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Competencies for Digital Transformation:

Predictors of Proactive and Innovative Work Behaviors

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List of abbreviations

CAPS   Cognitive-Affective Personality System

CAU   Cognitive Affective Unit

cf.   confer

CFA   Confirmatory Factor Analysis

DZHW   German Centre for Higher Education Research and Science Studies

e.g.   exempli gratia

et al.   et alii

fsQCA   fuzzy-set Qualitative Comparative Analysis

i.e.   id est

IHF   Bavarian State Institute for Higher Education Research and Planning

IWB   Innovative Work Behaviors

OLS   Ordinary Least Square

PSD   Proactive Skill Development

QCA   Qualitative Comparative Analysis

VIF   Variance Inflation Factor

Abstract

The present three quantitative studies enhance theoretical and empirical evidence on the roles of individuals' cognitive resources and contextual factors for employees' engagement in proactive skill development, paradoxical work activities and innovative work behaviors. These career and work behaviors gain relevance in organizations and for individual members of the workforce over the years, especially as digitalization (e.g., advances in machine learning, artificial intelligence, the automation of job tasks and related hardware improvements) has changed the ways of working and doing business.

Study 1 extends research on proactive skill development by proposing and empirically examining how extra-organizational contexts influence this proactive career behavior. Building on the Cognitive Affective Personality System theory, this study found that digitalization (specifically, industry digital maturity) drives employees' proactive skill development via employees' interpretations of this phenomenon as controllable or an opportunity for their organization. In contrast, interpretation of digitalization as a threat for their organization does not function as a mechanism in this relationship.

Study 2 extends research on individuals' engagement in paradoxical work activities by proposing diversity of professional experience as an individual-level antecedent of employees' engagement in individual ambidexterity (i.e., the pursuit of both innovation- and efficiency-oriented work activities within a certain time span). Empirical results from multivariate regressions and fuzzy-set qualitative comparative analyses indicated that country and industry variety, not firm variety, as drivers of this work behavior. Hence, this study suggests that complex changes, rather than narrow changes, of work contexts facilitate individuals' cognitive resources for engaging in paradoxical work activities.

Study 3 defines and examines educational breadth and educational depth as predictors of early career professionals' innovative work behaviors (i.e., idea generation, dissemination

and implementation). Drawing from a cognitive entrenchment perspective and earlier research on knowledge structures as determinants of innovative behavior, this study argues that educational breadth and educational depth reflect early career professionals' knowledge-related resources for behavior more adequately than the previously established concepts knowledge breadth and knowledge depth. Subsequent data analyses from a configurational perspective find that combinations of educational breadth and educational depth and particular team climates are associated with frequent idea generation. Remarkably, the analyzed data did neither indicate any combinations of the four factors associated with frequent idea dissemination or idea implementation, nor any independent effects of educational breadth and educational depth nor their interactions with team exploration and team exploitation climate on these behaviors.

In total, these three empirical studies address particular research interests within literatures on skill development, paradoxical work activities and innovative behaviors, hence, research on future-oriented micro-organizational career and work behaviors. Their results from three surveys totaling about 4,000 participants add to previous researches on the three future-oriented micro-organizational behaviors. Specifically, they expand the established set of predictor variables, herein offering links to previous unrelated research streams. From a methodological perspective, they support calls for data analyses that complement net-effect and configurational approaches.

Moreover, these three studies offer practical guidance for innovation and human resources managers who aim at recruiting and developing employees who proactively update their skills and are able to drive innovations (e.g., employees with diverse professional experience or educational depth). They also inform human resources and innovation managers about the particular kinds of intra-organizational work contexts that foster these behaviors (e.g., contexts in which extra-organizational phenomena are positively perceived and team exploration climate). Likewise, these present studies indicate to early career professionals

particular kinds of work contexts, professional experience and knowledge from higher education that should support the future-oriented and self-directed career and work behaviors that are currently often demanded.

Kurzfassung (German abstract)

Die drei quantitativen Studien in dieser Arbeit erweitern die Forschung zu kognitiven und kontextuellen Prädiktoren dafür, dass Erwerbstätige proaktiv lernen (Kompetenzen erwerben), sich mit paradoxen Arbeitsanforderungen auseinander setzen und Innovationen in Organisationen voran bringen. Diese Karriere- und Arbeitsverhalten sind in den letzten Jahren zunehmend wichtig geworden, insbesondere weil die Digitalisierung (z.B. Fortschritte in maschinellem Lernen, künstlicher Intelligenz, Automatisierungsprozessen und der dafür erforderlichen Hardware) viele Produktions- und Dienstleistungsprozesse und schließlich auch viele Arbeitstätigkeiten stark verändert.

Die erste Studie in dieser Dissertation ergänzt die bisherige Forschung zu proaktivem Lernen von Erwerbstätigen, indem sie aus der Theorie zum kognitiv-affektiven Persönlichkeitssystem („Cognitive Affective Personality System theory") herleitet, wie Entwicklungen im außerorganisationalen Umfeld dieses proaktive Karriereverhalten beeinflussen. Das zentrale Ergebnis dieser Studie ist ein indirekter Effekt von dem Digitalisierungsgrad einer Branche auf das proaktive Lernen von Erwerbstätigen über deren Wahrnehmung der Digitalisierung als kontrollierbar oder als Chance für das Unternehmen oder die Organisation, in der sie arbeiten. Anders als vermutet, scheint es keinen indirekten Effekt vom Digitalisierungsgrad einer Branche auf das proaktive Lernen von Erwerbstätigen über deren Wahrnehmung von Digitalisierung als Bedrohung zu geben.

Die zweite Studie erweitert Forschung zu den Prädiktoren dafür, dass sich Erwerbstätige mit paradoxen Arbeitsanforderungen auseinander setzen. Konkret untersucht diese Studie den Zusammenhang zwischen der Diversität in der Karriere einer Person und deren ambidextrem Arbeitsverhalten (dieses Verhalten beschreibt, dass eine Person sowohl innovativ-explorierend als auch routiniert-effizient in einer gewissen Zeitspanne arbeitet und sich in diesem Sinn mit paradoxen Arbeitsanforderungen auseinander setzt). Ergebnisse aus

multivarianten Regressionen deuten darauf hin, dass Berufserfahrungen in verschiedenen Ländern und Branchen ambidextres Arbeitsverhalten unterstützen. Berufserfahrungen in verschiedenen Unternehmen zeigen hingegen keinen Zusammenhang mit ambidextrem Arbeitsverhalten. So legt diese Studie nahe, dass eher komplexe als einfache Wechsel beruflicher Kontexte den Umgang mit paradoxen Arbeitsanforderungen stärken.

Die dritte Studie definiert und untersucht die disziplinäre Breite (Vielfalt) und die disziplinäre Tiefe (Spezialisierung) von Hochschulbildung sowie zwei Teamklima als Determinanten innovativer Arbeitsverhalten (Ideen entwickeln, verbreiten und umsetzen) von Berufsanfängerinnen und -anfängern. Dabei bezieht sich diese Studie auf eine Theorie (die „Cognitive Entrenchment Perspective") und bisherige empirische Evidenz zum Zusammenhang zwischen kognitiven Strukturen und der Innovativität von Individuen. In multivariaten Regressionsanalysen zeigten sich keine unabhängigen Effekte von der disziplinären Breite und Tiefe von Hochschulbildung auf die drei untersuchten Arbeitsverhalten. Analysen von Konfigurationen aus diesen Faktoren („configurational analyses") legen jedoch nahe, dass disziplinären Breite und Tiefe von Hochschulbildung dazu beitragen können, dass Berufsanfängerinnen und -anfänger häufig Ideen generieren, wenn sie mit bestimmten Teamklima kombiniert werden. Es wurde keine Kombination aus diesen vier Faktoren gefunden, die mit einem häufigen Verbreiten oder Umsetzen von Ideen assoziiert ist.

Letztendlich adressieren diese drei empirischen Studien bestimmte Forschungsinteressen in den Bereichen Lernverhalten Erwerbstätiger, Erfüllung paradoxer Arbeitsanforderungen und innovative Arbeitsverhalten, also in der Forschung zu zukunftsorientierten mikroorganisationalen Karriere- und Arbeitsverhalten. Die Ergebnisse der vorliegenden Studien basieren auf Onlinebefragungen mit jeweils rund 1.000 Teilnehmenden. Sie erweitern die Listen zuvor erforschter Prädiktoren in ihren jeweiligen Forschungsbereichen und zeigen dadurch, welche Forschungsbereiche künftig stärker mit einander verbunden werden sollten. Aus methodischer Perspektive unterstützen die

vorliegenden Ergebnisse Hinweise darauf, dass sich vollständigere empirische Evidenz erzielen lässt, wenn Analysen zur Identifikation unabhängiger Effekte („net-effect approaches") mit Analysen zur Identifikation von Kombinationen aus Faktoren („configurational approaches") komplementiert werden.

Diese Studien enthalten Handlungsempfehlungen für Innovations- und Personalmanager. Diese erfahren Merkmale von Erwerbstätigen, die mit recht hoher Wahrscheinlichkeit proaktiv Lernen, paradoxe Arbeitsanforderungen erfüllen und Innovationen in Organisationen voranbringen. Die in dieser Arbeit identifizierten Merkmale von Berufsanfängerinnen und -anfängern sind Berufserfahrung in verschiedenen Kontexten sowie die disziplinäre Breite und Tiefe ihrer Hochschulbildung. Diese Merkmale können Innovations- und Personalmanager bei der Personalauswahl- und -entwicklung berücksichtigen. Auch erhalten Innovations- und Personalmanager empirische Evidenz dafür, dass sie proaktives Lernen unterstützen können, indem sie dafür sorgen, dass Phänomene außerhalb ihres Unternehmens oder ihrer Organisation bei ihren Mitarbeitenden als positiv wahrgenommen und innovative Arbeitsweisen von Arbeitsteams wertgeschätzt werden. Dementsprechend erfahren Berufsanfängerinnen und -anfänger aus dieser Dissertation, welche Arbeitskontexte, Typen von Berufserfahrung und Hochschulbildung Arbeitsweisen fördern, die in der gegenwärtigen Arbeitswelt, insbesondere im Kontext der Digitalisierung, oft gefordert sind.

1 Introduction

In the 21st century, competencies, work and career behaviors that foster learning and innovation within organizations have become crucial for organizations and thus, employees' individual career success. One important reason for this is that organizations in all sectors need to adapt in their ways of value creation, working and doing business in view of the ongoing digitalization (i.e., the adoption and use of digital technologies, big data analytics and artificial intelligence; Legner, Eymann, & Hess, 2017; Cascio & Montealegre, 2016; Welpe, Brosi, & Schwarzmüller, 2018). Specifically, digitalization challenges and changes organizations' core product-related knowledge and raises societies' demands for highly individualized services (Loebbecke & Picot, 2015; Vial, 2019). Moreover, an increasing computerization of cognitive and manual job tasks changes the nature of occupations and skill demands across industries and educational levels at a pace difficult to predict (Sousa & Rocha, 2019; for Germany, Dengler & Matthes, 2015; for the U.S., Frey & Osborne, 2017). Consequently, organizations have changed their human resources management such that employees need to manage their careers by themselves rather than rely on organizations' career-paths and human resources development activities (Direnzo & Greenhaus, 2011; Hall, Yip, & Doiron, 2018; Hirschi, 2018).

In view of these developments, especially individuals' proactive skill development (Wong & Fieseler, 2018) and innovative work behaviors have a great potential to support individuals' career achievements (Hirschi, 2018; Parker, Wang, & Liao, 2019) and organizations' success (e.g., Barsh, Capozzi, & Davidson, 2008; Birdi, Leach, & Magadley, 2012; Tellis, Prabhu, Chandy, 2009). To pursue these behaviors, employees will likely need to engage in paradoxical work activities (e.g., exploration and exploitation; Schad, Lewis, Raisch, & Smith, 2016).

This dissertation sets off to enhance the empirical understanding of the individual-level and contextual factors which support these three currently demanded work behaviors (Figure 1; Table 1). Considering that digitalization gains more momentum with the onset of the COVID-19 virus and subsequent governmental actions (especially longer-term social distancing actions), it is reasonable to argue that an enhanced empirical understanding of the factors that drive these three future-oriented career and work behaviors became important as never before. The next section motivates the research questions examined in this work.

Figure 1: Overview of the investigated concepts

Employees' cognitive resources
•Interpretations of macro-level phenomena
•Diversity of professional experiences
•Breadth and depth of institutionalized education

Intra-organizational factors
•Team exploration climate
•Team exploitation climate

Employees' career and work behaviors
• Proactive skill development
• Paradoxical work activities (namely, individual ambidexterity)
• Innovative work behaviors

Macro-level phenomena
•Digitalization (industry digital maturity)

Table 1: Key concepts and definitions

Concept	Definition	Examined in
Outcomes:		
Proactive skill development	"Individuals' self-initiated activities and interventions which result in the mastery of different tasks involved an occupation (Claes & Ruiz-Quintanilla, 1998)" (this work: 5).	Chapter 2
Engagement in paradoxical work activities (such as, individual ambidexterity)	*Engagement in paradoxical work activities* is defined as employees' involvement in "persistent contradiction between interdependent elements" (Schad et al., 2016: 10) *Individual ambidexterity* is individuals' "orientation toward combining exploration and exploitation related activities within a certain time" (Mom et al., 2009: 812).	Chapter 3
Innovative work behaviors	"Individuals' intentional creation, introduction and application of new ideas within a work role, a group or an organization" (Jannsen, 2000: 288), including *idea generation, idea dissemination* and *idea implementation* respectively.	Chapter 4
Predictors:		
Cognitive resources	*In this work, "cognitive resources" is referred to as individuals' cognitive elements that are able to explain differences in individuals' behavior, especially, interpretations of contextual phenomena, experience and knowledge (cf., Elby & Hammer, 2010; Mischel & Shoda, 1995).*	
Interpretations of macro-level factors as controllable, opportunities and threats	Individuals transform data into knowledge and understanding. To distinguish different interpretations, they frequently use the labels *controllable, opportunity* and *threat* (e.g., Thomas & McDaniel, 1990). In this study, these labels reflect individuals' feelings that their employer organization can effectively act upon, gain and lose through digitalization, respectively.	Chapter 2
Diversity of professional experience	The variety of professional experience an individual acquires throughout his or her career, which is operationalized as the numbers of different firms, industries and countries an employee has worked in during his or her career (i.e., *firm, industry* and *country variety* respectively; cf., Quiñones et al., 1995).	Chapter 3

Table 1 (continued): Key concepts and definitions

Concept	Definition	Examined in
Predictors (continued):		
Educational breadth and depth	The diversity (*breadth*) and comprehensiveness (*depth*) of knowledge individuals have developed during institutionalized education (in this study, higher education).	Chapter 4
Intra-organizational factors	*Factors in intra-organizational contexts*	
Team exploration climate	"[T]eam members' shared perceptions of the importance that innovation-related activities, such as the identification of new opportunities, have for their organization (Hirst, van Knippenberg, Zhou, Zhu, & Tsai, 2018)" (this work: 16).	Chapter 4
Team exploitation climate	"[T]eam members' shared perception of the value that efficiency- and reliability-related activities have for their organization (Hirst et al., 2018)" (this work: 16).	Chapter 4
Macro-level factors	*Factors in extra-organizational contexts*	
Digitalization (specifically, industry digital maturity)	*Digitalization* reflects the diverse "sociotechnical phenomena and processes of adopting and using [digital] technologies in broader individual, organizational, and societal contexts" (Legner et al., 2017: 301). "*Industry digital maturity* is the extent to which organizations within an industry implemented new processes, methods or tools in response to digital transformation (cf., Rammer et al., 2017)" (this work: 13).	Chapter 2

1.1 Research questions[1]

Proactive skill development is defined as individuals' self-initiated activities and interventions which result in the mastery of different tasks involved an occupation (Claes & Ruiz-Quintanilla, 1998). Prior research on this proactive career behavior largely focuses on the investigation of individual-level factors as predictors of proactive skill development, namely, personality traits, career-related attitudes, prior work experience and nationality (Claes & Ruiz-Quintanilla, 1998; Clements & Kamau, 2018; Pajic, Kiszler, Kismihóc, Mol, & Den Hartog, 2018; Ren & Chadee, 2017; Taber & Blankemeyer, 2015). Nonetheless, theory and empirical evidence suggests that contextual factors (e.g., job autonomy, supervision and team support) may also influence proactive behaviors (Parker et al., 2019). Yet, research on the role of context for proactive skill development is largely limited to intra-organizational factors.

However, research on relations between micro- and macro-level phenomena indicates that broader contextual factors influence individuals' behavior (Johns, 2018). For example, previous studies have shown that organizations' members interpret and respond to issues in the broader organizational context (Dutton, Walton, & Abrahamson, 1989), for instance, the emergence of e-commerce (Anderson & Nichols, 2007), climate change (Haney, 2017) and issues concerning the natural environment (Bansal, 2003).

Building on this literature, study 1 (Chapter 2) therefore seeks to enhance research on how macro-level factors influence employees' proactive skill development. Specifically, this study addresses this gap at the example of digitalization (operationalized as industry digital maturity), a macro-level phenomenon that presently influences work lives of most (if not all) employees (Cascio & Montealegre, 2016; Vial, 2019) and arguably needs additional empirical

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[1] This and the following sections in this chapter are partly based on chapters 2 to 4.

insights from scholars on organizational behaviors and careers. Hence, the first research question of this dissertation reads

> **RQ1.** *How do macro-level factors (specifically, industry digital maturity) translate into employees' proactive skill development via employees' interpretations of such macro-level factors? (Chapter 2)*

Perhaps, it is due to dynamic and ambiguous macro-level developments, such as digitalization, that paradoxes become more salient in contemporary organizations (Schad et al., 2016). Examples of paradoxes that employees meet are the demands for working efficiently and innovatively or for learning and performing (Schad et al., 2016). *Engagement in paradoxical work behaviors* may be described as switching between different work activities to manage "persistent contradiction[s] between interdependent elements" (Schad et al., 2016: 10). Yet, relatively few management studies examine the factors that help individuals to engage in paradoxical activities and most of them focus on leaders (Schad et al., 2016). Among the factors that have been found are cognitive and behavioral capabilities (namely, paradoxical thinking, reflexivity, behavioral complexity; Schad et al., 2016). Hence, it seems plausible that employees' engagement in paradoxical work behaviors depends, inter alia, on their cognitive resources (in this work, a multi-faceted concept which involves diverse cognitive attributes that enable behavior, e.g., interpretations of contextual phenomena, experience and knowledge; cf., Elby & Hammer, 2010; Mischel & Shoda, 1995).

However, empirical evidence of what individuals can do to enable them to pursue paradoxical job tasks and the criteria that organizations can apply to identify employees who fulfill this work demand is limited. To address this research gap, study 2 (Chapter 3) builds on theoretical and empirical evidence on the role of past experience for cognitive framing and subsequent behavior (Karhu & Ritala, 2020; Walsh, 1995). This study contributes to paradox research by theorizing and empirically examining the diversity of professional experience as

antecedent for employees' contradictory work activities, distinguishing three types of professional experience by their level of specificity (i.e., complexity) (Quiñones, Ford, & Teachout, 1995). From a methodological perspective, this study suggests the use and discussion of both a net-effect and a configurational perspective as a fruitful analytic approach for paradox research. The second research question in this work reads

> **RQ2.** *What links exist between the diversity of professional experience and employees'*
>
> *paradoxical work activities? (Chapter 3)*

As outlined in the previous paragraph, contemporary organizations need employees who support organizational innovation (e.g., Carnevale, Huang, Crede, Harms, Uhl-Bien, 2019; Anderson, Potočnik, & Zhou, 2014). *Innovative work behaviors* involve individuals' intentional activities for creating, introducing and applying useful new ideas within work roles, groups or organizations (Janssen, 2000). On the one hand, research has revealed that inner-organizational contextual factors such as leadership, team climates and job design (e.g., autonomy, job complexity and work demands) influence individuals' innovative work behaviors (Anderson et al., 2014; Carnevale et al., 2019; Hammond, Neff, Farr, Schwall, & Zhao, 2011; Ng & Feldman, 2013; Standing, Larsen, Fulford, & Gengatharen, 2016). On the other hand, theoretical and empirical evidence show that a variety of individual-level factors (e.g., different types of personality, motivation, educational level and age) support innovative work behaviors (Anderson et al., 2014; Hammond et al., 2011; Ng & Feldman, 2013; Standing et al., 2016).

However, the understanding of individuals' knowledge structures, particularly those developed through institutionalized education, as drivers of innovative work behaviors is still insufficient. This is unfortunate, considering that theories are proposing combinations of distinct knowledge elements as important cognitive resources for individuals' innovative abilities (especially creativity; Dane, 2010). Also, a related stream of research found that

knowledge breadth and depth (operationalized as professional experience) influence innovative work *performance* (operationalized mostly as numbers of published research papers and patent publications; Boh, Evaristo, & Ouderkirk, 2014; Mannucci & Yong, 2018; Wang, Lin, Yan, & Cui, 2017).

