisciplinary research – Disciplinary Innovation, Strategic Compliance, Niche-seeking, and Field-creation – as the main result of our qualitative study.

**Table 1.** Coping strategies and its main characteristics.

	Disciplinary Innovation	Strategic Compliance	Niche-seeking	Field-creation
Behavior towards monodisciplinary demands	Reactive	Reactive	Proactive	Proactive
Cognitive openness	Low	Medium	Medium	High
Career level	Senior	Junior	Junior & Senior	Senior
Motivation	Stabilize field position	Advance career position	Pursue intellectual adventurism	Become leader in field
Socialization	Exclusively in the German system	Partly in the Anglosaxon system	Partly in the Anglosaxon system	Partly in the Anglosaxon system
Orientation	Community	Individual	Individual	Community
Success factors	Networking, advance disciplinary discourses	Create individual research profile	Create excitement for new ideas	Networking, legitimize new knowledge, obtain funding
Career perspective	Secure	Unsecure	Unsecure & Secure	Secure

Each of the strategies we identified is characterized by a different degree of openness to knowledge bases of unfamiliar disciplines and a different degree of proactivity towards monodisciplinary field level demands. One large proportion of scholars we interviewed report to apply a strategy – Disciplinary Innovation – that is characterized by no inclusion of unfamiliar disciplines knowledge stocks. Another large proportion report engaging proactively with knowledge bases of unfamiliar disciplines but often not conducting interdisciplinary research for strategic reasons (Strategic Compliance). A small number of our interviewees strategically resist monodisciplinary demands in order to realize interdisciplinary research (Niche-seeking; Field-creation). Taken together, our findings illuminate how interdisciplinary research agendas become directed in a monodisciplinary direction by demands from the scientific field. The results shed light on mechanisms that cause a discrepancy between the goals and missions formulated on the ‘front-stage’ of interdisciplinary research centers and scholarly behavior on their ‘back-stage.’

Douglas North (1997) argues there are always people committed to preserving existing institutional structures, as these promote their individual welfare and provide them with high benefits (Wetzell 2005). In case of disciplinary innovation this explanation seems plausible given that scholars applying it – all senior scholars at the professor level – have experienced a strict disciplinary socialization. Interdisciplinary missions and structures might be perceived as a threat to the dominance of those paths that have helped them to succeed and foster their current status. Resource-based barriers and career status act as regulative factors among scholars complying strategically. They are framed by the strong monodisciplinary field-level structures and seem to have the impression of not being able resist or change the demands of these structures. Scientists applying niche-seeking do not accept or invest high costs to influence the structures of the scientific field proactively. Their focus is more on self-realization and on pursuing own scientific interests than on a commitment whose added value goes beyond own scientific benefits. The familiar combination of practices, resources or rules creates synergy effects and provides resources. Thus, it becomes attractive to take advantage of these synergies (Leonard-Barton 1995; Sydow, Schreyögg, and Koch 2009). Field-creation is the only strategy that is path-breaking, i.e. characterized by the goal of ‘the effective restoration of a choice situation – the insertion of at least one alternative course of action’ (Sydow, Schreyögg, and Koch 2009, 14). Scholars applying this strategy ‘set path creation processes in motion in real time. Specifically, they attempt to shape institutional social and technical facets (...)’ (Garud and Karnøe 2001, 7) of the scientific field. Shaping institutional structures of the scientific field provides new resources and positions as ‘leader in the field.’ Due to their career status, career ambitions and resource-based barriers do not act as regulative factors among these scholars.

Our results are exploratory in nature. Based on our study design, the article shows common limitations of qualitative research approaches. We used the dominant strategies captured in the narratives of our interviewees as an anchor for our typology. In a quantitative survey or an experimental study, the strategies could be operationalized and compared systematically, in particular with regard to their interdependencies. For exploratory reasons, we have refrained from including factors such as the implications of disciplinary specifics and the detailed research process in our analysis. Due to our qualitative small N design we are not able to make reliable statements regarding disciplinary-dependent propensities to apply a specific strategy. It should be noted that we conducted our study in social science institutes. Including other disciplines in further studies promises further important insights on the subject of our study. Our results suggest that propensities to conduct interdisciplinary research are especially influenced by three structural factors: the type of study programs scholars were graduated in, the higher education system scholars were socialized in, and the career-level. Further studies with a quantitative focus could investigate the influence and the interdependence of these three structural factors and the role of disciplinary-dependent propensities to conduct interdisciplinary research. In particular, with regard to the different employment structures, future studies could conduct an international institutional comparison in order to investigate path dependencies and context factors of coping strategies in more detail. Due to the fact that

interdisciplinary research tends to be suitable for other than traditional research outcomes, further studies could also explore how barriers from the scientific field and the four strategies relate to these outcomes. In addition, the question arises as to how barriers to interdisciplinary research can be overcome. Our results suggest that dependencies from senior scholars with monodisciplinary research foci and the structure of academic career paths are the central factors that prevent scholars from conducting interdisciplinary research. These factors should thus be regarded as relevant variables when it comes to the development of mitigating strategies. There are several possibilities to mitigate challenges of interdisciplinary research, for example, interdisciplinary-specific supervisor agreements, or the incorporation of specific interdisciplinary criteria into tenure evaluations and research assessments in general. However, our findings illustrate that the main barriers interdisciplinary researchers have to cope with are resulting from structural challenges in the academic field. These challenges have to be addressed on a macro-level in order to achieve a permanent improvement of the conditions for interdisciplinary research. Our results suggest that beside these structural factors personality traits such as risk aversion influence openness and behavior towards monodisciplinary demands. Further studies could also investigate these aspects.

Finally, we don't make a normative plea that only certain strategies should be pursued. Coexistence of different strategies can certainly be useful to the science system and promote its diversity. However, whether an optimal proportion between the strategies can be guaranteed, what this optimal balance should look like and how to ensure that scholars can fully realize interdisciplinary potential is an important subject for further research.

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