Study 3 contributes to closing the research gap on the roles of broad and deep institutionalized education for innovative work behaviors. To this end, it focuses on early career professionals, namely, higher education graduates. That is because innovation is an expected graduate outcome (Martín, Potočnik, & Fras, 2017) which contributes to organizational success (Anderson et al., 2014) and is associated with higher incomes (Paul, 2011). Moreover, higher education institutions tend to set up more multi-disciplinary study programs (Lyall, Meagher, Bandola, & Kettler, 2015) as put forward by several higher education scholars (e.g., Bardecki, 2015; Davies & Devlin, 2010; Nichols, 2017; Terjesen & Politis, 2015). Therefore, the third research question of this work is

> *RQ3a. What relations exist between the disciplinary breadth and depth of institutionalized education and early career professionals' innovative work behaviors? (Chapter 4)*

As mentioned, previous investigations on determinants of innovative work behaviors (Anderson et al., 2014; Hammond et al., 2011; Standing et al., 2016) suggest that work contexts may condition the link between employees' knowledge structures and their innovative work behavior. Changeable context factors such as team climates are of particular research interest in this regard (van Knippenberg & Hirst, 2015). Hence, study 3 additionally examines what joint relations between the disciplinary breadth and depth of institutionalized education and team climates are associated with employees' innovative work behaviors. The final research question reads

RQ3b. What joint associations between the disciplinary breadth and depth of institutionalized education, team climates and early career professionals' innovative work behaviors do exist? (Chapter 4)

In sum, this dissertation examines the drivers of three individual-level career and work behaviors which share the characteristics of self-direction and future-orientation. Theories on the link between individuals' cognitive resources and behavior (Dane, 2010; Heslin, Keating, & Minbashian, 2019; Smith & Lewis, 2011; Walsh, 1995) guide the empirical investigations of the research questions in this work.

The remainder of this chapter includes, firstly, a description of the theoretical background (chapter 1.2), secondly, an outline of data requirements, the data and the analytical methods used in this work (chapter 1.3) and, finally, the main findings and the remaining structure of this dissertation (chapter 1.4).

1.2 Theory

This subchapter presents the three main theoretical frameworks that underlie the hypotheses developed and tested in this dissertation. These are Cognitive-Affective Personality System (CAPS) theory (Heslin et al., 2019), paradox theory (Smith & Lewis, 2011) and theory on cognitive flexibility and entrenchment (Dane, 2010).

1.2.1 Cognitive-Affective Personality System (CAPS) theory

The CAPS theory, as developed by Mischel and Shoda (1995), takes a situated view of a person. It seeks to explain the variability of human behavior across situations by theorizing when and why particular situations within and outside individuals activate individuals' cognitions and affects (Mischel & Schoda, 2010). Around the 1970s, CAPS theory's proposition that humans do not behave consistently across situations and still have a stable underlying system was new to the scientific community and contradictory to the traditional

trait activation theory (Mischel, 1973; Mischel & Shoda, 2010). Specifically, CAPS theory proposes that situational cues, personality traits and the interaction between situational cues and personality traits activate particular *cognitive affective units*. These cognitive affective units can be described as perceptions and anticipated results of perceptions. They are differentiated in encodings, expectancies and beliefs, affects, goals and values, self-regulatory plans and competencies (Mischel & Shoda, 1995). CAPS theory further proposes that activated cognitive affective units influence human behavior (Mischel & Shoda, 1995).

Heslin and co-authors (2019) develop this theory with regards to subjective and objective career outcomes, including career-enabling behaviors such as skill development. Drawing from these authors' proposals (Heslin et al., 2019), study 1 (chapter 2) investigates how industries' digital maturity (situational cue) relates to employees' interpretations of the consequences digitalization might have on their employer organization (individuals' cognitive-affective units) and how proactive personality influences these relationships as a boundary condition. Further, this study examines how employees' interpretations of digitalization (individuals' cognitive-affective units) are linked to their proactive skill development (career-enabling behavior).

There are three key theoretical assumptions that underlie these proposed relationships. Firstly, employees' subjective interpretations of situational cues are critical for their career behaviors because they respond to them rather than to objective situational characteristics (Heslin et al., 2019). Secondly, in line with person-situation theory (Tett & Burnett, 2003), joint influences of personality and situational cues on behavior occur only if a situational cue is relevant for (i.e., thematically connected with) a personality trait (Heslin et al., 2019; Mischel & Shoda, 1995). Also, a situational cue has to be weak enough to allow personality traits to become salient through individuals' behavior, or else, leaves individuals with sufficient behavioral freedom (Heslin et al., 2019; Tett & Burnett, 2003). The third key

assumption of CAPS theory is that career outcomes are shaped by interrelated and recurring situational, personality and mindset dynamisms (Heslin et al., 2019).

1.2.2 Paradox theory

Paradox theory is a meta-theory on tensions within organizations and their management which has influenced management science in a variety of areas (Lewis & Smith, 2014). Today's understandings of 'paradoxes' root both in Eastern philosophies which suggest that paradoxes need to be embraced and transcended rather than resolved and in Western philosophies which argue that paradoxes can be solved (Schad et al., 2016).

Presently, scholars define a 'paradox' as a "persistent contradiction between interdependent elements" (Schad et al., 2016: 10). According to this definition, three attributes are essential to paradoxes, namely contradictions, interdependence and persistence. *Contradictions* emerge as oppositional elements that appear logical when considered separately but irrational, absurd and as a tug-of-war experience when considered at the same time (Lewis, 2000; Schad et al., 2016). Scholars' assumptions of *interdependence* vary from "ontologically inseparable" to "separable" but associated with feelings of wholeness, high effectiveness and creativity when regarded simultaneously (Schad et al., 2016). *Persistence* implies that paradoxes' core elements remain over time and that handling paradoxes involves constant shifts between these elements (Schad et al., 2016). Therefore, scholars assume that "coping with" and "working through" attitudes are more promising for engaging in paradoxes than emphasis on solutions, decisions and control (Lüscher & Lewis, 2008).

A 25-year review of paradox research revealed that paradoxes appear at multiple levels (e.g., in the field, organizations, teams and individuals) and that they can be classified as learning, organizing, belonging and performing types of paradoxes (Schad et al., 2016). This literature review (Schad et al., 2016) also reveals that that there is relatively few management research on the drivers of individuals' engagement in paradoxes and that this

research mostly focuses on leaders. Amongst the investigated individual-level capabilities for engaging in paradoxes are cognitive resources (e.g., paradoxical thinking, conceptualizing across temporal dimensions and integrative complexity) and behavioral resources (e.g., rhetorical skills, behavioral complexity and integration; Schad et al., 2016). Study 2 expands these findings by proposing diversity of professional experience as a proxy for individuals' cognitive capabilities and examining diversity of professional experience as a predictor of engagement in paradoxical work activities, namely, in both exploration and exploitation (i.e., individual ambidexterity, Mom, Frans, van den Bosch, & Volberda, 2009).

1.2.3 Cognitive entrenchment perspective

In theory, human knowledge is organized in different cognitive schemas which are characterized by comprehensiveness and diversity (e.g., Alexander, 2003; Dane, 2010). The cognitive entrenchment perspective proposes that different knowledge elements and flexible knowledge structures enable innovative behavior; whereas few knowledge elements and rigid knowledge structures tend to inhibit innovative behavior (Dane, 2010). Furthermore, this theoretical perspective proposes that individuals' interactions with their environment (e.g., social interactions) influence the kinds and extents of knowledge structures individuals develop. Particularly, person-situation interactions are proposed to make cognitive schemas more flexible or more rigid depending on whether they expand or address individuals' prior knowledge (Dane, 2010). Building on this theoretical perspective, study 3 investigates the singular and joint roles of the breadth and depth of knowledge early career professionals develop during higher education and team climates at work (Hirst, van Knippenberg, Zhou, Zhu, Tsai, 2018) for innovative work behaviors (Janssen, 2000). The following section presents the key concepts examined in this dissertation (their definitions are summarized in Table 1).

1.2.4 Key concepts

Study 1 (chapter 2) examines individuals' *proactive skill development* as the dependent variable. Proactive skill development is a form of proactive career behavior which involves the initiatives individuals take during organizational entry (Ashford & Black, 1996). Specifically, individuals who engage in proactive career behaviors act on their own initiative rather than adhere to prescriptions to enhance their career; they sculpture their career rather than react to opportunities; and they cause rather than accommodate to changes (Parker & Collins, 2010; Parker et al., 2019). As such, proactive skill development relates to the concept of *protean career behaviors* which describes that individuals change their jobs beyond traditional organizational career arrangements (Arthur, 2014; Claes & Ruiz-Quintanilla, 1998). Moreover, proactive skill development is considered as a facet of career initiative (Seibert, Kraimer, & Crant, 2001) and thus, is associated with the concept of *person-environment fit* (Parker & Collins, 2010). Concepts that are similar to but different from proactive skill development are *self-directed learning* and *autonomous learning* which focus on learning processes (Bell, 2017; Noe & Ellingson, 2017) rather than on self-starting, change- and future-oriented actions that characterize proactive skill development (Claes & Ruiz-Quintanilla, 1998).

To enhance the understanding of proactive skill development, study 1 examines industry digital maturity as predictor and employees' interpretations of the consequences digitalization might have on their employer organization as mechanisms. *Industry digital maturity* is the extent to which organizations within an industry implement new processes, methods or tools in response to digital transformation (cf., Rammer et al., 2017). *Employees' interpretations* of the consequences digitalization might have on their organization are conceptualized as *control, opportunity* and *threat* (cf., Jackson & Dutton, 1988; Dutton et al., 1989). These reflect individuals' feelings that organizations can effectively act upon digitalization, may gain and lose through digitalization, respectively. Research on humans'

interpretations of issues in their context revealed *control, opportunity* and *threat* as frequently used labels for these interpretations (e.g., Thomas & McDaniel, 1990; Sharma, 2000; George, Sitkin, & Barden, 2006; Haney, 2017). According to theoretical and empirical insights on individuals' issue interpretation processes, issue interpretations occur once a problem has been noticed and information on this problem have been gathered (Anderson & Nichols, 2007). At the end of this process, individuals take actions in response to their issue interpretations (Anderson & Nichols, 2007).

According to CAPS theory (Heslin et al., 2019), personality traits should constrain the link between context factors and individuals' interpretations thereof. Empirical evidence shows, for instance, that proactive personality moderates the relationship between job demands and control and learning-related outcomes (Parker & Sprigg, 1999). Therefore, study 1 additionally investigates individuals' *proactive personality* as a boundary condition in the link between industry digital maturity and individuals' interpretations of digitalization. Proactive personalities are characterized as individuals having a relatively stable disposition to scan their environment for opportunities and to initiate change without feeling limited by situational conditions (Bateman & Crant, 1993).

Study 2 (chapter 3) examines employees' engagement in paradoxical work activities using the example of *individual ambidexterity*. This concept describes that individuals combine exploration- and exploitation-related activities within a certain time span (Mom et al., 2009). Ambidexterity research is part of the organization theory literature which developed the integrative (rather than separate) approach to paradoxes named *contextual ambidexterity* (Gibson & Birkinshaw, 2004). This concept implies that organizational ambidexterity is achieved when individuals decide on their own how much time they spend on alignment- and adaption-oriented activities (Gibson & Birkinshaw, 2004). As such, individual ambidexterity is classified as a learning-type of paradox (Schad et al., 2016).

Prior research reveals several individual-level factors such as personality, personal orientations and motivation as drivers of individual ambidexterity (recently, e.g., Kauppila & Tempelaar, 2016; Keller, & Weibler, 2015; Sok, Sok, & De Luca, 2016). Moreover, research on individual ambidexterity recently began to investigate factors reflecting individuals' professional experience, namely, organizational and functional tenure, as predictors of individual ambidexterity (Mom, Fourné, Jansen, 2015). Following this research interest, study 2 examines *diversity of professional experience* as predictor of individual ambidexterity. As this concept is an amount-based measure for professional experience (cf., Quiñones et al., 1995), it differs from the previously examined time-based predictors of individual ambidexterity (Mom et al., 2015), As such, it arguably reflects the diversity of employees' work-related cognitive schemas (rather than the depth of particular experience as in the case of time-based measures). Especially, study 2 examines three dimensions of this concept, namely, *firm, industry* and *country variety*; *id est* the number of different firms, industries and countries employees have worked in during their career.

Study 3 (chapter 4) investigates cognition-related determinants of innovative work behaviors, namely, idea generation, idea dissemination and idea implementation. *Innovative work behaviors* reflect "individuals' intentional creation, introduction and application of new ideas within a work role, group or organization" (Jannsen, 2000: 288). Concerning the cognition-related determinants of innovative work behaviors, this study builds on the concepts of knowledge breadth and depth (Mannucci & Yong, 2018; Wang et al., 2017) to define and examine the concepts of *educational breadth* and *educational depth* as the disciplinary diversity and comprehensiveness of knowledge individuals have developed during institutionalized (higher) education. As prior theory (Dane, 2010; van Knippenberg & Hirst, 2015) and research (recently, Černe, Hernaus, Dysvik, & Škerlavaj, 2017; Zhu, Gardner, & Chen, 2016; for reviews see Hülsheger, Anderson, & Salgado, 2009; West & Sacramento, 2012) led to the assumption that educational breadth and depth interact with social context

factors in the prediction of innovative work behavior, study 3 also examines team exploration and team exploitation climate as boundary conditions of the link between educational breadth and depth and innovative work behaviors. *Team exploration climate* reflects team members' shared perceptions of the importance that innovation-related activities, such as the identification of new opportunities, have for their organization (Hirst, van Knippenberg, Zhou, Zhu, & Tsai, 2018). *Team exploitation climate* mirrors team members' shared perception of the value that efficiency- and reliability-related activities have for their organization (Hirst et al., 2018). Yet, these recently established team climates are known to interact with different types of individuals' self-efficacy in the prediction of individual creativity and job performance (Hirst et al., 2018).

The data and the research methods used in this dissertation are presented in the next section.

1.3 Data and research methods

This thesis applies a quantitative (rather than a qualitative) research approach, as the key concepts of this dissertation are clearly defined and reliably measurable (cf., Choy, 2014). The data analyzed in this thesis are mainly collected via large-scale online surveys. This is because large-scale survey data typically have a relatively high external validity and the resulting outcomes should have a relatively high comparability, generalizability and transferability (Choy, 2014; Queriós, Faria, & Almeida, 2017). To analyze these data, this thesis primarily uses net-effect approaches (namely, multivariate regressions; chapters 2 to 4) whose findings are, in part, complemented with configurational approaches (namely, fuzzy-set Qualitative Comparative Analyses, fsQCA; chapters 3 and 4).

1.3.1 Study design

For societies, it is important that scientists identify causal relations, namely, knowledge of whether and how a factor x influences an outcome y (Antonakis, Bendahan,

Jacquart, & Lalive, 2010). To identify causal relations, three conditions must be fulfilled. These are that

(1) y must follow x temporally,

(2) there must be a reliable correlation between x and y (beyond chance) and

(3) there must not be any other causes which explain the relation between x and y (Antonakis et al., 2010; Spector, 2019).

The second condition demands quantitative data which allow identifying statistically reliable relationships (Antonakis et al., 2010). Conditions number one and three may be addressed through study design and analysis. Specifically, to ensure (3) that the coefficient of x is interpretable (i.e., has a meaning), x must not be endogenous (Antonakis et al., 2010).

There are different study designs which allow meeting these three conditions, for instance, experiments and longitudinal survey studies (Antonakis et al., 2010). Large-scale surveys make an extent of generalizability, comparability and transferability possible which cannot be reached with experiments. Moreover, key predictor variables in these studies (especially diversity of professional experience and educational breadth and depth) are barely investigable by means of experiments. Therefore, large-scale surveys are conducted to collect the data needed to answer the research questions of this dissertation.

Surveys can be designed longitudinal or cross-sectional. Spector (2019) recommends cross-sectional instead of longitudinal study designs in five different situations of which three apply to these studies: In the first situation, it is unknown whether x and y covary as "a new variable in an old domain" (Spector, 2019: 133) is examined. This situation applies to all three studies. Specifically, in study 1 (chapter 2), industry digital maturity and individuals' interpretations of digitalization are new variables in the domain *proactive skill development*. In study 2 (chapter 3), the variables reflecting diversity of professional experience are new in the domain *paradoxical work activities*. Finally, in study 3 (chapter 4), educational breadth and depth are new variables and the domain *innovative work behaviors*.

Ruling out alternative explanations for covariation is considered a relevant first step toward understanding relationships between variables (Spector, 2019). Since no prior empirical investigations established covariation between the predictor variables and outcomes of interest in this thesis, this situation applies to all of its studies. Further, a cross-sectional (rather than a longitudinal) design is recommended if the timeframe for x causing y is unknown (Spector, 2019). In this situation, which applies to all three of the studies in this work, a cross-sectional design is considered "a safer bet to indicate covariation" (Spector, 2019: 134).

In sum, balancing sample and data requirements, access to available data and financial constraints, the collection of new and use of existing large-scale survey data to answer the research questions of this dissertation seemed the best decision for this thesis. The next section offers more detailed descriptions of the data collected and analyzed for this work.

1.3.2   Data

Prior research suggests that proactive skill development (Claes & Ruiz-Qunitanilla, 1998; Frese & Fay, 2001), engagement in paradoxical work activities (Mom et al., 2009, 2015) and innovative behaviors (Martín et al., 2017; Hammond et al., 2011) are particularly demanded by and relevant to higher qualified employees. Additionally, knowledge workers become increasingly important for contemporary economies (Wright, Tartari, Huang, Di Lorenzo, & Bercovitz, 2017). Therefore, I consider an enhanced empirical understanding of the work behaviors of highly qualified employees to be relevant for organizations' and individuals' career success.

Research institutes in Germany that are specialized in examining higher education graduates are, for instance, the German Centre for Higher Education Research and Science Studies (DZHW) and the Bavarian State Institute for Higher Education Research and Planning (IHF). Two studies (chapters 2 and 4) use data from the Bavarian Graduate Studies.

These are annually gathered, cross-sectional survey data in the collection of which I was actively involved at the IHF from 2016 to 2019. One study (chapter 3) uses data from the DZHW PhD Panel 2014, a four-wave survey among German doctorate holders (Brandt, Briedis, de Vogel, Jaksztat, & Teichmann, 2018). Thus, the survey data analyzed as part of this dissertation stem from graduates from German higher education who obtained a degree in different subjects about 1.5 years before their data were collected. They were mostly self-report, common method and cross-sectional, three characteristics discussed in the section "analyses" (chapter 1.3.3) and in the general "discussion" (chapter 5).

However, identifying relationships between predictors and outcomes is possible only if data contain sufficient variation on key variables. Prior research suggests that, for instance, motivation to learn and to handle complex tasks, occupational demands and autonomy in organizing job tasks should affect the dependent variables examined in the present studies (concerning proactive skill development, see Parker, Bindl, & Strauss, 2010; Parker et al., 2019; regarding individual ambidexterity, see Bidmon & Boe-Lillgraven, in press; Junni, Sarala, Tarba, Liu, & Cooper, 2015; Mom et al., 2009; concerning innovative work behaviors, see Anderson et al., 2014; Hammond et al., 2011). In contrast, prior research indicates that career age and educational level are not particularly dominant drivers of these outcomes (regarding proactive skill development, see Parker et al., 2010, 2019; concerning paradoxical activities, see Junni et al., 2015; Schad et al., 2016; regarding innovative work behaviors, see Anderson et al., 2014; Hammond et al, 2011; Ng & Feldman, 2013). Hence, responses from highly qualified, early career employees who work in a variety of different jobs, organizations and industries should contain sufficient variety regarding the outcomes of interest in these studies.

Likewise, data from this sample should contain enough variance in the main predictors of interest in these studies. *Individuals' interpretations of their work context* (study 1, chapter 2) are driven by several individual-level factors such as personality, affect, information search

behavior and prior experience with a situation (Anderson & Nichols, 2007; Jackson & Dutton, 1988; Mittal & Ross, 1998; Thomas & McDaniel, 1990; Zimmerman, Swider, Woo, & Allen, 2016) and by diverse contextual factors such as job demands and resources as well as organizations' information-processing structures (van Emmerik, Bakker, & Euwema, 2009; Thomas & McDaniel, 1990). Hence, it is unlikely that individuals' interpretations of the consequences digitalization might have on their employing organization are mainly driven by educational degree or career age.

Regarding the independent variables reflecting *diversity of professional experience* (study 2, chapter 3), prior research found that several individual and contextual factors (Feldman & Ng, 2007; Kostal & Wiernik, 2017; Wiernik & Kostal, 2018) rather than level of education influence individuals' career mobility and turnover (Biemann, Zacher, & Feldman, 2012; Kornblum, Unger, & Grote, 2018; Rubenstein, Eberly, Lee, & Mitchell, 2018). Finally, regarding study 2 (chapter 3), sufficient variation in the independent variables *educational breadth and depth* in the sample of higher education graduates is anticipated because the Bachelor and Master's programs offered by German universities allow individuals to study more and less multi-disciplinary (Meyer-Guckel, Klier, Kirchherr, & Winde, 2016), a behavior which probably depends primarily on individuals' personal interests and anticipated career prospects.

Overall, prior studies on individuals' proactive, paradoxical and innovative work behaviors as well as research on individual cognition and careers led assume highly qualified, early career professionals as a particularly relevant population for investigating the research questions posited in this dissertation. The next section presents the analytic methods used in this thesis.

1.3.3 Analyses

To address the potential problems of *common method variances* (i.e., "an unintended influence on the assessment of the variables of interest", Spector, 2019: 126) mentioned above (chapter 1.3.2), all studies of this dissertation run Confirmatory Factor Analyses (CFA) and Herman's Single Factor Test prior to hypothesis testing as established in management research (Podsakoff, MacKenzie, Podsakoff, & Lee et al., 2003; Podsakoff, MacKenzie, Podsakoff, 2012). To assess potential issues of *multicollinearity* (i.e., high correlations between an independent variable with a set of other independent variables), variance inflation factors and tolerance values on data were examined (Hair, Tatham, Anderson, & Black, 2014).

To examine the hypotheses and research questions posited, this thesis applies two distinct analytical approaches for understanding quantitative data. All its studies aim to identify the net effects of particular variables on outcomes, specifically moderated-mediation (study 1) and direct effects (studies 2 and 3). Hence, these studies use multivariate regressions (i.e., variable-centered, correlation-based analytic approaches; Hayes, 2017), specifically ordinary least square (OLS) regressions. This is because their dependent variables are not limited and thus, no assumption of OLS regressions should be violated (Coxe, West, & Aiken, 2009). Nonetheless, these studies mostly calculate average indirect effects and bootstrapped standard errors because bootstrapping does not rely on the assumption of multivariate normality (Hayes, 2017).

Studies 2 and 3 also seek to identify particular combinations (rather than net effects) of individual and contextual conditions which lead to the incidence of behaviors. For this objective, these studies take a configurational perspective and apply fsQCA, a case-centered, set-theoretic analytic approach (Longest & Vaisey, 2008; Ragin, 2008). Remarkably, QCA has four interesting characteristics which made this approach more popular over the last decade (Straatmann, Rothenhöfer, Meier, & Mueller, 2018) and a valuable complement of the

net effects approaches applied in this work. First, QCA allows the identification of *asymmetries*, namely, the presence and the absence of variables. Second, QCA involves the opportunity of revealing *necessary* and *sufficient conditions*, these are conditions which must always or, correspondingly, in particular instances, exist for an outcome. Third, QCA distinguishes *core* and *peripheral elements* included in a relevant configuration. These elements are essential and correspondingly less essential conditions depending on the simplifying assumptions applied systematically in QCA. Fourth, QCA explores *equifinality*, namely, several patterns which lead to an outcome of interest.

The following section summarizes the three empirical studies conducted as part of this dissertation and, thus, gives an overview over the remaining chapters of this thesis.

1.4 Thesis structure and main results

Chapter 2 drew from theoretical and empirical evidence on how individuals interpret macro-level factors and how these interpretations may translate into proactive career behavior (Heslin et al., 2019; Jackson & Dutton, 1988). Specifically, this chapter derived and empirically examined a moderated mediation model proposing indirect links between industry digital maturity and employees' proactive skill development (Claes & Ruiz-Qunitanilla, 1998) via employees' perceptions of digitalization as controllable, an opportunity and a threat to their organization (Jackson & Dutton, 1988), considering employees' proactive personality (Parker & Sprigg, 1999) as a moderator. To this end, the data on the concepts of interest for this study are collected as part of the Bavarian Graduate Studies 2016 (N = 720) and complemented with data on industries' digital maturity from the Mannheim Innovation Panel 2016 (Rammer et al., 2017). Findings of this paper suggest positive indirect effects of industry digital maturity on employees' proactive skill development via their interpretations of digitalization as controllable and as an opportunity for their organization. Against the hypothesis, employees' interpretations of digitalization as a threat did not mediate the link

between industry digital maturity and employees' proactive skill development. Also, employees' proactive skill development and the link between industry digital maturity and employees' interpretations appear to be independent of proactive personality. However, additional analyses indicate that proactive personality drives employees' interpretations of digitalization as an opportunity for their organization.

Chapter 3 expands research on individuals' engagement in paradoxical work activities (e.g., Smith & Lewis, 2011) by investigating the relationships between diversity of professional experience (cf., Quiñones et al., 1995; Crossland, Zyung, Hiller, & Hambrick, 2014) and individual ambidexterity (Mom et al., 2009). This chapter builds on a cognitive framing perspective proposing professional experience as a determinant of cognitive resources for behavior (cf., Karhu & Ritala, 2020; Westenholz, 1993) as well as on earlier theory and empirical evidence on individuals' capabilities for engaging in paradoxes (Schad et al., 2016). Results from multivariate regression analyses of the DZHW PhD Panel 2014 (N = 1,981) suggest that diversity of professional experience supports individual ambidexterity. Remarkably, having work experience in a variety of countries affects individual ambidexterity more than having work experience in a variety of firms and industries. Thus, complex rather than simple changes of work contexts seem to drive employees' engagement in paradoxical work activities.

Chapter 4 builds on a cognitive entrenchment perspective (Dane, 2010) as well as on empirical evidence on knowledge breadth and depth (recently, e.g., Boh et al., 2014; Mannucci & Yong, 2018; Wang et al., 2017) and work contexts (Cai, Parker, Chen, & Lam, 2019; van Knippenberg & Hirst, 2015) as antecedents of innovative work behaviors. First, this chapter develops the concepts of *educational breadth* and *educational depth* which represent the diversity and the comprehensiveness of the discipline-specific knowledge graduates develop during higher education. As argued in this chapter, these concepts account for the cognitive knowledge schema of early career professionals more adequately than the

established concepts of *knowledge* breadth and depth. Afterwards, this study examines independent effects and combinations of educational breadth and team climates in relation to innovative work behaviors. For this study, both self-developed and established measures were integrated into the Bavarian Graduate Studies 2017 (N = 1,358) and analyzed using multivariate regressions (Hayes, 2017) and fsQCA (Greckhamer, Misangyi, & Fiss, 2013; Longest & Vaisey, 2008). This study found that educational breadth and depth do not relate independently to innovative work behaviors. Nonetheless, combinations of the presences of educational breadth or depth and the two innovation-related team climates examined appear to be associated with frequent idea generation but not with frequent idea dissemination and idea implementation. In particular, the combination of educational depth and team exploration climate as well as the combination of educational breadth, team exploration and team exploitation climate appear to be accompanied by frequent idea generation.

Overall, as summarized in Table 2, this thesis seeks to enhance research on individual-level and contextual factors which facilitate work behaviors that are expected from employees in the contemporary work contexts of high market dynamisms and uncertainty. The next three chapters (chapters 2 to 4) are the quantitative studies summarized in this section and written as the key elements qualifying this dissertation. *Chapter 5* discusses this dissertation, reevaluating its contributions to research and practice, limitations and future research opportunities.

Table 2a: Overview over the empirical studies in this dissertation

	Chapter 2: Digitalization and proactive skill development	Chapter 3: Diversity of professional experience and paradoxical work activities	Chapter 4: Educational breadth and depth and innovative work behaviors
Purpose	**Overarching objectives:** • Reach more conclusive empirical understandings of employees' future-oriented career and work behaviors by expanding the set of known predictor variables and, herein, offering approaches for integrating insights from (until then) unrelated research streams • Provide practical implications for human resources and innovation managers as well as individual employees (especially early career professionals) concerning the development of career and work behaviors that are needed to thrive in dynamic work contexts (e.g., digitalization) **Particular aims:** • Examine how employees interpret the consequences digitalization might have on their organization • Investigate which particular interpretations of macro-level phenomena (digitalization) relate to proactive skill development • Examine personality as a boundary condition of the link between macro-level phenomena and individuals' interpretations thereof	• Examine if employees' engagement in paradoxical work activities (individual ambidexterity) is enabled by diversity of professional experience • Investigate employees' whole work history as predictor of individual ambidexterity (as suggested by Mom et al., 2015)	• Reveal if educational breadth and depth support early career professionals' innovative work behaviors • Investigate what kinds of team climates function as boundary conditions of the link between educational breadth and depth and their innovative work behaviors
Theory	**Individuals' cognitive resources for behavior**		
	Cognitive-Affective Personality System (CAPS; Heslin et al., 2019)	Paradox theory (Smith & Lewis, 2011)	Cognitive entrenchment perspective (Dane, 2010)
Design	Cross-sectional online survey (Bavarian Graduate Studies 2016) N = 720	Four wave longitudinal survey (DZHW PhD Panel 2014) N = 1, 981	Cross-sectional online survey (Bavarian Graduate Studies 2017) N = 1,358

Table 2b: Research models
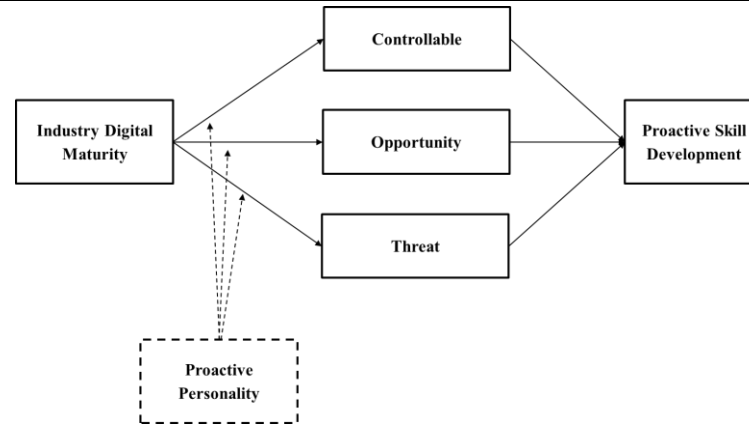
Chapter 2: Digitalization and proactive skill development	
Chapter 3: Diversity of professional experience and paradoxical work activities	
Chapter 4: Educational breadth and depth and innovative work behaviors	

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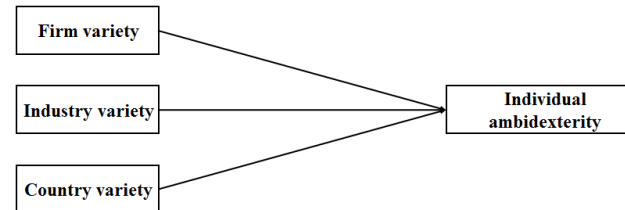Barsh, J. (2008). Leadership and innovation. *McKinsey Quarterly*. (1), 36–47. Retrieved from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/leadership-and-innovation#

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2 Building skills in the digital transformation: How industry digital maturity drives proactive skill development

2.1 Abstract

The digital transformation is changing the employee skills that organizations need to succeed. In this context, it becomes increasingly important for employees to proactively develop their skills. Emerging research on employee proactive skill development (PSD) has largely ignored the possible role that employees' perceptions of large-scale changes in organizations' environments may play in their motivation to engage in such valuable behavior. This study addresses this gap using Cognitive-Affective Personality System theory to explain how macro-level developments affect employee behavior. Survey data of 720 higher education graduates working across various organizations and industries, combined with objectively measured data on industry digital maturity, support the hypothesized positive indirect effects of industry digital maturity on PSD via employees' interpretation of digitization as controllable and as an opportunity for their organization. Additional analyses indicate that proactive personality is an important individual factor in this relationship. Implications for research and for organizational practice are discussed.

Keywords: Digital Transformation, Proactive Behavior, Individual Learning, Cognition

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2.2 Introduction

The digital transformation creates the need for organizations to update the skills of their workforce to remain successful (Sousa & Rocha, 2019a; van Laar, van Deursen, van Dijk, & de Haan, 2017). From a macro-level perspective, the core knowledge of a firm has been identified as a key area in which technological changes affect organizations and their ability to adapt and thrive (Eggers & Park, 2018). From a micro-level perspective, informal and proactive forms of work-related learning have gained importance (Noe & Ellingson, 2017; Wong & Fieseler, 2018), mainly because employees need to manage their careers proactively today more than in the past (Ren & Chadee, 2017; Taber & Blankemeyer, 2015) and because informal training opportunities have achieved higher flexibility in comparison to traditional formal training programs (Noe & Ellingson, 2017; Noe, Clarke, & Klein, 2014).

At the same time, researchers have noted a relative dearth of empirical research on the individual and, especially, contextual antecedents of such self-initiated skill development (Ren & Chadee, 2017) and have called for an integration of micro and macro perspectives in investigating the development of human capital (Noe et al., 2014). This research takes an individual-level cognitive-affective perspective to address this gap by investigating how the macro-level digital transformation of industries affects individual cognitions that foster engagement in proactive skill development (PSD).

PSD is defined as the self-initiated, future- and change-oriented acquisition of knowledge and skills individuals may need to master future job tasks (Claes & Ruiz-Quintanilla, 1998). Although this concept has recently gained attention among management scholars (e.g., Clements & Kamau, 2018; Pajic, Keszler, Kismihók, Mol, & Den Hartog, 2018; Ren & Chadee, 2017; Strauss, Griffin, & Parker, 2012; Strauss & Parker, 2018; Taber & Blankemeyer, 2015), empirical research on its antecedents is still sparse, and prior research on the antecedents of PSD focuses mostly on individual factors (Claes & Ruiz-Quintanilla,

1998; Clements & Kamau, 2018; Pajic et al., 2018; Ren & Chadee, 2017; Taber & Blankemeyer, 2015). Consequently, the understanding of macro-level stimuli in the broader organizational environment and individual perceptions of these stimuli as antecedents of PSD is insufficient.

Macro-level stimuli may influence individual perceptions and beliefs and, further, individual strategic, future-oriented behaviors. For instance, research shows that managers perceive and interpret strategic issues (i.e., typically ambiguous developments in organizations' environment with the potential to influence organizational performance, King, 1982) and take strategic action in response to these interpretations (recently, e.g., Haney, 2017; Saebi, Lien, & Voss, 2017). Moreover, prior research indicates that not only top managers but also employees at middle and lower organizational levels scan, interpret and respond to the strategic environment of their employing organization with different behaviors (Helpap & Bekmeier-Feuerhahn, 2016; Maitlis & Sonenshein, 2010; Prior, Keränen, & Koskela, 2018; Strobel, Tumasjan, Spörrle, & Welpe, 2017). However, despite the potential of macro-level stimuli to influence PSD via individual cognitions these stimuli have not yet been examined as predictors of PSD.

Hence, this study employs the Cognitive-Affective Personality System theory of career behavior (CAPS, Heslin, Keating, & Minbashian, 2019) to develop and test a model that links industry digital maturity (i.e., the extent to which particular digital technologies are used within an industry, Rammer et al., 2017) and PSD indirectly via employees' interpretations of digitization as controllable, as an opportunity and as a threat for their organization (Dutton & Jackson, 1987). Moreover, it examines the role of proactive personality as a boundary condition of these indirect links.

First, this study contributes to understanding and improving employee self-initiated skill development in organizations (e.g., Bednall & Sanders, 2017; Pajic et al., 2018; Ren &

Chadee, 2017; Sousa & Rocha, 2019b; Strauss & Parker, 2018; Taber & Blankemeyer, 2015). While extant research has concentrated on personality and motivation as drivers of PSD, this work focuses on the role of employee perceptions of the strategic environment of their employing organization in relation to PSD. This issue is relevant to management scholars and practitioners aiming to understand how ongoing macro-level changes affect employee engagement in self-initiated learning (e.g., Claes & Ruiz-Qunitanilla, 1998; Ren & Chadee, 2017; Taber & Blankemeyer, 2015) and how organizations may succeed in the digital transformation (Wong & Fieseler, 2018).

Second, this study adds to the micro organizational behavior literature on how macro-level factors translate into micro behavior (Johns, 2018; Molina-Azorín, Pereira-Moliner, López-Gamero, Pertusa-Ortega, & Tarí, in press) by examining how technology-driven forces in the broader organizational environment, namely, the digital transformation, affect employee perceptions and subsequent behaviors. Prior research in this field has focused mostly on intra-organizational factors as predictors of group- or employee-level outcomes or on the links between the broader organizational environment and the perceptions and subsequent behaviors of managers (Johns, 2018; Molina-Azorín et al., in press). In contrast, this study examines top-down processes from the organizational environment via employee perceptions to employee behavior. As such, it addresses Johns' (2018) recommendations to explore the mediators of more distal, omnibus contextual cues in the prediction of micro-level behavior. Moreover, examining the digital transformation as a situational stimulus of individual perceptions contributes to this field because this relation has rarely been examined.

Third, this study contributes to emerging research on organizational behavior on the consequences of the digital transformation for organizations and their members (Cascio & Montealegre, 2016; Sousa & Rocha, 2019a; van Laar et al., 2017; Wong & Fieseler, 2018). Notably, empirical evidence on the prediction of individual behavior is insufficient in research

integrating the areas of technology, work and organization (Casio & Montealegre, 2016). This study enhances knowledge in this field by examining individual behavior in response to individual perceptions of the digital transformation as controllable, as an opportunity and as a threat. In this regard, it applies and examines a framework of individual cognition and behavioral responses (Heslin et al., 2019; Keating & Heslin, 2015) to this market technological force.

The remainder of this chapter is structured as follows. First, there is a review of the literature related to the purpose of this research and the hypotheses are derived. Then, the data and methods are described, the results are presented and discussed, and a conclusion summarizes this work.

2.3 Theory and hypotheses development

2.3.1 Proactive skill development

PSD describes individuals' self-initiated, future- and change-oriented development of their competencies with the aim of mastering the tasks of their occupation and actively creating their own career (Claes & Ruiz-Quintanilla, 1998). PSD is one of four proactive career behaviors in addition to proactive career planning, proactive consultation behavior and proactive networking behavior (Claes & Ruiz-Quintanilla, 1998) and is part of career initiative behavior (Seibert, Kraimer, & Crant, 2001). By focusing on a longer-term fit between organizational requirements and member expectations, PSD may contribute to an improved functioning of organizations' internal environment (Parker & Collins, 2010).

Concepts related to but distinct from PSD are self-directed and autonomous learning. Self-directed and autonomous learning emphasize individual learning on individual responsibility by focusing on the processes through which individuals plan, implement and evaluate their own learning needs and outcomes (Noe & Ellingson, 2017; Garrison, 1997;

Knowles, 1975). In contrast, PSD emphasizes the elements of one's own initiative as well as future orientation and change orientation (Claes & Ruiz-Quintanilla, 1998). Through the elements of future orientation and change orientation, PSD involves a macro-level perspective that is important for the research question of how macro-level developments influence skill development. Self-directed and autonomous learning lack this macro-level perspective and focus on individual learning processes. Therefore, this study examines (and focus on) the antecedents of PSD rather than self-directed or autonomous learning.

Building on the initial article by Claes and Ruiz-Quintanilla (1998), a few recent studies have examined the antecedents of PSD. Pajic and coauthors (2018) found positive direct relations between both conscientiousness and career adaptability and PSD as well as a positive indirect effect of conscientiousness and PSD via career adaptability among Hungarian nurses. Clements and Kamau (2018) revealed that career goal commitment and a mastery approach were drivers of PSD among students. Strauss and Parker (2018) hypothesized but did not find that a vision-focused training intervention and the interaction between a vision-focused training intervention and individuals' future orientation facilitated PSD in a sample of police officers and support staff. Ren and Chadee (2017) identified a positive indirect effect of career networking behavior on the relationship between work pressure and PSD. Taber and Blankemeyer (2015) found that confidence fully mediated the relationship between the future work self and PSD and that all three mediating links were positive. Claes and Ruiz-Quintanilla (1998) revealed that experienced hierarchical mobility and employment experience related positively to PSD and that unemployment experience related negatively to PSD. Moreover, the authors (Claes & Ruiz-Quintanilla, 1998) found that the level of PSD was higher in a group of blue-collar workers than in a group of white-collar workers and that characteristics of national culture (Hofstede, 1991) contributed to predicting PSD.

This study argues that PSD is particularly relevant for both organizations and employees to develop the specific skills they need to benefit from ongoing macro-level trends such as the digital transformation. The development of formal training programs demands substantial organizational resources, such as supportive structures, knowledge, and time (Scott, Jones, Bramley, & Bolton, 1996; Tam & Gray, 2016). For instance, knowledge about skill development in view of the digital transformation seems to be at the stage of identifying relevant digital skills (e.g., Sousa & Rocha, 2019a; van Laar et al., 2017) rather than at the stage of being translated into large-scale trainings. Hence, this study assumes that most organizations that face dynamic contexts, such as the digital transformation, have limited or specific rather than comprehensive training offers in view of such novel trends. It proposes that employees need to find and seek this training proactively, namely, through future-oriented, self-initiated actions that are driven by proactive motivational states (Parker, Bindl, & Strauss, 2010).

In the following section, the research model (Heslin et al., 2019) building on CAPS theory is presented.

2.3.2 Cognitive-Affective Personality System Theory as a framework for understanding PSD in the digital transformation

Based on the CAPS theory developed by Mischel and Shoda (1995, 2008, 2010), Heslin and coauthors (2019) developed a model in which situational cues and personality traits activate cognitive and affective patterns (i.e., cognitive-affective units, CAUs), which in turn evoke career-enabling behaviors such as skill development.

The research model in this study (Figure 1) proposes that industry digital maturity functions as a situational cue that activates individual CAUs. Industry digital maturity reflects the degree to which organizations within an industry acted to profit from the digital transformation by implementing novel processes, tools or methods related to this technology-

driven development (Rammer et al., 2017). However, the ongoing digital transformation requires organizations to rethink their ways of doing business, their processes and their methods (e.g., Cascio & Montealegre, 2016; Eggers & Park, 2018; Kohli & Melville, 2019), although clear, broadly applicable guidelines for organizations on how to succeed in this development are largely lacking. Consequently, many organizations initially lack clear processes and internal programs for skill development in the face of digital transformation. Nevertheless, employees in such organizations are likely to perceive the ongoing changes (e.g., through public media) and may be concerned about securing their own future employability. Especially when guidance from their own organization is lacking, employees may try to use developments in the organization's industry as an orientation in forming their own attitudes and behaviors. For instance, employees may doubt whether their employing organization will successfully handle the digital transformation and may start to seek other potential employers within the industry (cf., Ayyagari, Grover, & Purvis, 2011) and to identify their skill demands. Hence, this study argues that industry digital maturity may function as a situational cue that shapes how employees perceive and interpret the digital transformation and, in turn, their engagement in skill development.

As mentioned, CAPS theory suggests that not only situational cues but also personality traits and their interaction with situational cues may influence the activation of individual CAU (Heslin et al., 2019). Building on this model (Heslin et al., 2019), this study investigates proactive personality (Bateman & Crant, 1993) as a boundary condition of the link between industry digital maturity and individual cognitions in its research model (Figure 1). It focuses on the person-situation interaction rather than on the direct effects of proactive personality on individual cognitions because it is mainly interested in the indirect relation between industry digital maturity and PSD. This work examines the proactive personality trait (Bateman & Crant, 1993) in interaction with industry digital maturity because proactive

individuals typically scan their environment to effect change upon it (Bateman & Crant, 1993). Thus, it suggests that proactive employees perceive and interpret organizational and employee reactions to the digital transformation.

After explaining the predictors in the research model (namely, industry digital maturity and its interaction with proactive personality), the mediators of the link between industry digital maturity and the outcome of PSD are now proposed. Prior research indicates that individuals commonly use three concepts to categorize and evaluate strategic issues (Jackson & Dutton, 1988; Saebi et al., 2017; Sharma, 2000; Thomas, Clark, & Gioia, 1993). These concepts are *controllable* (i.e., an expression of the feeling that effective actions can be taken to resolve an issue, Dutton, Walton, & Abrahamson, 1989), *opportunity* (i.e., an expression of feeling qualified and of projected gains and positive outcomes, Jackson & Dutton, 1988) and *threat* (i.e., an expression of feeling underqualified and of anticipated negative outcomes or potential losses, Jackson & Dutton, 1988). This research examines these three individual interpretations regarding digitization as cognitive processes that mediate the effect of industry digital maturity on PSD.

Following CAPS theory, individual perceptions and interpretations are elements of individual CAU (Heslin et al., 2019). Specifically, CAPS theory distinguishes different categories of CAUs, for instance, "encodings" and "expectancies and beliefs" (Heslin et al., 2019). "Expectancies and beliefs" reflect individual mastery experience and self-efficacy in attaining goals (Heslin et al., 2019). Feelings of mastery and self-efficacy involve perceptions of control (Bandura & Wood, 1989). Hence, this study proposes individual interpretations of industry digital maturity as controllable as an "expectancy and belief" type of CAU (Figure 1). "Encodings" are individuals' mental representations of objective situations (Heslin et al., 2019). These include individual categorizations and evaluations of situational characteristics, for instance, as opportunities or as threats (Heslin et al., 2019). Accordingly, in line with

Zimmerman, Swider, Woo and Allen (2016), this study proposes individual interpretations of industry digital maturity as an opportunity and as a threat as "encoding" types of CAU (Figure 1).

Furthermore, CAPS theory (Heslin et al., 2019) suggests that the levels of activation of CAUs influence individual career-enabling behaviors, which include skill development. In sum, integrating the concepts of interest into the CAPS framework results in the research model (Figure 1), in which industry digital maturity (situational cue) affects individual interpretations of digitization as controllable ("expectation and beliefs" type of CAU), as an opportunity and as a threat ("encoding" type of CAU) to an organization and subsequent PSD (career-enabling behavior).

In the next sections, the hypotheses are derived by building on the links between situational cues, individual cognition and behavior suggested by CAPS theory (Heslin et al., 2019).

Figure 1: Research model on proactive skill development in response to industry digital maturity and employees' interpretations of the consequences of digitization for their organization
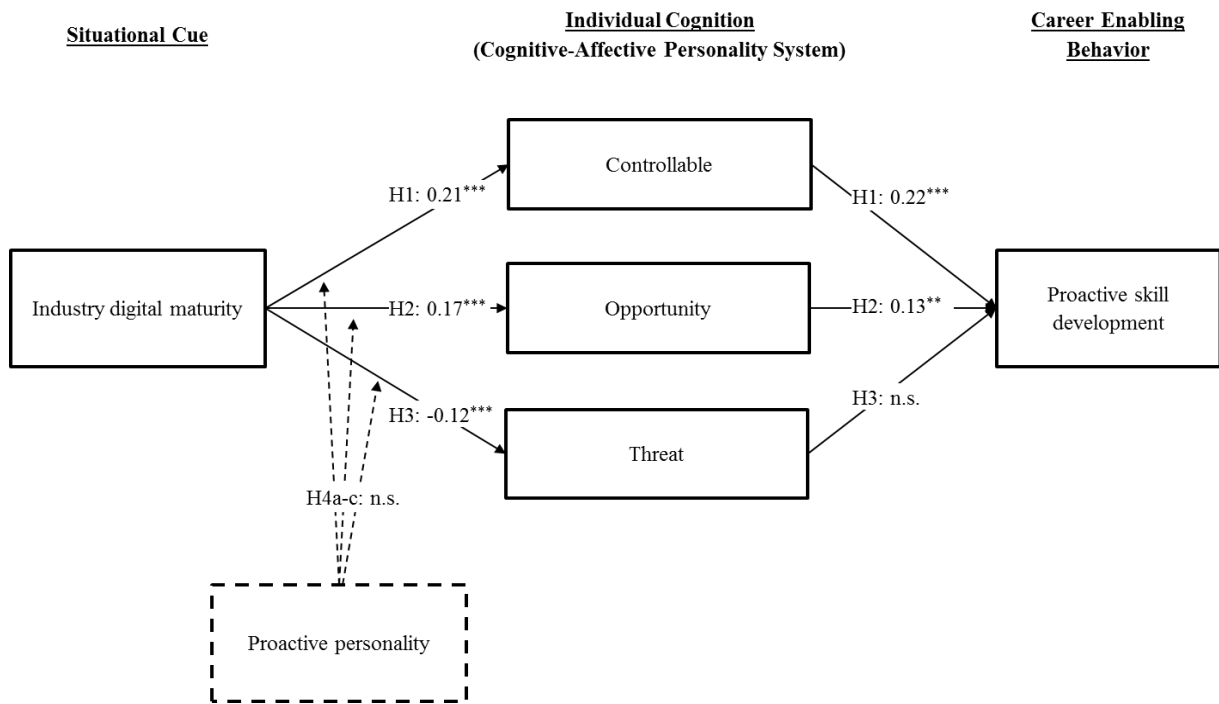
Note. Beta coefficients obtained from 5,000 bootstrapped samples reported; N=720.
    n.s. = not significant.
    $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$.

2.3.3 Positive indirect effect of interpreting digitization as controllable in the link between industry digital maturity and PSD

The CAPS model (Heslin et al., 2019) assumes that situational cues may activate individual cognitions (which are elements of individual CAUs). Building on this model (Heslin et al., 2019), this research argues that industry digital maturity is a situational cue that drives employees' interpretations of digitization as controllable for their organization:

Individuals tend to interpret issues as controllable if information is readily available (Kuvaas, 2002) and if the amount of given information is high (Thomas et al., 1993). This study argues that these conditions are available at high levels of industry digital maturity, namely, when a large share of organizations adapt their work processes and methods to control and to benefit from the digital transformation (e.g., through the implementation of

digital tools, Rammer et al., 2017). In this situation, much information on how organizations may respond to the digital transformation should be available, for instance, in the form of individual reports and best practices on useful tools, processes and methods organizations have implemented in view of the digital transformation. This relatively high availability of information on how to manage digitization should lead employees to interpret digitization as controllable for their organization (cf., Thomas et al., 1993). Therefore, this study assumes a positive relation between industry digital maturity and individual interpretations of digitization as controllable.

At high levels of industry digital maturity, employees arguably observe which tools and strategies their own and other organizations use and which competencies organizations need and develop in this regard (e.g., Garcia, Alvarez, Bonnet, & Buvat, 2015; Iansiti & Lakhani, 2014; Weill & Woerner, 2015). Prior research suggests that observing role models dealing effectively with difficult situations facilitates perceived self-efficacy (Bandura & Wood, 1989; Parker, 1998). Furthermore, the literature proposes that perceived self-efficacy, feelings of control and feasibility, and "can do" motivation are associated with each other and support proactive behaviors (Parker et al., 2010) or skill development (Cook & Artino, 2016; Sitzman & Ely, 2011; Zimmerman, 2000). Hence, this study suggests a positive relation between employees' individual interpretations of digitization as controllable and their PSD.

In sum, it proposes the following:

H1. *There will be a positive indirect effect of industry digital maturity on employee PSD through employees' interpretations of digitization as controllable for their organization.*

2.3.4 Positive indirect effect of interpreting digitization as opportunity in the link between industry digital maturity and PSD

When individuals expect gains and positive outcomes of an issue, they tend to interpret this issue as an opportunity (Jackson & Dutton, 1988). This study argues that employees observe that comparable organizations that have implemented digital tools and processes (cf., Rammer et al., 2017) manage the digital transformation successfully at high levels of industry digital maturity. Practitioners suggest (recently, e.g., Bessen & Frick, 2018; Rosemann, Kowalkiewicz, & Dootson, 2017) and scholars find that organizations that adapt their business models or their ways of value creation in view of new digital opportunities may be very successful (e.g., Iansiti & Langhanki, 2014; Kiel, Müller, Arnold, & Voigt, 2017; Kohli & Melville, 2019; World Economic Forum, 2018) under some conditions (Eggers & Park, 2018). This observation should lead employees to project potential gains of the digital transformation on their organization and to interpret this development as an opportunity for their organization (cf., Jackson & Dutton, 1988).

Moreover, organizations in digitally mature industries implement many novel tools or processes in view of digital transformation (cf., Rammer et al., 2017). Therefore, this study argues that employees who work in industries with a high level of digital maturity tend to work in an organizational culture that signals that the digital transformation provides possible gains and opportunities for an organization that can be realized, for instance, through innovations. Consequently, this research assumes that industry digital maturity supports employees' perceptions of digitization as an opportunity for their organization.

Furthermore, this study assumes that the interpretation of digitization as an opportunity for an organization involves ideas of the specific opportunities this macro-level development may provide for the organization and, in turn, for individual job tasks and careers. Regarding digital transformation, such opportunities may be, for instance, new ways

of selling products and interacting with stakeholders and job opportunities in the emerging areas of electronic monitoring, roboting, big data analysis, and digital collaboration (Cascio & Montealegre, 2016; Colbert, Yee, & George, 2016). If organizations and employees want to benefit from the opportunities that emerge from the digital transformation, they should perceive a reason to (Parker et al., 2010) develop their skills accordingly. This "reason to" proactive motivational state has been proposed to support proactive behaviors (Parker et al., 2010), such as PSD (Cleas & Ruiz-Quintanilla, 1998).

Moreover, employees who interpret strategic issues as opportunities tend to be in a positive affective state (Mittal & Ross, 1998). Positive affective states relate to individuals' "energized to" motivation—another motivational state that supports proactive behavior (Parker et al., 2010). Thus, there is reason to assume that employees' interpretation of digitization as an opportunity for their organization activates not only their "reason to" motivation but also their "energized to" motivation. Both motivations should facilitate employees' PSD (Parker et al., 2010). Therefore, this study suggests a positive relation between individual interpretations of digitization as an opportunity and their PSD. It hypothesizes the following:

> **H2.** *There will be a positive indirect effect of industry digital maturity on employee PSD through employees' interpretations of digitization as an opportunity for their organization.*

Additionally, given the uncertain and unpredictable implications of the digital transformation for organizations (Nambisan, Lyytinen, Majchrzak, & Song, 2017; Vial, 2019) and prior research suggesting that individuals may interpret equivocal phenomena as both an opportunity for and a threat to organizations (Anderson & Nichols, 2007; Gilbert, 2006; Jackson & Dutton, 1988; Plambeck & Weber, 2010), this study proposes that employees'

interpretation of digitization as a threat is a mediator in the link between industry digital maturity and PSD in the following.

2.3.5 Positive indirect effect of interpreting digitization as a threat in the link between industry digital maturity and PSD

Individuals tend to interpret strategic issues as a threat if they perceive issues as negative, if they expect (personal) losses from acting on issues and if the characteristics of an issue are perceived ambiguously or threat-distinctively rather than neutrally (Jackson & Dutton, 1988). Prior research shows that individuals tend to trust and value new technologies if these new technologies are endorsed and legitimized by others, especially experts (Elsbach & Stigliani, 2019). At high levels of industry digital maturity, employees should observe that many organizations have implemented new tools, methods and processes to benefit from the digital transformation (cf., Rammer et al., 2017). In turn, this information should decrease the likelihood that individuals perceive digitization as risky or threatening (cf., Elsbach & Stigliani, 2019). This work therefore assumes a negative link between industry digital maturity and individual interpretations of digitization as a threat.

Furthermore, this study assumes that individuals act in response to a perceived threat as proposed by the threat-rigidity hypothesis (Staw, Sandelands, & Dutton, 1981). This hypothesis suggests that organizations and their members tend to react with rigidity and tend to pursue routine activity in the face of threat (Staw et al., 1981; Chattopadhyay, Glick, & Huber, 2001). Because routine activity should be contrary to the change-oriented nature of PSD (Parker et al., 2010), this study argues that threat perceptions inhibit PSD.

This proposition is supported by research on constructs similar to threat interpretation and PSD. For instance, Klehe, Zicic, Van Vianen and De Peter (2011) find that perceived job insecurity (i.e., fear of the future and perceived powerlessness due to the perception that the stability of the current employment is uncertain) inhibits career planning, another proactive

career behavior (Claes & Ruiz-Quintanilla, 1998). Furthermore, qualitative data indicate that contextual factors associated with downsizing conditions, fear of negative consequences, and uncertainty may decrease the likelihood that middle managers are willing to behave proactively (Dutton, Ashford, O'Neill, Hayes, & Wierba, 1997). Additionally, prior research suggests that issue interpretation as a threat is associated with negative affective states (Isen & Daubman, 1984; Mittal & Ross, 1998) which should decrease the probability that employees behave proactively (Parker et al., 2010) and engage in information processing and learning (Eysenck & Calvo, 1992; Warr & Downing, 2000) if they lack active coping strategies. Moreover, based on a literature review, Johnston (2016) proposes that career adaptability (i.e., individuals' resources and readiness for coping with career-related changes) may be inhibited in situations that are perceived as threatening.

An alternative theory for explaining individuals' behavioral response to perceived threat is the conservation of resources theory (Hobfoll, 2001). This theory suggests that humans are motivated to act to protect themselves against future losses of personal, social, material and energy resources (Hobfoll, 2001), and proactive career behaviors might be seen as a way to avoid the decline of one's own human capital. However, a study by Strobel, Tumasjan, Spörrle and Welpe (2013) found that employees' proactive strategic behavior is driven more by promotion-focused motivation (i.e., seeking to achieve gains) than by prevention-focused motivation (i.e., seeking to avoid losses).

Therefore, this work argues that employees who interpret digitization as threatening their organization act in line with the threat-rigidity hypothesis (Staw et al., 1981) such that they are less likely to perform PSD when they perceive digitization as a threat to their organization. Taken together, this study proposes a negative effect of industry digital maturity on perceptions of threat and a negative effect of perceptions of threat on PSD, resulting in an overall positive mediation effect. Hence, it suggests the following:

H3. *There will be a positive indirect effect of industry digital maturity on employee PSD through employees' interpretations of digitization as a threat for their organization.*

2.3.6 Proactive personality as a moderator of indirect links between industry digital maturity and PSD

CAPS theory proposes that person-situation interactions occur under the conditions that situational cues are relevant to a personality trait and that cues are weak enough to allow for trait-dependent individual differences in behavior (Heslin et al., 2019; consistent with trait activation theory; Tett & Guterman, 2000). By definition, proactive individuals actively observe their environment to perceive and initiate potentials for improvement (Bateman & Crant, 1993). At high levels of industry digital maturity, for instance, proactive employees should observe that organizations manage to handle the digital transformation by taking future- and change-oriented actions (cf., Rammer et al., 2017). Hence, this study argues that industry digital maturity and proactive personality have common characteristics, namely, the need or inner drive for future- and change-oriented action, which evoke an interaction between these two factors.

Furthermore, this work recognizes that the digital transformation is associated with considerable uncertainty regarding the consequences of and best practices in response to this development (Cascio & Montaelegre, 2016; Colbert et al., 2016). Hence, there is reason to assume that employees need to develop their own understandings of and behavioral responses to the digital transformation. This should imply that industry digital maturity is a situational cue that allows the proactive personality to become salient (cf., Heslin et al., 2019; Tett & Guterman, 2000).

Having argued for the interaction between industry digital maturity and proactive personality, this study now proposes how proactive personality affects individual

interpretations of digitization. Individuals with proactive personalities have a relatively great sense of self-determination and self-efficacy (Seibert, Crant, & Kraimer, 1999) as well as a high sense of mastery and believe that they can control occurring job demands (Parker & Sprigg, 1999). Hence, this work argues that proactive individuals think that they themselves as well as other (proactive) organizational members can influence and control macro-level developments, assuming that other organizational members act similarly proactively as they do themselves with the aim of controlling these developments (cf., Ashford & Black, 1996; Feldman, 1981; Ross, Greene, & House, 1977).

Proactive individuals are characterized as acting to actively control their environment (Bateman & Crant, 1993). Illusions of control lead to reduced risk perceptions and ultimately to more positive opportunity evaluations (Keh, Der Foo, & Lim, 2002). Confirming this characterization, meta-analytic findings indicate that proactive individuals are more likely to interpret work challenges as opportunities rather than as threats (Fuller & Marler, 2009). In addition, empirical evidence on the correlation between proactivity and optimism (Aspinwall, Sechrist, & Jones, 2005; Tolentino et al., 2014) suggests that proactive individuals have some characteristics of optimists, such as dominant attention to constructive information (Aspinwall, Richter, & Hoffmann, 2001; Fuller & Marler, 2009). Therefore, this study assumes that proactive individuals share optimists' dominant attention to opportunities and tend to interpret macro-level developments as opportunities.

Individuals interpret developments in their environment selectively; that is, they interpret some developments but ignore others (Dutton & Jackson, 1987). Considering that proactive individuals actively seek out opportunities in their environment (Bateman & Crant, 1993), this work argues that proactive employees are consequently less aware of threatening developments in their environment. Moreover, the literature on individual characteristics of entrepreneurs shows that individuals may simultaneously have a proactive personality and a

high tolerance for ambiguity, namely, a tendency not to interpret ambiguous developments in the environment as a threat (Crant, 1996; Jain & Ali, 2013; Luca & Robu, 2016).

In sum, this section has argued that the proactive personality trait is activated in the context of digital transformation and influences how employees interpret the consequences of this macro-level development for their organization. This study hypothesizes the following:

H4. *Proactive personality moderates the strengths of the indirect relations between industry digital maturity and PSD via individual interpretations of digitization such that the paths between industry digital maturity and individual interpretations of digitization as (H4a) controllable, (H4b) an opportunity and (H4c) a threat will be stronger at high rather than low levels of proactive personality.*

2.4   Method

2.4.1   Data and sample

To test the hypotheses, data on the dependent, independent, and mediating variables are collected as part of an annual survey among graduates from universities (including universities of applied sciences) in Bavaria, a German federal state. This survey took place approximately 1.5 years after participants obtained their degree. Specifically, the items were answered only by those graduates who were employed at the time of the survey.

This sample of employed graduates is particularly suitable for this study because information seeking, creating an understanding of the work environment and learning have been suggested as particularly relevant for organizational newcomers (Ashford & Black, 1996) and should similarly be relevant for this study's sample of employees with quite few work experience after graduation from higher education. Moreover, prior research suggests that individual proactive behaviors vary depending on the organizational context (e.g., Crant,

2000) and occupational level (e.g., Claes & Ruiz-Quintanilla, 1998). Thus, this study presumed that surveying graduates employed in different types of jobs, organizations and industries would increase the likelihood of observing substantial variance in participants' PSD and in the independent variables of interest as needed to test the hypotheses.

Of the initial 8,346 participants of the regular graduate survey, 6,000 respondents fulfilled the inclusion criteria of having obtained gainful employment, a traineeship or an internship after graduation. These respondents were invited to respond to an optional additional survey that included this study's main constructs of interest. Of these participants, 2,107 began to respond to this additional survey. Finally, 720 participants fulfilled the inclusion criteria of being regularly employed, being employed in an industry whose digital maturity information was given, and providing complete data on all study items. Thirty-nine percent of the participants held a bachelor's degree, and they had obtained degrees in different subject areas (14% arts, 8% sciences, 44% engineering, 29% business and economics, 0.1% law; classified as in Crossland, Zyung, Hiller, & Hambrick, 2014; Wiersema & Bantel, 1992). At the time of the survey, participants worked in a broad range of industries (23% in machine construction and the automobile industry, 11% in information technology and telecommunication services, 10% in business consultancy and marketing, 10% in technical, research and development services, and the remainder in other industries such as the electrical industry, business and financial services, manufacturing, and wholesale; classification according to Rammer et al., 2017). Participants were, on average, 29 years old (the youngest was 24, and the oldest was 59 years old), and 59 percent of them were male.

2.4.2 Measures

PSD was assessed with the three items used by Strauss and Parker (2018, e.g., "Over the past few weeks, to what extent have you developed skills which may be needed in the future?"; 1 = not at all to 5 = a great deal). This scale was originally established and tested by

Claes and Ruiz-Quintanilla (1998) to capture respondents' self-reported PSD. Following Claes and Ruiz-Quintanilla (1998), the introductory sentence, "The following questions are about general activities in a job context", and the items' wording invited respondents to focus "on broader perspectives of the occupational track" (Claes & Ruiz-Quintanilla, 1998: 366) rather than on their adjustment to their present job, their organization, or a specific career stage. Cronbach's alpha was 0.84.

To assess how employees perceived the consequences of digitization for their organization, this study built on the literature on individual issue interpretations. It assessed individual interpretations of digitization as controllable, as an opportunity, and as a threat with eight items adapted from Anderson and Nichols (2007), which were originally based on Thomas and colleagues (1993). Specifically, to assess controllability, this research specified Anderson and Nichols' (2007) two items on the issue of digitization (e.g., "To what extent would you feel your organization can manage digitization?"; 1 = to a small extent to 5 = to a great extent). Likewise, to measure individual interpretations as an opportunity and as a threat, this study specified the three items with the highest factor loadings of each subscale to the issue of digitization (e.g., for the interpretation of digitization as an opportunity, "To what extent would you feel the future will be better for your organization because of digitization?"; for the interpretation of digitization as a threat, "To what extent would you see digitization as having negative implications for the future of your organization?"). Cronbach's alpha was 0.88 for interpretation as controllable, 0.89 for interpretation as an opportunity, and 0.91 for interpretation as a threat.

Information on the digital maturity of the industries in which the participants worked (i.e., an index of industry digital maturity) was added to the survey data from the results of the Mannheim Innovation Panel (Rammer et al., 2017). The results of the Mannheim Innovation Panel are the responses of nearly 11,800 companies in Germany that had more than five

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employees in 2016 (approximately 53% of the sample). Survey participants indicated the degree (widely, medium, poorly, not at all) to which 11 digital applications for digital networks (e.g., between service, production and logistics), internal organization and communication (e.g., web-based platforms), sales and external communication (e.g., e-commerce), and information processing (e.g., cloud applications) were used within their company at the time of the survey. Rammer and colleagues (2017) projected this information to the population of companies in Germany with more than five employees and reported the share of companies using these different digital applications, inter alia, by sector. Based on this report, this study calculated industry digital maturity as the average share of companies using digital applications by sector. For each sector, it aggregated the shares of usage reported for each of the 11 digital applications and divided them by the number of applications. Because the industry classification established in the regular graduate survey did not correspond with the industry classification used in the Mannheim Innovation Panel, this study had to aggregate information provided by Rammer and coauthors (2017) as described in the next paragraph. In this case, it calculated the industry-specific average shares of companies using digital applications by summing the indicated shares of usage over all 11 digital applications in each subindustry and dividing them by the product of the number of digital applications and the number of aggregated subindustries.

Specifically, industries of the two surveys were matched and, if necessary, aggregated based on the names in both surveys and the German classification of economic sectors (Federal Statistical Office Destatis, 2008) used by Rammer and colleagues (2017). For instance, to calculate the digital maturity of the mechanical engineering and vehicle construction industries, Rammer and coauthors' (2017) information on the industries' mechanical and automotive engineering were aggregated. The final dataset contains information on 14 industries: business services; chemistry and pharmacy; electrical industry;

energy, mining, and mineral oil; financial services; information technology and telecommunication; management consulting and advertising; manufacturing; media services; metal production and processing; technical and R&D services; transportation and post; water, disposal, recycling; and wholesale.

To assess proactive personality, this study selected the three items with the highest factor loadings from Parker's (1998) measure, originally developed by Bateman and Crant (1993, e.g., "I am always looking for better ways to do things"; 1 = strongly disagree to 5 = strongly agree). Cronbach's alpha was 0.55.

After excluding the data of participants who provided incomplete information, the final sample contained 720 observations, as described above.

2.5   Results

2.5.1   Model fit

Table 1 displays the descriptive statistics, internal consistencies and pairwise correlations of the variables included in this study. All analyses were conducted by applying sound diagnostic methods indicated in the following using Hayes' (2017) PROCESS macro with SPSS version 25.

Confirmatory factor analysis (CFA) supported the conceptualization of a five-factor model composed of PSD, individual interpretations as controllable, as an opportunity, and as a threat, and proactive personality. CFA indicated a good model fit ($\chi^2[67] = 146.83$, $p < 0.000$; $\chi^2/df = 2.19$; CFI = 0.99; RMSEA = 0.04; SRMR = 0.03; Iacobucci, 2010) that was, considering these fit indices, better than any four- to one-factor models combining two or more of these factors. Additionally, as Fornell and Larcker (1981) recommend, the squared correlations between the latent constructs and all other constructs were smaller than the

average variances extracted for each latent construct. In sum, these results provide evidence of discriminant validity.

To address concerns of common method bias, Harman's one-factor test was conducted using exploratory factor analysis (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). An individual factor explained a maximum of 35.489% of the variance, and all the surveyed items related to the intended factors. Furthermore, the CFA mentioned above indicated a poor fit of the one-factor model. Hence, this study concludes that common method bias is unlikely to be a significant threat in it.

To assess whether multicollinearity is a problem in this study, the variance inflation factor (VIF) and the tolerance for all regression models were calculated. The largest VIF (1.71; Model 4, Table 2) and the smallest tolerance (0.58; Model 4, Table 2) indicated no major problems of multicollinearity (Hair, Black, Babin, & Anderson, 2014).

Table 1: Means, standard deviations, internal consistencies and correlations of all variables in the regression model

	Mean	S.D.	1	2	3	4	5	6
1 PSD	3.80	0.85	(0.84)					
2 Digital maturity	9.84	7.01	0.08*					
3 Controllability	3.84	0.89	0.28**	0.21**	(0.88)			
4 Opportunity	4.07	0.83	0.24**	0.17**	0.42**	(0.89)		
5 Threat	1.80	0.85	-0.18**	-0.12**	-0.36**	-0.60**	(0.91)	
6 Proactive personality	3.85	0.57	0.31**	-0.03	0.17**	0.22**	-0.16**	(0.55)

Note. $N = 720$. Scales of concepts 1 to 5 ranging from 1 to 5. Cronbach's alpha in parentheses.
  *$p < 0.05$ (two-tailed), **$p < 0.01$ (two-tailed).

2.5.2 Analyses and results

Hypotheses are tested in two sequential steps. First, this study ran hierarchical regression analyses using multiple regression and bootstrapping techniques following Hayes (2017) to assess the hypothesized indirect and moderated indirect effects. It used bootstrapping because this approach does not require any assumptions on the shape of the sampling distribution, its inferences are more likely to be accurate, and its tests tend to have more power than a normal theory approach (Hayes, 2017). Specifically, following Hayes

(2017), bootstrapping procedures are set so that they drew up to 5,000 samples from the original sample of 720 units with replacement and calculated the average indirect effects as well as bootstrapped 95% confidence intervals (CI). Second, Hayes' (2017) PROCESS macro was used to test the proposed indirect (H1, H2, H3) and moderating (H4) effects. In line with Hayes (2017), this study concluded that indirect effects are significant only if their 95% CI do not include zero.

To test hypotheses 1 to 3, this study ran a model in which industry digital maturity was the predictor, employees' interpretations of digitization as controllable (H1), as an opportunity (H2), and as a threat (H3) were simultaneous mediators, and PSD was the outcome using Hayes' (2017) PROCESS macro. To test hypothesis 4, it used the same software to run a model in which industry digital maturity and the interaction between industry digital maturity and proactive personality predicted employees' interpretations as controllable (H4a), as an opportunity (H4b), and as a threat (H4c) while controlling for proactive personality. All variables were standardized prior to the analyses.[1]

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[1] To control for industry effects besides industry digital maturity, this study additionally conducted all analyses of the hypotheses with standard errors clustered for industry in Stata 15. The resulting coefficients of most of the independent variables of interest did not change in significance and direction. The only change in significance was that the coefficient of the individual interpretation of digitization as an opportunity became insignificant in the prediction of PSD (indicated by its 95% CI).

Table 2: Main effects of industry digital maturity and individual interpretations of digitization on proactive skill development

	Model 1	Model 2	Model 3
Step 1: Control variables			
Constant	0.00	0.00	0.00
Proactive personality			0.26***
Step 2: Main effect			
Industry digital maturity	0.08*	0.01	0.03
Step 3: Mediation effects			
Controllable		0.22***	0.19***
Opportunity		0.13**	0.09
Threat		-0.02	-0.01
Overall F	4.57	19.01	26.67
R^2	0.01	0.10	0.15
Change in F		23.68	51.89
Change in R^2		0.09	0.06
Sample size	720	720	720
Bootstrap samples (max. 5,000)	5,000	5,000	5,000

Note. Beta coefficients reported.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3: Effects of industry digital maturity on individual interpretations of digitization as controllable, as an opportunity and as a threat

	Controllable		Opportunity		Threat	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1: Control variables						
Constant	0.00	0.00	0.00	0.00	-0.00	-0.00
Step 2: Main effect						
Industry digital maturity	0.21***	0.22***	0.17***	0.17***	-0.12***	-0.13***
Step 3: Moderation						
Proactive personality		0.18***		0.23***		-0.16***
IDM* Proactive personality		0.01		0.04		-0.04
Overall F	34.21	19.72	20.10	20.67	11.02	10.58
R^2	0.05	0.08	0.03	0.08	0.02	0.04
Change in F		11.95***		20.44***		10.21***
Change in R^2		0.03		0.05		0.03
Sample size	720	720	720	720	720	720
Bootstrap samples	5,000	5,000	5,000	5,000	5,000	5,000

Note. IDM = Industry digital maturity. Beta coefficients reported.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Hypothesis 1 proposes an indirect effect of industry digital maturity on PSD via employees' interpretation of digitization as controllable. Supporting this hypothesis, the 95% CI [0.03, 0.07] of the indirect effect (Table 4) excluded zero and thus indicated that this indirect effect was significant. Consistently, both the effect of industry digital maturity on employee interpretation as controllable ($\beta = 0.21$, $p < .001$; 95% CI [0.14, 0.28]; Model 1, Table 3) and the effect of interpretation of digitization as controllable on PSD were significant and positive ($\beta = 0.22$, $p < .001$; 95% CI [0.14, 0.30]; Model 2, Table 2). The direct effect of industry digital maturity on PSD became insignificant when the variables of the indirect effect—individual interpretations of digitization as controllable, as an opportunity and as a threat—were added into the model ($\beta = 0.08$, $p < 0.05$ in Model 1 vs. $\beta = 0.01$, $p > 0.10$ in Model 2; Table 2), and the change in F was significant ($\Delta F = 23.68$, $p < 0.001$, $\Delta R^2 = 0.09$; Model 1 compared to Model 2, Table 2).[2] Hence, this study concludes that hypothesis 1 is supported.

Hypothesis 2 suggests an indirect effect of industry digital maturity on PSD through employees' interpretation of digitization as an opportunity. The 95% CI [0.01, 0.04] of this indirect effect (Table 4) did not include zero and hence indicated that this indirect effect was significant. Specifically, the results showed a positive effect of industry digital maturity on the interpretation of digitization as an opportunity ($\beta = 0.17$, $p < .001$; 95% CI [0.10, 0.23]; Model 1, Table 3), and the effect of the interpretation of digitization as an opportunity on PSD excluded zero at a 95% CI ($\beta = 0.13$, $p = 0.01$; 95% CI [0.04, 0.23]; Model 2, Table 2). Therefore, this study concludes that hypothesis 2 is supported.

Hypothesis 3 proposes an indirect effect of industry digital maturity on PSD via employees' interpretation of digitization as a threat. However, the 95% CI [-0.01, 0.01] (Table 4) did not indicate significance of this indirect effect because it included zero. The effect of

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[2] These findings support hypotheses one, two and three. To avoid repetitions, these findings will not be mentioned among the results for hypotheses two and three.

industry digital maturity on employees' interpretation of digitization as a threat to their organization was negative (β = -0.12, p < .001; 95% CI [-0.19, -0.05]; Model 5, Table 3), while the effect of the interpretation of digitization as a threat on PSD was not significant (p > 0.10, Model 3, Table 2). Hence, this study concludes that hypothesis 3 is not supported.

Hypothesis 4 suggested that proactive personality moderates the indirect effect of industry digital maturity on PSD such that the effects through individual interpretations of digitization as controllable (H4a), as an opportunity (H4b) and as a threat (H4c) will be stronger. However, results from data analyses did not indicate that digital maturity moderates any of the links between industry digital maturity and individual interpretations of digitization; neither of the interaction effects was significant (p > 0.10, Models 2, 4, 6, Table 3), and their 95% CIs did not exclude zero. Consistently, the inclusion of the interaction term in the regression models did not lead to a significant change in R^2 as the tests of highest-order unconditional interactions (p > 0.10) implemented in Hayes' (2017) PROCESS macro indicated. Likewise, the 95% CIs of the indices of moderated mediation implemented in Hayes' (2017) PROCESS macro did not point to any significant interaction between industry digital maturity and proactive personality in the prediction of employees' interpretations of industry digital maturity. This study therefore concludes that hypotheses 4a, 4b and 4c are not supported.

2.5.2.1 Post hoc analyses

In line with Spector and Brannick's (2011) recommendations on the use of control variables, this study additionally investigated the influence of proactive personality on the first three hypothesized relations (H1 to H3). Specifically, it repeated all regressions while controlling for proactive personality. This is because proactive personality has been shown to drive behaviors similar to PSD (e.g., other proactive behaviors, Seibert et al., 2001; Orvis & Leffler, 2011; and self-directed learning, Fuller & Marler, 2009; Raemdonck, van der Leeden,

Valcke, Segers, & Thijssen, 2012), and proactive personality may influence individual perceptions of situational attributes (recently, e.g., Debus, König, Kleinmann, & Werner, 2015; Sherman, Rauthmann, Brown, Serfass, & Jones, 2015). Thus, this study argues that it is important to additionally examine whether proactive personality influences the proposed relations, especially those between individual perceptions and PSD.

The results of these analyses indicate that the effect of industry digital maturity on employees' perceptions of control as well as the effect of perceived control on PSD do not change in significance or direction when controlling for proactive personality (Model 2, Table 3; Model 3, Table 2; cf., hypothesis 1). Similarly, controlling for proactive personality does not seem to influence the link between industry digital maturity and employees' perception of opportunity (Model 4, Table 3; cf., hypothesis 2). However, the effect of opportunity perception on PSD (cf., hypothesis 2) loses significance ($p < 0.05$, Model 3, Table 2), and its 95% CI [-0.00, 0.18] does not exclude zero when controlling for proactive personality. Finally, the effect of industry digital maturity on employees' threat perception and the effect of perceived threat on PSD remain insignificant and do not change direction when controlling for proactive personality (Model 6, Table 3; Model 3, Table 2; cf., hypothesis 3).

Table 4: Indirect effects of industry digital maturity on proactive skill development through individual interpretations of digitization

Without proactive personality as control variable				
	Effect	**Boot SE**	**LL 95% CI**	**UL 95% CI**
TOTAL	0.07	0.01	0.04	0.10
Controllable	0.05	0.01	0.03	0.07
Opportunity	0.02	0.01	0.01	0.04
Threat	0.00	0.01	-0.01	0.01
With proactive personality as control variable				
	Effect	**Boot SE**	**LL 95% CI**	**UL 95% CI**
TOTAL	0.06	0.01	0.04	0.08
Controllable	0.04	0.01	0.02	0.06
Opportunity	0.02	0.01	-0.00	0.03
Threat	0.00	0.01	-0.01	0.01

Note. $N = 720$; bootstrap samples = 5,000.

SE = standard error; LL = lower limit; CI = confidence interval; UL = upper limit.

2.6 Discussion

This study recognizes the importance of employees' self-initiated skill development at work, particularly in the face of digital transformation. Hence, it developed and tested a model that proposes a positive indirect effect of industry digital maturity on employee PSD, which is strengthened if employees interpret the digitization as controllable, as an opportunity and as a threat to their organization. Furthermore, this study proposed that proactive personality strengthens the indirect effects of industry digital maturity on PSD by supporting the effects of industry digital maturity on employees' interpretations.

As expected, this study found that industry digital maturity facilitates employees' interpretations of digitization as controllable and as an opportunity for their organization and, in turn, employee PSD. However, according to additional regressions with standard errors clustered for industries, the indirect effect between industry digital maturity and PSD via opportunity perception seems to not exist because the link between the interpretation of digitization as an opportunity and PSD is insignificant. Further, additional post hoc analyses suggest that the indirect effect of industry digital maturity on PSD via opportunity perception

(specifically, the link between opportunity perception and PSD) may be driven by proactive personality. Thus, the indirect effect between industry digital maturity and employees' PSD via opportunity perception seems to be less robust than the effect via perceived controllability. In contrast to the hypothesis, this study did not find employees' interpretation of digitization as a threat to their organization to be an indirect effect in the link between industry digital maturity and PSD. Nevertheless, results indicate the expected negative link between industry digital maturity and employees' interpretation of digitization as a threat.

Additionally, results reveal positive direct effects of proactive personality on individual interpretations of digitization as controllable and as an opportunity as well as a negative relation between proactive personality and individual interpretations of digitization as a threat. These effects are as strong as the effects of industry digital maturity. Hence, according to these findings, employees' perceptions of macro-level developments are driven not only by macro-level stimuli but also by individual personalities to a similar degree.

In sum, the findings indicate employees' interpretations of macro-level developments as mechanisms in the link between industry maturity in handling these developments and employees' PSD. At a more general level, in line with CAPS theory (Heslin et al., 2019), the findings indicate that the macro-level context may translate into individual proactive career behavior via individual interpretations of the possible consequences of current macro-level developments for an employing organization.

2.6.1 Theoretical contributions

The findings of the present study contribute to prior research on the role of context in micro-organizational behavior (Johns, 2018), the consequences of digital transformation for the management of organizations (e.g., Cascio & Montealegre, 2016; Colbert et al., 2016; Sousa et al., 2019a) and predictors of self-initiated skill development among employees (e.g.,

Bednall & Sanders, 2017; Ren & Chadee, 2017; Strauss & Parker, 2018; Taber & Blankemeyer, 2015).

First, to contribute to research on the predictors of self-initiated skill development (e.g., Ellingson & Noe, 2017; Strauss & Parker, 2018; Ren & Chadee, 2017; Sousa & Rocha, 2019b), the results of this study indicate that PSD may depend on how employees evaluate developments in the extra-organizational environment. Furthermore, the results of this study suggest that these evaluations may depend on industry maturity in handling these macro-level developments. Hence, this study points to individual perceptions of and subsequent reactions to current developments in organizations' broader environment (cf., Heslin et al., 2019; Mischel & Shoda, 1995, 2008, 2010; Williams & Wood, 2015) as a relevant additional focus for research on self-initiated skill development.

Second, following Johns' (2018) suggestions for future research concerning contextual effects on organizational behavior, this study investigated how a more distal, omnibus contextual cue (specifically, a technology-driven trend) translates into individual behavior. This analysis expands knowledge of the nature of contextual cues that should be considered when examining employee behavior: Prior literature on person-situation interactions has examined mostly within-organizational cues as predictors of individual behavior (Tett & Burnett, 2003). In contrast, the findings in this study point to situational cues that exist outside organizations as interesting antecedents of employees' perceptions and subsequent behavior.

Third, the findings in this study contribute to the growing stream of research on the implications of the digital transformation for organizations and their members: This study identifies links between industry digital maturity, individual interpretations of the digital transformation and subsequent individual behavior. Hence, it suggests research on the effects of digital transformation for individual behavior, particularly individual skill development, as an interesting additional field for research in organizational behavior on the ways of work,

leading, and doing business (Cascio & Montealegre, 2016; Wong & Fieseler, 2018) and the development of individual competence needs (Sousa & Rocha, 2019a; van Laar et al., 2017).

2.6.2   Practical implications

This study has practical implications for organizations that aim to support skill development among their employees, especially in the context of the ongoing digital transformation. Its findings suggest that industry maturity in handling technology-driven developments is positively associated with employees' perceptions of these developments as controllable and as an opportunity and is negatively related to employees' perceptions of such developments as a threat. Furthermore, its results indicate that employees' perceptions of technology-driven developments as controllable and as an opportunity have the potential to support PSD among employees.

Hence, to promote skill development among employees, organizational managers could deliberately design employee communications on the consequences of macro-level trends (such as digital transformation) for their organization. In this regard, they could refer to the actions comparable organizations and industries take to manage these trends. This may influence employee perceptions and thus may support managerial communication goals of facilitating individual self-initiated skill development. Because this study focuses on recent higher education graduates, its results may be of particular relevance for designing human resources practices targeting this group of employees. For example, considering the results, programs that aim for the development and retention of "generation Y and Z" might include discussions of how the employing organization may benefit from ongoing macro-level trends and developments to strengthen employees' perceptions of such developments as an opportunity and as controllable for the organization. Based on the results of this study, this may strengthen employees' willingness to proactively and continuously enhance their knowledge and skills.

Notably, the results from post hoc analyses suggest the possibility that proactive personality may play a role in the positive relation between employees' opportunity perception and PSD but not in the positive link between employees' control perception and PSD. Hence, designing organizational communication strategies aimed at facilitating employees' interpretations of controllability rather than of opportunity may be most effective in enhancing PSD among a broad variety of employees. Moreover, organizations seeking employees who develop their skills proactively could aim to recruit individuals with proactive personalities.

2.6.3 Limitations and suggestions for future research

This study has some limitations that may be addressed in future research. It cannot fully rule out problems of common method variance because it collected single-source, self-reported data. However, this study investigated PSD among employees, a voluntary behavior that is not necessarily fully in the awareness of colleagues or supervisors (Orvis & Ratwani, 2010). Furthermore, other-ratings of employee proactivity may include observational or egocentric biases (Parker, Williams, & Turner, 2006). In these cases, self-ratings rather than other-ratings have been argued to be advantageous (Orvis & Ratwani, 2010; Parker et al., 2006). Moreover, this study employed analytical methods (Podsakoff et al., 2003) to reduce the likelihood of common method bias. Nevertheless, it supports the suggestion of Ren and Chadee (2017) to collect data from multiple sources to avoid biases resulting from self-reports, such as data from colleagues and supervisors.

As in similar empirical investigations of proactive skill development (e.g., Pajic et al., 2018; Ren & Chadee, 2017; Taber & Blankemeyer, 2015), the findings of this study are based on cross-sectional data that do not allow us to draw causal inferences. However, building on Spector (2019), there is a substantial reason for choosing a cross-sectional design: it is unknown how long to expect employee perceptions of technology-driven trends to cause

PSD. In such a case when it is unclear which time lags to choose, longitudinal designs risk reaching erroneous conclusions on causal relations (Spector, 2019). Nevertheless, the cross-sectional design provides evidence for causal cases for three (out of four) elements (Spector, 2019). First, it establishes relations between industry digital maturity (a rarely examined macro-level cue in organizational behavior), employee interpretations and PSD. Second, this it rules out alternative explanations for covariation through the use of control variables at the individual and organizational levels (specifically, proactive personality, age, prior learning experience operationalized as highest educational degree and final grade, actual number of working hours and firm size). Third, this study provides a previously unknown explanatory mechanism for the link between industry digital maturity and PSD or for the translation of macro-level factors into micro-behavior. Nevertheless, this research encourages further studies using longitudinal study designs to explore the temporal dynamics of proactive skill development.

To enhance the understanding of the role of context as a driver of employee skill development, this work encourages future research to systematically examine different types of situational cues (e.g., proximate versus distal, omnibus versus discrete, social versus task based; Johns, 2018) as predictors of skill development. Moreover, future studies may benefit from examining why some evaluations of a context facilitate skill development while others do not. Specifically, these studies could identify the mechanisms that explain which particular interpretations predict skill development (besides controllability, opportunity and threat—for instance, complexity, familiarity, feasibility, and urgency; Dutton et al., 1989).

Finally, empirical findings based on data from a sample of employees more diverse in terms of age and job experience that assess whether the findings of this research from a sample of higher education graduates hold for older and more experienced employees would be appreciated.

2.7   Conclusion

In line with CAPS theory, the results of this study suggest that macro-level, technology-driven developments may influence employee PSD indirectly via employees' interpretations of the possible consequences of these developments for their organization. Specifically, this study finds positive indirect effects of industry digital maturity on employee PSD via interpretations of digitization as controllable and as an opportunity for their employing organization. Because employee skill development is increasingly needed, especially in the context of dynamic macro-level developments, this research encourages further studies that expand knowledge of how developments in the broader organizational environment influence individual skill development.

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3 Understanding employees' engagement in paradoxical work activities: Diversity of professional experience supports individual ambidexterity

3.1 Abstract

Currently, several jobs require employees to engage in paradoxical work activities such as exploration and exploitation (i.e., individual ambidexterity). Hence, empirical evidence on the personal characteristics that enable employees to meet these demands is relevant for human resources and management researchers and practitioners. This study offers new insights for research on individuals' engagement in paradoxical activities by investigating employees' cognitive resources, namely, diversity of professional experience, as drivers of individual ambidexterity. The findings of this study are based on nested survey data that were collected over four consecutive years from doctorate holders who graduated from German universities. The sample consists of 1,981 participants with professional experience in a broad range of occupational fields, firms and industries. Counter to the hypotheses, analyses reveal linear rather than inverted U-shaped relations between employees' diversity of professional experience and paradoxical work activities. In particular, the results from multivariate regressions and fuzzy-set Qualitative Comparative Analyses indicate that country variety (not firm or industry variety) is key to individual ambidexterity. The contributions to research on employees' engagement in paradoxical work activities and individual ambidexterity are discussed, together with the practical implications for human resources and individuals' self-directed career management.

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3.2   Introduction

The increased pace of technological changes, pandemics, economic downturns and unpredictable political events, inter alia, render current work contexts volatile and complex (e.g., Barley, Bechky, & Milliken, 2017; Eggers & Park, 2018; Fergnani, in press). One consequence of this is that organizations must constantly adapt their business models and work processes to changing demands in their environment and, at the same time, maintain efficiency in their daily business operations (e.g., in view of digitalization, Cascio & Montealegre, 2016). Hence, employees, particularly highly qualified employees, often need to meet paradoxical work demands (Schad, Lewis, Raisch, & Smith, 2016; Smith & Lewis, 2011; Smith & Tushman, 2005), such as demands to explore new opportunities and exploit existing resources (Gibson & Birkinshaw, 2004; Parker, 2014; Schultz, Schreyoegg, & Reitzenstein, 2013; Tempelaar & Rosenkranz, 2017).

Another consequence of volatile work contexts is that individual employees need to manage their careers in flexible and self-directed ways (Sullivan & Baruch, 2009). In this regard, career research shows that contemporary employees make several career decisions, as they tend to work in multiple jobs, firms and countries during their work life (e.g., Biemann, Fasang, & Grunow, 2011; Chudzikowski, 2012; Frey & Osborne, 2017). Thus, considering the growing demands for both employees' engagement in paradoxical work activities and self-directed career management, this study investigates the relation between employees' professional experience and their engagement in paradoxical work activities.

There are two related streams of research that seek to understand individuals' engagement in paradoxical work activities. On the one hand, there is a growing body of research on individuals' ability to engage in such activities (Schad et al., 2016). On the other hand, research on determinants of individual ambidexterity (i.e., individuals' orientation towards pursuing both explorative and exploitative activities within a certain time span; Mom,

Frans, van den Bosch, & Volberda, 2009) is emerging. This literature has developed the proposition that the diversity of professional experience individuals have affects the extent to which they engage in two different versus only one kind of work activities (Bonesso, Gerli & Scapolan, 2014; Kang & Snell, 2009). Empirical evidence relevant to this proposition is limited to the findings of one study showing that organizational tenure is a driver and functional tenure is an inhibitor of managers' ambidexterity (Mom, Fourné, & Jansen, 2015).

Drawing from these two literature streams (on individuals' engagement in paradoxical activities and individual ambidexterity), this study hypothesizes and empirically examines the relation between diversity of professional experience and employees' engagement in paradoxical work activities using the example of individual ambidexterity. Specifically, it examines different dimensions of diversity of professional experience (namely, firm, industry and country variety) that arguably reflect different cognitive resources and motivations for behavior. This study supplements a net-effect analytic approach (multivariate regressions) with configuration-based analyses (fuzzy-set Qualitative Comparative Analysis, fsQCA) to reveal what independent effects and combinations of the different facets of professional experience are associated with the outcome of interest.

This study seeks to enrich the research on employees' engagement in paradoxical activities (e.g., Jarzabkowski & Lê, 2017; Lewis & Smith, 2014; Miron-Spektor, Ingram, Keller, Smith & Lewis, 2018) by expanding its set of examined theories and predictor variables (cf., Schad et al., 2016) through research on diversity of professional experience (cf., Quiñones, Ford, & Teachout, 1995). Moreover, from a methodological perspective, the combination of multivariate regressions and qualitative comparative analysis (QCA) is, to the best of the author's knowledge, a new analytic approach in this literature, although this mixed methods approach has proven fruitful in several other areas of management research (Misangy et al., 2017). Furthermore, this study contributes to the research on the predictors of

individual ambidexterity by providing empirical evidence that accounts for employees' full work history as a determinant of individual ambidexterity, as suggested by Mom and coauthors (2015).

Providing empirical evidence on the relation between diversity of professional experience and paradoxical work activities is relevant for human resources managers and team leaders who want to know which individual-level attributes increase the likelihood that highly qualified employees will engage in paradoxical work activities, a common demand in the current work context. Additionally, empirical findings on this question can indicate to (highly qualified) employees what kinds of professional experience could enable them to fulfill current work demands.

The following sections of this chapter review the literature and derive hypotheses. Then, they describe the sample and methods used in this study, present and discuss its findings and conclude.

3.3 Theory

3.3.1 Employees' engagement in paradoxical work activities

According to Smith and Lewis (2011), "engagement in paradoxical work activities" means that employees participate in contradictory but interrelated work activities within a certain time span. Thus, employees who engage in paradoxical work activities switch between contradictory activities according to contextual demands (Adler, Goldoftas, & Levine, 1999; Bidmon & Boe-Lillgraven, in press).

On the one hand, prior research on individuals' engagement in paradoxical activities points to cognitive capabilities (e.g., integrative complexity and paradoxical thinking) and behavioral capabilities (e.g., behavioral integration and behavioral complexity) as facilitators of this outcome (Schad et al., 2016). For example, theory proposes that individuals can

enhance their ability to manage paradox by, for instance, learning to pay attention to different aspects of their environment, developing integrative ways of categorizing external stimuli and learning to control their emotions (Keller & Chen, 2017). On the other hand, prior research suggests that individuals' experience influences their cognitive schemas and, in turn, their behavioral repertoires (Karhu & Ritala, 2020; Westenholz, 1993). Therefore, in the following, this study theorizes that professional experience should contribute to explaining employees' engagement in paradoxical work activities.

3.3.2 U-shaped relations between diversity of professional experience and paradoxical work activities

According to the cognitive framing perspective, employees' past experience functions as a lens through which they perceive and interpret situations and, in turn, respond to them (e.g., Karhu & Ritala, 2020; Westenholz, 1993). Thus, considering professional experience as a proxy for individuals' cognitive resources for behavior, a relation between employees' professional and their (actual) paradoxical work activities seems plausible. Specifically, research on individuals' capacity to engage in paradoxical activities suggests that paradoxical thinking (also called "paradoxical framing", "discursive" and "complex thinking" or the "both-and perspective"), holistic and dynamic decision making and the ability to maintain one's integrity despite conflicting expectations are relevant individual-level attributes for handling paradox (Lewis & Smith, 2014; Schad et al., 2016).

Paradoxical thinking can be described as a process by which individuals develop a new relation to their situation by giving less meaning to existing dimensions and being open to new ones (Westenholz, 1993). This involves recognizing both facets of dualities and exploring the synergies between them (Smith & Lewis, 2011). Regarding the question of how employees develop this cognitive capacity, research on the link between cognition and engagement in paradoxical activities proposes that humans develop new or expand existing

cognitive schemas when they develop an understanding of new contexts (Karhu & Ritala, 2020; Westenholz, 1993). In this regard, research on newcomers' socialization within organizations suggests that changing organizations is associated with assimilating to new roles and settings, for instance, by making sense of unfamiliar situational cues and expected behaviors (Louis, 1980). These activities are associated with an expansion of existing cognitive schemas (e.g., Keller & Chen, 2017). Hence, employees who have gained professional experience in different contexts arguably have relatively broad work-related knowledge and multiple cognitive schemas. These should allow them to perceive and categorize diverse perspectives and, thus, to think and act paradoxically (cf., Smith & Lewis, 2011).

Moreover, during the course of their careers, employees with diverse professional experience are likely to have developed an understanding of several new work settings by relating unfamiliar phenomena to their previously developed cognitive schemas (Harris, 1994). Hence, such employees should be able to take a relatively broad, multifaceted and flexible perspective on situations (Dearborn & Simon, 1958) and identify similarities among them (Gary, Wood, & Pillinger, 2012). Therefore, this study argues that a diverse professional experience facilitates employees' ability to make decisions in the holistic and dynamic way required for paradoxical work behaviors.

Additionally, employees with diverse professional experiences should identify themselves with different job roles (Ashforth, Kreiner, & Fugate, 2000). Hence, they arguably maintain their integrity when confronted with contradictory expectations or priorities such as exploration and exploitation (cf., Tempelaar & Rosenkranz, 2017), which, in turn, should facilitate their engagement in such paradoxical work activities.

Although these arguments suggest that a more diverse professional experience supports engagement in paradoxical work activities, it is questionable whether more diversity

consistently leads to higher levels of paradoxical work behavior. In the exploration and exploitation paradox (Karhu & Ritala, 2020), for example, very frequent changes in work context may reflect a strong personal preference for new experience and a tendency to explore new opportunities (possibly driven by the personality trait openness to experience; Bledow, Frese, Anderson, Erez, & Farr, 2009; Keller & Weibler, 2015). If this is the case, employees should prefer to engage in one type of activity (in the example given, exploration) rather than in paradoxical activities (both exploration and exploitation). However, professional experience characterized by high diversity could also indicate that employees had to work in different areas, for instance, because they lacked the cognitive capacity to perform job tasks or because they had socioemotional difficulties at work. In this case, it is arguably unlikely that employees will engage in paradoxical work activities, as these tend to be cognitively and emotionally challenging (Smith & Lewis, 2011). Therefore, this study proposes an inverted U-shaped rather than a linear relationship between diversity of professional experience and engagement in paradoxical work activities.

3.3.3 Distinguishing types of professional experience by level of specificity

This study examines three types of professional work experience that vary by the measured level of specificity (Quiñones et al., 1995), namely, firm, industry and country variety. According to Quiñones and coauthors (1995), different levels of measurement specificity can capture unique dimensions of employees' overall work experience, and thus, their influence on behavior may differ.

Firms differ in their resources and capabilities, culture, incentive systems, governance and performance expectations (Crossland, Zyung, Hiller, & Hambrick, 2014). Hence, when employees change firms, they need to adapt to a new organizational culture, which involves understanding members' roles within the organization, leadership styles and performance expectations and the organization's mission (e.g., Crossland et al., 2014; Louis, 1980).

Industries vary, for instance, in their munificence, in their regulatory constructions and in their levels of competitiveness, dynamism and uncertainty (Crossland et al., 2014; Datta, Guthrie, & Wright, 2005). Hence, when changing industries (and firms), employees encounter differences in the extraorganizational environment, such as new stakeholder demands, competitors, market dynamics and external regulations (Crossland et al., 2014). They need to understand and personally cope with these (in addition to firm-related changes) in order to perform in their new work context.

Employees who work in different *countries* need to adjust socioculturally in multiple areas of life (Takeuchi, Wang, & Marinova, 2005) and need to accept relatively high levels of institutional and cultural distance (Kumarika Perera, Yin Teng Chew, & Nielsen, 2017). They are exposed to relatively ambiguous situations and must undergo intense socialization and sensemaking processes to understand an unfamiliar national culture and society (Godart, Maddux, Shipilov, & Galinsky, 2015).

This study assumes that these three types of professional experience (firm, industry and country variety) develop (at least to some extent) the same kinds of cognitive and socioemotional capabilities for engaging in paradoxical activities (e.g., flexible thinking, recognition of synergies, emotional control) and should therefore foster engagement in paradoxical activities. Hence, as depicted in Figure 1, this study hypothesizes that

> **H1.** *There is an inverted U-shaped relation between firm variety and employees' paradoxical work activities.*

> **H2.** *There is an inverted U-shaped relation between industry variety and employees' paradoxical work activities.*

> **H3.** *There is an inverted U-shaped relation between country variety and employees' paradoxical work activities.*

Figure 1: Diversity of professional experience as a predictor of paradoxical work activities
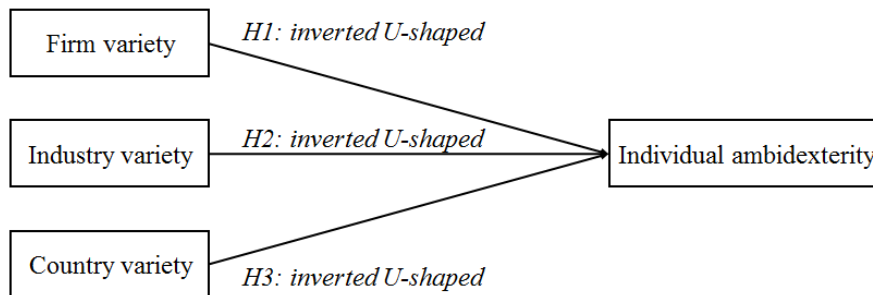
Furthermore, this study reasons that these three levels of measurement specificity reflect different levels of complexity of professional experience with regard to the cognitive sensemaking and socioemotional challenges employees have managed as organizational newcomers (cf., Louis, 1980). For example, as indicated above, when changing industries within a country, employees are expected to primarily develop an understanding of different customer demands, competitors and market regulations. When changing countries, they primarily need to make sense of another national culture (involving different languages and new ways of social interaction). Hence, this study argues that individuals need to make sense of a broader variety of situational cues to understand a setting if contextual changes are less specific (i.e., are quite complex), such as when they begin working in a new country. In contrast, they need to make sense of fewer situational cues to understand a situation if contextual changes are more specific (i.e., less complex), as in the case of moving to a different industry. Following Quiñones and colleagues (1995), firm variety should reflect the highest and country variety the lowest level of specificity (i.e., the lowest and highest level of complexity, respectively).

The less specific (i.e., more complex) employees' professional changes are, the more diverse the cognitive schemas that employees develop should be (cf., Karhu & Ritala, 2020; Westenholz, 1993). As the structure of individuals' cognitive schemas should be relevant for understanding and engaging in paradoxical activities (Smith & Lewis, 2011; Smith &

Tushman, 2005; Westenholz, 1993), this study also proposes that the effect strength of diversity of professional experience on paradoxical work activities varies by the level of specificity at which diversity of professional experience is measured. Therefore, this study hypothesizes:

> **H4.** *The effect strength of firm, industry and country variety on paradoxical work activities varies by level of specificity such that the effect of country variety is stronger than the effects of industry and firm variety.*

As indicated above, different levels of specificity in measures of professional experience should capture different aspects of cognitive and behavioral capabilities (cf., Quiñones et al. 1995). Specifically, *country variety* should, primarily, develop several different cognitive schemas that reflect quite basic (and in this sense, relatively general) ways of working, communicating and interacting at work. In contrast, *firm variety* should develop, primarily, deep and detailed cognitive structures reflecting firm-specific processes, structures and ways of cooperating with colleagues and supervisors. Thus, the *diversity* of cognitive schema developed should be higher and the *depth* of cognitive schema narrower when contextual changes are less specific (i.e., more complex). The contrary should be true when contextual changes are relatively specific (i.e., less complex). One reason for this is that humans' cognitive receptivity is limited (Dearborn & Simon, 1958). Therefore, when contextual changes are less specific (i.e., relatively complex), fewer details from a particular domain are perceived than when contextual changes are more specific, and thus, fewer details are integrated into individuals' existing cognitive schemas.

Hence, it may be that the different levels of measurement specificity concerning professional experience entail unique cognitive and socioemotional capabilities and different breadths of cognitive schemas that could enable engagement in paradoxical activities. If this is the case, certain combinations of different types of diversity of professional experience

could be beneficial for paradoxical work activities. As there are neither clear theoretical insights nor empirical evidence on this assumption, this study posits the following research question:

> ***RQ1.*** *Which combinations of professional experience (firm, industry and country variety) are associated with employees' engagement in paradoxical work activities?*

The following sections in this chapter describe the data and sample as well as the measures employed in this study.

3.4 Methods

3.4.1 Data and sample

To examine the hypotheses, data from doctorate holders were collected, as it was reasonable to expect that this sample would include mostly employees who can fulfil complex task requirements (Szierbowski-Seibel & Kabst, 2018) and paradoxical job demands such as exploration and exploitation (cf., Schultz et al., 2013). Furthermore, the relative homogeneity of this sample with respect to education should allow to keep relevant individual-level determinants of engagement in paradoxical work activities, especially general cognitive ability and motivation, relatively constant (e.g., Mom et al., 2009; Schad et al., 2016; Sok, Sok, & Luca, 2016; Tempelaar & Rosenkranz 2017).

Specifically, data were collected from participants in a panel survey conducted among doctorate holders from multiple German universities (Brandt, Briedis, de Vogel, Jaksztat, & Teichmann, 2018). The sample was surveyed annually for four consecutive years beginning in 2015, approximately 1.5 years after the participants obtained their degree in 2013 or 2014. Notably, this study used a longitudinal rather than a panel data structure because the information on the dependent variable was collected only in the last survey wave.

Of the 5,409 participants in survey wave one, 2,127 participants completed all four surveys. Ultimately, 1,981 participants provided complete data on all the items relevant to this study and fulfilled the inclusion criteria of being or having been self-employed or employed after graduation. The distribution of men and women is relatively equal in the sample (approximately 52 percent of participants are men), and most participants in the sample were born in Germany (approximately 93 percent). This sample comprises different subject areas (math and natural sciences; health sciences and human medicine; law, economics and social sciences) and a broad range of occupational fields (e.g., health, social services and education; management, accounting, law and administration; natural sciences, geography and informatics). Therefore, this study assumed that this sample exhibited sufficient variance in paradoxical work activities.

At the time of the survey, participants were in different work contexts in terms of, for example, firm size (approximately 8 percent in firms with 1-9 employees, 11 percent in firms with 9-49 employees, approximately 22 percent in firms with 50-499 employees and approximately 59 percent in firms with more than 500 employees) and sector (e.g., approximately 42 percent in consumer discretionary, approximately 26 percent in health care, approximately 17 percent in industrial, approximately 8 percent in materials, approximately 4 percent in information technology and telecommunication, approximately 2 percent in financial and less than 0.5 percent in energy and other sectors). Hence, there was reason to assume that this sample showed sufficient variance in the explanatory factors.

3.4.2 Measures

Paradoxical work activities were examined using the example of individual ambidexterity, as this concept has been described as requiring paradoxical work activities (e.g., Karhu & Ritala, 2020; Lewis & Smith, 2014; Rosing & Zacher, 2017). Specifically, individual ambidexterity reflects the extent to which individuals engage in both explorative

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and exploitative activities at work within a certain time span (Mom et al., 2009). While *exploitative* behaviors aim to extend and refine existing knowledge, competencies and resources, *explorative* behaviors target the development of alternative or new opportunities and the acquisition of broader knowledge (Kauppila & Tempelaar, 2016). As such, individual ambidexterity reflects the extent to which individuals engage in paradoxical work activities (Karhu & Ritala, 2020; Schad et al., 2016) and switch between different mindsets (Bledow et al., 2009). Consistent with the "both-and" perspective on paradox (cf., Lewis & Smith, 2014), this study focuses on combined rather than balanced individual ambidexterity, assuming that exploration and exploitation support each other rather than primarily compete for resources (Cao, Gedajlovic, & Zhang, 2009).

In line with prior research (e.g., Mom et al., 2009, 2015), this study assessed individual ambidexterity in a two-step approach. First, it captured the extent to which individuals engaged in exploration and exploitation using the German translation of the six items of Mom and coauthors' (2009) scale employed by Kobarg, Wollersheim, Welpe and Spörrle (2017, e.g., "To what extent did you, during the last 12 months, engage in work-related activities that can be characterized as follows:" for *exploration*: "Activities requiring quite a lot of personal adaptability"; for *exploitation*: "Activities that you clearly understood how to perform"; all rated from 1 = to a very small extent to 5 = to a very large extent); the full scale is provided in the appendix. Cronbach's alpha for *exploration* was 0.79; for *exploitation* it was 0.77. Second, the measures for exploration and exploitation were multiplied to create the multidimensional construct *individual ambidexterity* (e.g., Kauppila & Tempelaar, 2016; Mom et al., 2009, 2015; Tempelaar & Rosenkranz, 2017). Thus, in this study, employees' engagement in paradoxical work activities is highest when high levels of both exploration and exploitation are reported.

Similar to the construct *career variety* (Crossland et al., 2014), *diversity of professional experience* was assessed as the number of different firms (firm variety), industries (industry variety) and countries (country variety) respondents worked in prior to their current position. Specifically, participants were asked to answer several questions on the attributes of their most important professional positions during and after their doctoral study in survey waves one to four. They were asked to indicate a new professional position each time one of the job characteristics asked about changed, namely, if the number of working hours changed or if their employment contract changed from temporary to open-ended.

Firm variety was coded according to participants' indication of whether a particular job was at employer A, B, C, etc. (eight employers maximum), or represented self-employment.

Industry variety was coded as the number of different industry sectors that participants indicated having worked in. For this, a classification scheme established in graduate surveys conducted by the German Centre for Higher Education Research and Science Studies was used. This scheme distinguishes 30 different industries within the areas of services; education, research and culture; manufacturing, industry and construction; associations, organizations and foundations; and agriculture, forestry, fishing, energy and water management. However, unlike in the assessment of firm and country variety, a maximum of eight different industries could be indicated (as each of the four survey waves asked about the industry for only two rather than a maximum of ten different jobs). However, this survey question should have identified most of participants' industry variety, since participants indicated on average fewer than eight different firms and countries (namely, four firms and one country) and the time between survey waves one and four was just four years.

Country variety was coded as the number of different countries participants reported as the place of work for each professional job they indicated.

As individual-level control variables, this study included *age*, *years of gainful employment* and *gender* (1 = male, 0 = female), in line with prior studies on individual ambidexterity (e.g., Mom et al., 2015; Rosing & Zacher, 2017; Tempelaar & Rosenkranz, 2017) as well as *country of birth* (1 = Germany, 0 = not Germany). To account for different types of work contexts that likely affect individual ambidexterity (e.g., Mom et al., 2015; Rogan & Mors, 2014; Swart, Turner, van Rossenberg, & Kinnie, 2016), this study controlled for employees' *decision-making autonomy* (sample item "The job allows me to make a lot of decisions on my own"; 1 = I do not agree at all to 5 = I fully agree; Cronbach's alpha 0.91) using the German translation of Morgeson and Humphreys' (2006) scale by Stegmann and coauthors (2010). To this end, this study also controlled for *environmental dynamism* (i.e., the dynamism of participants' professional field; sample item: "The environmental demands on us are constantly changing", 1 = I do not agree at all to 5 = I fully agree, Schilke, 2014; Cronbach's alpha 0.82), *firm size* (number of employees: 1-9, 9-49, 50-499, or 500 and more) and *occupational area* (ten distinct fields established by the German Centre for Higher Education Research and Science Studies; Brandt et al., 2018).

To examine research question (RQ1), the data were calibrated as required for fsQCA (Longest & Vaisey, 2008). Applying the direct method of calibration (Ragin, 2008), a score of one indicates "full membership" and a score of zero indicates "full non-membership" (Longest & Vaisey, 2008) in membership sets. This data calibration was guided by the qualitative information represented by these data. Specifically, for *individual ambidexterity* (i.e., the product of *exploration* and *exploitation*), the point for full membership was set at 25 (i.e., the product of the scale means of five), the point for non-membership was set at 9 (i.e., the multiplied scale means of three) and the crossover point was set at 16 (i.e., the product of the scales means of four). For the count variables *firm*, *industry* and *country variety*, full membership was set at 5, non-membership at 3 and the crossover point at 4.

The next section presents the results on the four hypotheses and the research question in this study.

3.5   Results

Table 1 displays the descriptive statistics, internal consistency values and intercorrelations of the variables included in this study. All analyses were conducted using Stata 16.

To assess the discriminant validity of the measures, confirmatory factor analysis (CFA) of all multiple-item constructs, namely, exploration, exploitation, decision-making autonomy and environmental dynamism, were conducted. The four-factor model indicated better model fit (χ^2[71] = 644.43, p < 0.000; χ^2/df = 9.076; CFI = 0.95; RMSEA = 0.07; SRMR = 0.06; Iacobucci, 2010) than any of the possible one- to three-factor models.

Two procedures were applied to identify potential issues of multicollinearity. First, the regression models were constructed in a stepwise fashion. Additionally, the variance inflation factors (VIF) for all the linear regression models were calculated. As the stepwise integration of variables did not meaningfully change the previously included coefficients and their significance, and as all the VIF factors were between 2.15 and 1.01 (cf., Hair, Tatham, Anderson, & Black, 2014), one can assume that multicollinearity is not an important problem in these data.

Table 1: Descriptive statistics, internal consistencies and correlations

	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 IA (multipl.)	21.41	8.35	1.00	49.00	--												
2 IA (diff.)	4.37	1.29	0.00	6.00	0.42***	--											
3 Exploration	4.18	1.38	1.00	7.00	0.81***	0.57***	(0.79)										
4 Exploitation	5.14	1.14	1.00	7.00	0.49***	-0.33***	-0.06**	(0.77)									
5 Firm var.	4.50	2.10	1.00	16.00	0.05*	0.02	0.07**	-0.01	--								
6 Industry var.	1.48	0.64	1.00	4.00	0.03	0.10***	0.13***	-0.13***	0.25***	--							
7 Country var.	1.13	0.35	1.00	3.00	0.13***	0.09***	0.14***	0.01	0.13***	0.05*	--						
8 Env. dyn.	3.30	1.17	1.00	7.00	0.19***	0.22***	0.34***	-0.16***	-0.01	0.09***	0.06**	(0.82)					
9 DMA	3.81	0.92	1.00	5.00	0.27***	0.13***	0.27***	0.06**	-0.01	-0.03	0.05*	0.11***	(0.91)				
10 WExp. (yrs.)	8.47	2.15	2.08	23.92	-0.02	-0.10***	-0.06**	0.08***	0.12***	-0.08***	-0.04	-0.02	-0.02	--			
11 Funct. tenure	0.89	0.75	0.00	5.08	0.01	-0.01	-0.02	0.05*	-0.37***	-0.14***	-0.07**	0.01	0.02	0.05*	--		
12 Age	36.35	4.94	28.58	63.33	-0.03	-0.05*	-0.04*	0.03	0.02	-0.03	-0.04	-0.00	-0.01	0.41***	-0.02	--	
13 Male	0.51	0.50	0.00	1.00	0.08***	0.09***	0.14***	-0.04	-0.04	0.01	0.03	0.15***	0.07**	0.08***	0.02	0.10***	--
14 German	0.93	0.25	0.00	1.00	-0.04*	-0.05*	-0.06**	0.02	0.05*	0.01	-0.12***	0.02	-0.03	0.00	-0.03	-0.01	-0.02

Source. DZHW PhD Panel 2014; own calculations.

Note. N = 2,018. Cronbach's alpha in parentheses. Descriptive statistics for firm size and occupational area available upon request.

multipl. = multiplicative

diff. = difference

var. = variety

Env. dyn. = environmental dynamism

DMA = Decision-making autonomy

WExp. (yrs.) = Years of work experience

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.5.1 Hypothesis testing and analysis of research questions

To test the hypotheses and to examine the research questions, ordinary least squares (OLS) regressions (Models 1a and 1b, Table 2) were conducted in three subsequent steps. First, the control variables were included. Second, the independent variables (firm, industry and country variety) were added as linear terms to the regression model. Third, the squared terms of these independent variables were added to the regression model. In line with earlier studies on individual ambidexterity (e.g., Kauppila & Tempelaar, 2016; Kobarg et al., 2017; Rosing & Zacher, 2017), the regression coefficients and the robust standard errors are reported in the following. This study concludes that regression coefficients are significant if their 95 percent confidence intervals (CI) do not include zero as methodologically established (e.g., Hayes, 2017).

Hypothesis 1 suggests an inverted U-shaped relation between firm variety and paradoxical work activities. Contrary to this hypothesis, the effect of the squared term of firm diversity on individual ambidexterity was not significant.

Hypothesis 2 proposes an inverted U-shaped relation between industry diversity and paradoxical work activities. Inconsistent with this hypothesis, the effect of the squared term of industry diversity on individual ambidexterity was not significant.

Hypothesis 3 proposes an inverted U-shaped relation between country diversity and paradoxical work activities. Contrary to this hypothesis, the squared term of country diversity did not relate significantly to individual ambidexterity. Notably, the regression model with no squared terms shows a significant positive linear effect of country variety on individual ambidexterity (b = 2.12, p < 0.000; 95% CI [1.11, 3.13]; Model 1a, Table 2).

Hypothesis 4 suggests that less specific (i.e., more complex) types of diversity of professional experience exert stronger effects on employees' engagement in paradoxical work activities than more specific (i.e., less complex) types. However, the comprehensive

regression model including firm, industry and country variety with both curvilinear and linear terms did not show any significant coefficients and, thus, does not support this hypothesis (Model 1b, Table 2). Nonetheless, the same model without the curvilinear terms revealed a positive effect of country variety but not of firm and industry variety on individual ambidexterity (Models 1a, Table 2; cf., hypothesis 3). A Wald test on this latter regression model indicates that the effects of country and firm variety as well as country and industry variety are not equal (Prob > F = 0.000 and Prob > F = 0.004, respectively). As the effect of country variety is stronger than the effects of firm and industry variety (Model 1a, Table 2), this study concludes that hypothesis 4 is supported.

Table 2: Results from OLS regressions on individual ambidexterity

	(1a) Multiplicative	(1b) Multiplicative	(2a) Difference	(2b) Difference
Firm var.	0.16	-0.10	0.01	-0.02
	[-0.03, 0.35]	[-0.72, 0.51]	[-0.02, 0.04]	[-0.11, 0.08]
Industry var.	0.40	-1.03	0.10^{*}	0.04
	[-0.18, 0.98]	[-3.53, 1.47]	[0.01, 0.19]	[-0.37, 0.45]
Country var.	2.12^{***}	0.06	0.19^{**}	-0.03
	[1.11, 3.13]	[-7.36, 7.48]	[0.05, 0.33]	[-0.90, 0.84]
Firm var. (sq.)		0.02		0.00
		[-0.03, 0.08]		[-0.01, 0.01]
Industry var. (sq.)		0.39		0.02
		[-0.26, 1.04]		[-0.09, 0.13]
Country var. (sq)		0.65		0.07
		[-1.63, 2.93]		[-0.19, 0.32]
Control variables	yes	yes	yes	yes
Constant	8.35^{***}	11.41^{***}	3.34^{***}	3.60^{***}
	[4.51, 12.19]	[4.90, 17.92]	[2.74, 3.94]	[2.69, 4.51]
Observations	1,981	1,981	1,981	1,981
R^2	0.132	0.133	0.093	0.093
ΔR^2	—	0.001	—	0.000

Source. DZHW PhD Panel 2014, survey waves 1 to 4; own calculations.
Note. 95% confidence intervals in brackets.
   var. = diversity
   sq. = squared
   Results for the control variables available upon request.
   * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Consistent with the findings from the multivariate regressions, the results from fsQCA suggest that country variety is key to individual ambidexterity; employees with this base set

and low levels of firm or industry variety (two different solutions) are likely to show higher levels of ambidexterity at work (overall solution consistency = 0.86; total coverage = 0.17). The following two sections present robust checks and supplementary analyses.

3.5.2 Robustness check

One could argue that the participants in this sample made relevant contextual changes prior to obtaining their doctorate, especially if they grew up in other countries. Therefore, the analyses are repeated, reducing the sample to those who were born in Germany and obtained a German high school diploma (Abitur). The coefficients of the main independent variables did not change in significance or direction with this reduced sample (N = 1,770). Hence, this study concludes that the relations between the diversity of professional experience and individual ambidexterity hold independent of differences in national culture and education in its sample.

3.5.3 Supplementary analyses

Effects on balanced ambidexterity. Some scholars propose that two activities (e.g., exploration and exploitation) compete for resources (Cao et al., 2009). Thus, they operationalize individual ambidexterity as the extent to which individuals *balance* exploration and exploitation (e.g., Keller & Weibler, 2015). To determine whether findings on the link between diversity of professional experience and paradoxical work activities depend on the operationalization of the outcome variable, the multivariate regressions are repeated, operationalizing individual ambidexterity as the absolute difference between respondents' levels of exploration and exploitation (i.e., *balanced ambidexterity*; Keller & Weibler, 2015). The absolute difference ranges from 0 to 6. To facilitate the interpretation of this variable, the difference score was subtracted from seven such that higher values reflect more balanced ambidextrous behavior (cf., Cao et al., 2009; Keller & Weibler, 2015).

This study finds a positive linear (but no curvilinear) effect of *country variety* on balanced ambidexterity (b = 0.19, *p* < 0.01; 95% CI [0.05, 0.33]; Model 2a and 2b, Table 2). Likewise, *industry variety* shows a positive linear (but no curvilinear) effect on balanced ambidexterity (b = 0.10, *p* < 0.05; 95% CI [0.01, 0.19]; Models 2a and 2b, Table 2). In contrast, the results suggest no relation between *firm variety* and balanced ambidexterity (Models 2a and 2b, Table 2).

Regarding the control variables in the full regression models (Models 1b and 2b, Table 2), *males* show higher levels of combined ambidexterity than females (b = 0.99, p < 0.05; 95% CI [0.24, 1.75]), but balanced ambidexterity seems to not be influenced by gender. *Place of birth* seems not to influence combined ambidexterity, but the findings suggest a negative relation between a German origin and balanced ambidexterity (b = -0.21, p < 0.05; 95% CI [-0.39, -0.03]). Likewise, combined ambidexterity seems to be unaffected by *years of work experience*, but individuals seem to show less balanced ambidexterity with increasing years of work experience (b =-0.05, p < 0.001; 95% CI [-0.08, -0.02]). *Environmental dynamism* seems to support individual ambidexterity independent of the operationalization of this outcome (for combined ambidexterity b = 1.24, p < 0.001; 95% CI [0.91, 1.56]; for balanced ambidexterity b = 1.21, p < 0.001; 95% CI [0.16, 0.26]). Likewise, the results indicate that *decision-making autonomy* fosters both types of individual ambidexterity (for combined ambidexterity b = 2.28, p < 0.001; 95% CI [1.85, 2.70]; for balanced ambidexterity b = 1.14, p < 0.001; 95% CI [0.08, 0.24]). Additionally, this study finds that some *occupational areas* (e.g., raw materials production and manufacturing; natural sciences, geography and informatics; and management, accounting, law and administration) have different effects on individual ambidexterity depending on the operationalization of this outcome.

Effects on exploration and exploitation. When examining paradoxical activities as composed of two complementary activities (as in the main analyses in this paper), such activities may be driven by any factor that supports either explorative or exploitative activities if the increase in either behavior is not at the cost of the other behavior (Kauppila & Tempelaar, 2016). To deepen the understanding of the link between the diversity of professional experience and employees' engagement in paradoxical work activities, additional analyses on the diversity of professional experience as antecedents of employees' exploration and exploitation behaviors were performed, the two behaviors together constituting individual ambidexterity. As depicted in Table A1 in the appendix, this study identifies a positive linear (but no curvilinear) relations between firm variety (b = 0.04, $p <$ 0.05; 95% CI [0.01, 0.07]), industry variety (b = 1.19, $p < 0.001$; 95% CI [0.10, 0.28]) and country variety (b = 0.32, $p < 0.001$; 95% CI [0.17, 0.47]) and *explorative* behavior. Further this study finds a negative linear (but no curvilinear) relation between industry variety (but not country and firm variety) and *exploitative* behavior (b = -1.13, $p < 0.01$; 95% CI [-0.21, -0.05]).

Moreover, concerning the effects of the control variables on employees' explorative and exploitative activities, the data suggest that *males* explore more than females (b = 1.15, p < 0.01; 95% CI [0.04, 0.27]) and that *German-born* participants explore less than non-German born participants (b = -1.29, p < 0.05; 95% CI [-0.52, -0.07]). *Environmental dynamism* seems to support explorative behavior (b = 0.34, p < 0.001; 95% CI [0.29, 0.39]) and to inhibit exploitative behavior (b = -0.13, p < 0.001; 95% CI [-0.18, -0.09]). In contrast, *decision-making autonomy* seems to facilitate both explorative (b = 0.36, p < 0.001; 95% CI [0.29, 0.42]) and exploitative behavior (b = 0.09, p < 0.01; 95% CI [0.03, 0.15]). Moreover, the analyses reveal that employees indicate different levels of engagement in explorative and exploitative behaviors depending on their *occupational area*. For instance, employees in the

architecture, building services engineering and construction; commercial services, trade, sales, and tourism; and military areas report more engagement in explorative activities than employees in the area of health, social services and education. Employees in all occupational areas except agriculture, forestry, animal husbandry and horticulture and commercial services, trade, sales and tourism indicate fewer exploitative activities than employees in the area of health, social services and education.

The next sections summarize these findings, outline the theoretical and practical implications of this study, discuss its limitations and suggest directions for future research.

3.6   Discussion

Currently, highly qualified employees need to engage in paradoxical work activities within a certain time span, and they need to build their careers in a self-directed way. This study proposes and empirically tests curvilinear relations between different dimensions of professional experience (namely, firm, industry and country variety) and employees' paradoxical work activities (precisely, individual ambidexterity). Further, this research examines which combinations of these different kinds of professional experience are associated with paradoxical work activities.

Contrary to the hypotheses, this study found (positive) linear rather than curvilinear independent effects of diversity of professional experience on paradoxical work activities. In this regard, country diversity seems to be the strongest predictor, suppressing the individual effects of firm and industry variety. Consistently, supplementary results from fsQCA analyses indicate that country variety is essential for the outcome of interest (specifically, combinations of high country variety and either low firm or industry variety were consistently associated with individual ambidexterity). Further, supplementary analyses reveal that the positive link between country variety and individual ambidexterity is independent of the operationalization of individual ambidexterity as a combination or balance

of explorative and exploitative activities. Moreover, supplementary analyses reveal that diversity of professional experience drives employees' explorative but not exploitative activities. In sum, these findings indicate that diversity of professional experience, especially country variety, may support employees' engagement in paradoxical work activities.

3.6.1 Theoretical contribution

The present study contributes primarily to research on individuals' engagement in paradoxical activities (e.g., Miron-Spektor et al., 2018; Smith & Lewis, 2011) by theorizing and empirically establishing diversity of professional experience as a driver of engagement in paradoxical work activities, expanding the set of known predictor variables of this outcome. In particular, the finding that country variety (rather than firm or industry variety) is key for individual ambidexterity should be informative for scholars suggesting that individuals' cognitive and socioemotional resources are determinants of paradoxical activities (cf., Schad et al., 2016). For them, this study provides empirical evidence regarding an observable individual-level attribute that could function as a predictor in a mediation model explaining employees' engagement in paradoxical work activities with diversity of professional experiences as the direct predictor and cognitive and socioemotional resources as mediators (cf., Karhu & Ritala, 2020; Westenholz, 1993). Further, this study draws attention to the consequences of operationalizing paradoxical work activities in different ways, namely, as combined or balanced activities.

Additionally, the empirical findings in the present study should be of interest to scholars studying the determinants of individual ambidexterity. This is because they provide insights into individuals' work history as an antecedent of this outcome, which has been theoretically proposed (Bonesso et al., 2014) and identified as a topic for further study (Mom et al., 2015) but has rarely been systematically examined. Specifically, this study introduces a way of measuring work experience that has not been employed in individual ambidexterity

research before (namely, measures of specificity, Quiñones et al., 1995) and provides first evidence that employees with a diverse professional experience are more likely to *combine* exploration and exploitation. Likewise, the results from supplementary analyses in this study support findings from Bonesso and colleagues (2014) by suggesting that employees with diverse professional experience also tend to *balance* exploration and exploitation. In particular, less specific (i.e., more complex) changes in work contexts seem to be more relevant for employees' ambidextrous behavior than more specific (i.e., less complex) changes in work contexts. Finally, this study links research on individual ambidexterity with a relevant classification of professional experience (Quiñones et al., 1995) that allows the development of a more nuanced understanding of the role of professional experience in individual ambidexterity.

3.6.2   Practical implications

This study has practical implications for organizations that need employees who engage in paradoxical work activities (especially exploration and exploitation) and for highly qualified employees who need to act in a self-directed way to enhance their careers. It indicates that diversity of professional experience, especially country variety, supports individual ambidexterity. Hence, this study points to particular human resources development practices organizations might employ to foster in employees a favorable disposition toward paradoxical work activities. These are international assignments and, to a lesser extent, hiring candidates from other industries. Likewise, highly qualified employees can learn from this study that pursuing professional experience in different countries and industries has the potential to enable their engagement in paradoxical work activities (as is currently often required by employers).

3.6.3 Limitations and suggestions for further research

This study has a number of limitations that should be addressed in future research. First, its sample is limited to highly qualified employees, namely, doctorate holders. Therefore, future research that examines whether the findings in this study hold in a sample more varied in terms of qualifications and related job requirements would be welcome.

Second, the dimensions of professional experience investigated in this study are limited to firm, industry and country variety. Prior research on determinants of paradoxical work experience suggests that factors such as access to resources, social networks and task structure influence individual ambidexterity (e.g., Mom et al., 2009; Parker, 2014; Tempelaar & Rosenkranz, 2017). Thus, there is reason to assume that diversity of experience in these job attributes, for example, occupational and functional diversity, could influence individual ambidexterity. Therefore, future research could fruitfully examine additional dimensions of professional experience to reveal which operationalizations of professional experience predict employees' engagement in paradoxical work behaviors (cf., Quiñones et al., 1995). As prior research has shown that the operationalization of professional experience matters (Quiñones et al., 1995), future studies could examine whether the findings in this study hold for other (e.g., learning and performing) types of paradoxical work activities.

Third, the measures of diversity of professional experience cover only the time from the beginning of participants' doctoral studies until approximately four years after their graduation. Thus, they do not include the professional experience participants might have gained between their graduation with a master's degree and the beginning of their doctoral studies. Hence, future studies using measures of professional experience that consider individuals' full work history should be appreciated. Furthermore, considering that the findings in this work indicate that the complexity of contextual changes matters for the prediction of individual ambidexterity, it calls for future studies that measure diversity of

professional experience not only quantitatively (as in the present study) but also qualitatively. For example, a quantitative measure of country variety could be complemented by a measure based on Hofstede's (1991) cultural dimensions.

Fourth, this study lacks theoretical and empirical insights into *how* diversity of professional experience relates to employees' engagement in paradoxical work activities. Thus, a fruitful path for future studies could be to examine the mechanisms of this link. Based on existing theory and empirical evidence from paradox research, relevant mechanisms could be those reflecting different cognitive processes (e.g., paradoxical thinking and sensemaking; cf., Schad et al., 2016).

Fifth, it remains for future research to examine under which contextual conditions employees' professional work experience transforms into paradoxical (e.g., ambidextrous) behavior at work. Studies on this question could build on theory proposing that employees' professional experience needs contextual stimuli to translate into behavior (Ployhart & Molinerno, 2011) and that contextual factors combine with individual-level attributes to produce ambidextrous behavior (Kang & Snell, 2009). In this regard, research on individual ambidexterity suggests, for instance, that characteristics of individuals' job tasks (e.g., Mom et al., 2009; Rogan & Mors, 2014; Tempelaar & Rosenkranz, 2017), different types of leadership (Kauppila & Tempelaar, 2016; Keller, & Weibler, 2014, 2015; Rosing, Frese, & Bausch, 2011; Yu, Patterson, & de Ruyter, 2013; Zacher, Robinson, & Rosing, 2016), human resources practices (Lee & Meyer-Doyle, 2017; Prieto-Pastor & Martin-Perez, 2015) and organizational structure and culture (Ajayi, Odusanya, & Morton, 2017) may act as boundary conditions of paradoxical (ambidextrous) behavior.

3.7   Conclusion

This study expands the research on antecedents of employees' engagement in paradoxical work activities by hypothesizing and examining diversity of professional

experience as a predictor of individual ambidexterity. Specifically, it finds that a diverse professional experience supports this behavior in a linear (but not in a curvilinear) way, with country variety being a stronger driver of individual ambidexterity than industry and firm variety. As contemporary organizations need employees who engage in paradoxical work activities (such as exploration and exploitation) and professional experience is a theoretically reasonable and observable individual-level characteristic, the present study encourages further research that expands the empirical knowledge on the links between these two constructs.

3.8   References

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3.9   Appendix

3.9.1   Individual ambidexterity scale

In welchem Maß sind Sie in den letzten 12 Monaten folgenden arbeitsbezogenen Tätigkeiten nachgegangen?   *1 in sehr geringem Ausmaß – 5 in sehr hohem Ausmaß*

Exploitation

- Ausmaß der Tätigkeiten, mit denen ich mich bereits auskenne
- Tätigkeiten, bei denen klar war, wie diese auszuführen sind
- Tätigkeiten, die ich mit meinem vorhandenen Wissen ausführen konnte
- Tätigkeiten, bei denen ich auf frühere Erfahrungen zurückgreifen konnte

Exploration

- Ausmaß der Tätigkeiten, die von bereits bekannten Vorgehensweisen abweichen
- Suche nach neuen Herangehensweisen an meine Aufgaben
- Bewertung verschiedener Möglichkeiten, wie ich meine Aufgaben erledigen kann
- Tätigkeiten, bei denen ich nicht wie gewohnt vorgegangen bin, sondern mich stark angepasst habe

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Table A1: Results from OLS regressions on explorative and exploitative work activities

	(1a) Exploration	(1b) Exploration	(2a) Exploitation	(2b) Exploitation
Firm var.	0.04[*]	0.00	0.01	0.05
	[0.01, 0.07]	[-0.10, 0.10]	[-0.01, 0.04]	[-0.03, 0.14]
Industry var.	0.19[***]	0.11	-0.13[**]	-0.41[*]
	[0.10, 0.28]	[-0.30, 0.52]	[-0.21, -0.05]	[-0.74, -0.08]
Country var.	0.32[***]	-0.28	0.09	0.34
	[0.17, 0.47]	[-1.38, 0.82]	[-0.04, 0.22]	[-0.55, 1.22]
Firm var. (sq.)		0.00		-0.00
		[-0.01,0.01]		[-0.01, 0.00]
Industry var. (sq.)		0.02		0.08
		[-0.09, 0.13]		[-0.01, 0.16]
Country var. (sq.)		0.19		-0.08
		[-0.15, 0.53]		[-0.34, 0.19]
Constant	1.42[***]	1.97[***]	5.06[***]	4.99[***]
	[0.80, 2.04]	[0.96, 2.99]	[4.53, 5.59]	[4.12, 5.86]
Observations	1,981	1,981	1,981	1,981
R^2	0.213	0.214	0.087	0.089
ΔR^2	—	0.001	—	0.001

Source. DZHW PhD Panel 2014; own calculations.

Note. 95% confidence intervals in brackets.

    var. = diversity

    sq. = squared

    Results for the control variables (included in all models) available upon request.

    [*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$.

4 Early career professionals' innovative work behaviors: The combination of educational depth and team exploration climate is key for idea generation

4.1 Abstract

Employers expect higher education graduates to contribute towards innovation. In this aim, they try to establish team climates that support innovative work behaviors (IWB) and look increasingly for "T-shaped" professionals who have both cross-disciplinary and specialized knowledge and skills. At the same time, higher education programs offering such a T-shaped education are on the rise. Yet, empirical evidence on how disciplinary breadth and depth of study programs contribute to IWB is scarce. This study addresses this gap, building on and extending prior research on links between knowledge breadth and depth, team climates and IWB. Results from linear regression and fuzzy-set qualitative comparative analyses of a sample of 1,358 quite recent higher education graduates indicated that disciplinary breadth and depth of higher education do not have any independent effects on IWB, but may contribute to idea generation in different combinations with team exploration and team exploitation climate. Empirical and practical implications for future research are discussed.

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Ostmeier, E.; Strobel, M.; & Welpe, I. M. (15.11.2018). *Graduates' Innovation Behaviors at Work - A Matter of Educational Breadth and Depth?* 21st Century Education Forum @Harvard. 21st Century Education Forum, Boston (USA).

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4.2   Introduction

Employees' innovative work behaviors (IWB) are essential for organizations' longer-term competitiveness and survival (Anderson, Potočnik, & Zhou, 2014; Yuan & Woodman, 2010). Specifically, higher education graduates are expected to contribute to organizational innovation (Bergmann, Geissler, Hundt, & Grave, 2018) and tend to be rewarded therefore with higher incomes (Paul, 2011). Hence, the capability to behave innovatively is an important outcome of graduate education (Martín, Potočnik, Fras, 2017; van der Velden, 2013; Vila, 2019). Yet, empirical evidence shows that level of formal education and field of study influence employees' innovative performance (Potočnik, Anderson, & Latorre, 2015; Vila, Perez, & Coll-Serrano, 2014; Zwick, Frosch, Hoisl, & Harhoff, 2017). However, the knowledge on how different profiles of graduate education, specifically, the disciplinary breadth and depth of education, affect early career professionals' IWB is fairly limited (cf., Vila, 2019).

This gap in extant research is unfortunate as research on individual innovation suggests that teaching and training at educational institutions may foster individuals' cognitive resources for innovative behavior (Chen, Li, Li, Zheng, & Dong, 2013; Vila et al., 2014; Vila, Pérez, & Morillas, 2012). Several researchers put the need for multi-disciplinary education forward (e.g., Bardecki, 2015; Davies & Devlin, 2010; Nichols, 2017; Terjesen & Politis, 2015) and higher education institutions develop more multi-disciplinary study programs (e.g., Jacob, 2015; Lyall, Meagher, Bandola, & Kettle, 2015). However, the empirical understanding of what these trends in the design of study programs imply for early career professionals' IWB is incomplete. Furthermore, scholars suggest the recruitment of higher education graduates as an effective way to support innovations within organizations (Van der Velden, 2013; Vila et al., 2014). From a practical perspective, disciplinary breadth and depth of study programs are typically observable characteristics in job applications and,

thus, may quite easily be used as a selection criterion. Considering current trends in higher education and organizations' needs for employees who drive innovation, this study argues that there is need to better understand what kind of higher education fosters early career professionals' IWB.

Scholars and practitioners have proposed that possessing both broad and deep (i.e., T-shaped) knowledge and skills at the same time is beneficial to innovative behavior (Demirkan & Spohrer, 2015, 2018; Tsai & Huang, 2008; Lee & Choi, 2003; Wang, Lin, Yan, & Cui, 2017). Empirical evidence suggests breadth and depth of knowledge as functional for innovative performance (Boh, Evaristo, & Ouderkirk, 2014; Leahey, Beckman, & Stanko, 2017; Sosa, 2011; Wang et al., 2017). Remarkably, these studies focus on knowledge acquired through practical experience in different job roles and functions. Hence, knowledge acquired during institutionalized education, which should considerably determine early career professionals' cognitive resources for behavior, is barely understood empirically in relation to IWB.

This study addresses this research gap, as earlier research suggests that the knowledge structures humans develop through institutionalized education differ from the knowledge structures humans develop through practical work experience regarding the complexity and interrelatedness of their attributes (Kinchin, 2016). Hence, research findings on the link between largely experience-based knowledge structures and individual innovation (e.g., Boh et al., 2014; Leahey et al., 2017; Wang et al., 2017) might not be indicative of the relationship between largely education-based knowledge structures (arguably those of higher education graduates) and individual innovation. Thus, considering the importance of higher education graduates' contributions to innovation within organizations (Martín et al., 2017; Vila, 2019) and the trends in the development of study programs in higher education mentioned above (e.g., Jacob, 2015; Lyall et al., 2015), this study argues that empirical insights on the role of

cross-disciplinary and specialized study programs for early career professionals' IWB is relevant.

To addresses this research gap, this study examines the relations between *educational breadth* and *educational depth* (i.e., cross-disciplinary and specialized education respectively) and different IWB. Further, it examines these relations independently and jointly with key attributes of organizations' social work contexts, namely, team exploration and team exploitation climate (Hirst, van Knippenberg, Zhou, Zhu, & Tsai, 2018). To this end, this study builds on extant research on the relationship between the experience-based knowledge structures and individual innovation (e.g., Leahey et al., 2017; Mannucci & Yong, 2018; Wang et al., 2017) as well as on joint effects of individual-level and situational factors on individual innovative behavior (e.g., van Knippenberg & Hirst, 2015). Hence, this work contributes to prior research as follows.

Firstly, this study enhances research on the kinds of university study programs that foster early career professionals' innovative behavior at work (Paul, 2011; Van der Velden, 2013; Vila, 2019). It is, to the best of the author's knowledge, the first study to conceptualize and empirically examine the roles of educational breadth and depth for university graduates' innovative behaviors at work in this literature. Further, by applying the person-in-situation perspective (van Knippenberg & Hirst, 2015), this work adds a theoretical perspective and related empirical findings to this research stream.

Secondly, this study expands the scope of research on IWB (Janssen, 2000; Hammond, Neff, Farr, Schwall, & Zhao, 2011; Zwick et al., 2017) by introducing and empirically investigating the concepts of educational breadth and depth in relation to IWB. Furthermore, by investigating the quite recently established concepts team exploration and team exploitation climate (Hirst et al., 2018), this study expands this literature by empirical insights on the kinds of team climates that facilitate the transformation of cognitive resources

for IWB into actual IWB (cf., Ployhart & Molinterno, 2011). This is important, as employees, especially organizational newcomers such as early career professionals, might experience innovative behavior as challenging and, in turn, may not exploit their cognitive resources for such behaviors (cf., Baer, Leenders, Oldham, & Vadera, 2010; Harris, Li, Boswell, Zhang, & Xie, 2014; Kane & Rink, 2016).

The following sections in this chapter, review the literature, define 'educational breadth' and 'educational depth' and develop the hypotheses on these two concepts as predictors of IWB. Then, they present the sample and methods as well as the findings of this research. This chapter ends with a discussion of the findings and a conclusion.

4.3   Theory

IWB reflect individuals' "intentional creation, introduction and application of new ideas within a work role, group or organization" (Janssen, 2000: 288). IWB involve three distinct activities, namely, idea generation (i.e., producing new and useful ideas in any area), idea dissemination (i.e., promoting own or others' novel ideas to potential supporters of these ideas) and idea implementation (i.e., engaging in the realization of ideas, which includes creating tangible prototypes or models which can be experienced and applied within an organization) (Janssen, 2000).

Prior research shows that characteristics of employees' work context such as social support as well as individual-level attributes such as personality, skills, motivation and age are associated with IWB (Anderson et al., 2014; Hammond et al., 2011; Ng & Feldman, 2013; Standing, Larsen, Fulford, & Gengatharen, 2016). Additionally, research on individuals' cognitive resources for innovation theorized (Dane, 2010) and found (e.g., Mannucci & Yong, 2018; Wang et al., 2017) that knowledge structures affect innovative performance. Building on this literature, this study introduces the concepts of educational breadth and depth and

develops the hypotheses on the roles of these two concepts independently and jointly with team climates for early career professionals' IWB in the next sections.

4.3.1 Educational breadth and depth

This study refers to *educational breadth* as the extent of knowledge an individual acquired across distinct fields of study and to *educational depth* as the extent of knowledge an individual accumulated within a single field of study. These definitions are based on two concepts established in research on the link between professionals' knowledge structures and innovation-related outcomes (Mannucci & Yong, 2018; Wang et al., 2017). One of these is *knowledge breadth*, namely the extent to which individuals' knowledge covers multiple domains (Mannucci & Yong, 2018), or else, the diversity of knowledge an individual developed during work-life (Wang et al., 2017). The other concept is *knowledge depth*, which is defined as the extent to which individuals developed knowledge within a particular knowledge domain during work-life (Mannucci & Yong, 2018; Wang et al., 2017).

Further concepts that are similar to but distinct from educational breadth and depth are "breadth and depth of expertise" as well as "generalist" and "specialist". *Breadth* and *depth of expertise* are conceptually somewhat broader than educational and knowledge breadth and depth, comprising not only knowledge but also experience (Boh et al., 2014). *Specialists* are characterized as having deep, often narrowly focused expertise in relatively few specific knowledge domains, whereas *generalists* are defined as possessing several skills and knowledge in multiple domains (Boh et al., 2014).

Cognition theories suggest that the knowledge structures individuals develop at educational establishments differ from the knowledge structures they develop through practical experience in the way their knowledge elements are cognitively linked to each other (Kinchin, 2016; Kinchin, Lygo-Baker, & Hay, 2008). Similarly, theory on individual learning processes proposes that experts and non-experts differ in the way their knowledge elements

are organized (namely, in more or less complex cognitive knowledge schemas; Rousseau, 2001) and in their ability to use and to expand knowledge (Alexander, 2003). Thus, this study reasons that it is important to differentiate *educational* and *knowledge* breadth and depth to account adequately for the knowledge structures of professionals at early versus later career stages in empirical research. This is arguably because early career professionals draw primarily on their education-based knowledge to act, while professionals later in their career draw primarily on knowledge based on work experience.

The following section proposes relationships between educational breadth and depth and the three distinct IWB defined by Janssen (2000; namely, idea generation, idea dissemination and idea implementation).

4.3.2 Educational breadth and depth as predictors of innovative work behaviors

Relationships between educational breadth and depth and idea generation. Creativity research suggests that innovative ideas originate either from a combination of knowledge schemas or from a reorganization of the attributes that constitute a knowledge schema (e.g., Baughman & Mumfod, 1995; Mumford & Gustafson, 1988). Thus, the more knowledge attributes individuals have, the more "raw material" should they have to generate new ideas (Dane, 2010). In this regard, empirical evidence shows that the combination of attributes from distinct knowledge domains (broad knowledge) facilitates primarily the generation of many incrementally new ideas (recently, Boh et al., 2014; Hill, 2014; Hwang, Singh, & Argote, 2015), at least to some extent (Godart, Maddux, Shipilov, & Galinsky, 2015). In contrast, the reorganization of knowledge attributes from one schema (deep knowledge) appears to support mainly the generation of disruptive or high-impact ideas (Wang et al., 2017). In this regard, Mannucci and Yong (2018) found a positive effect of knowledge *depth* on creativity (i.e., the generation of ideas, services or products which others'

evaluate as novel and useful) which becomes weaker with career age as well as a positive effect of knowledge *breadth* on creativity that becomes stronger with career age.

Remarkably, the *cognitive entrenchment perspective* proposes that using the same knowledge schemas frequently stabilizes existing knowledge structures (Dane, 2010). In turn, these knowledge structures may become so rigid that individuals can hardly combine or reorganize their attributes (Dane, 2010). Hence, very deep knowledge may inhibit idea generation (Dane, 2010). In this regard, this study argues that higher education typically builds up job-related knowledge and requires a constant modification of existent knowledge schemas. Therefore, it expects that higher education does not lead to cognitive entrenchment but facilitates cognitive complexity and flexibility, which are essential requisites for idea generation (Perry-Smith & Mannucci, 2017). Hence, this study argues that both educational breadth and depth should support idea generation and hypothesizes:

> **H1a.** *Educational breadth relates positively to idea generation.*

> **H1b.** *Educational depth relates positively to idea generation.*

Relationships between educational breadth and depth and idea dissemination. Employees disseminate their own ideas or others' to find supporters of an idea (Janssen, 2000). For this reason, employees primarily need influence on and legitimacy among their stakeholders (Howell, 2005; Perry-Smith & Mannucci, 2017). However, specialists (with deep knowledge) are likely to experience difficulties and emotional barriers in communicating with specialists in fields of expertise different from theirs (Heath & Staudenmayer, 2000). Explanations for this phenomenon are that individuals with only deep (no broad) knowledge tend to have difficulties in viewing problems from the perspectives of others (Dane, 2010). Moreover, specialists typically use domain-specific language which makes mutual understanding among specialists from different disciplines relatively difficult (Heath & Staudenmayer, 2000). Hence, this study supposes that employees with only educational depth

lack motivational drivers (e.g., confidence in their ability to convince others of new ideas, Ng & Lucianetti, 2016; expectations of success and feelings of control, Parker, Bindl & Strauss, 2010) which would encourage them to disseminate ideas.

Conversely, the present study expects that employees with educational breadth are able to explain ideas to a variety of stakeholders (with diverse disciplinary backgrounds). In turn, they should feel motivated to disseminate ideas, for example, as they trust in their abilities and expect to disseminate ideas successfully (cf., Ng & Lucianetti, 2016, Parker et al., 2010). Moreover, employees with educational breadth can draw from several distinct knowledge schemas to understand and recognize the worth of new ideas from different disciplines. In turn, they should perceive value and importance of disseminating new ideas (e.g., "reason to" motivation, Parker et al., 2010). Consistently, scholars have revealed that individuals who successfully promote ideas tend to have broad general knowledge, diverse interests and search widely for information and ideas (Howell, 2005). Hence, this study hypothesizes:

H2a. Educational breadth relates positively to idea dissemination.

Educational depth arguably allows employees to give in-depth information on a new idea. This should increase communicators' credibility and, in turn, their success and engagement in communicating ideas (Howell, 2005; Mills & Harvey, 1972; Norman, 1976). Therefore, this study proposes that educational depth instills "can do" motivation (i.e., anticipations of success, feelings of control and self-efficacy, Parker et al., 2010) among employees with educational breadth. Hence, it seems plausible that the combination of educational depth and breadth is beneficial for idea dissemination among early career professionals. Thus, the next hypothesis states:

H2b. *Educational depth moderates the relationship between educational breadth and idea dissemination such that the link between educational breadth and idea dissemination is stronger at high levels of educational depth.*

Relationships between educational breadth and depth and idea implementation. Employees who implement new ideas need to feel confident in handling ambiguous situations, in managing change and colleagues' hesitance or even resistance against changing established ways of work (Ng & Lucianetti, 2016). Empirical evidence suggests that job-relevant knowledge and expertise rather than general mental ability facilitate idea implementation (Birdi, Leach, & Magadley, 2016; Potočnik et al., 2015). Moreover, deep (rather than general) knowledge on a topic would enable employees to recognize advantages as well as potential pitfalls associated with new ideas. In turn, employees with deep knowledge arguably feel able to control the challenges and the ambiguity typically involved in the implementation of new ideas (cf., Ng & Lucianetti, 2016).

Furthermore, research on job promotions shows that employers tend to expect that early career professionals with a specialization have the abilities and reliability necessary for idea implementation (Ferguson & Hasan, 2013). Additionally, studies on successful patent applications and research publications suggest that institutional gatekeepers (those who decide upon the implementation of ideas) tend to choose domain-consistent ideas (that require deep knowledge) rather than domain-spanning ideas (that require broad knowledge) (Ferguson & Carnabuci, 2017; Leahey et al., 2017). Hence, this study argues that early career professionals with educational depth (rather than only educational breadth) are regarded as legitimate and competent for idea implementation and, in turn, get the organizational resources (e.g., leader and coworker support, information, materials, funds, space and time) they need to implement ideas (Axtell et al., 2000; Clegg, Unsworth, Epitropaki, & Parker, 2002; Škerlavaj, Černe, Dysvik, 2014). Therefore, this study hypothesizes:

H3a. *Educational depth relates positively to idea implementation.*

Nonetheless, considering that successful idea implementation requires shared vision and understanding (Perry-Smith & Mannucci, 2017), it seems plausible that educational breadth is beneficial for idea implementation when combined with educational depth. That should be because educational breadth facilitates communication with stakeholders from different disciplines (cf., Heath & Staudenmayer, 2000) as outlined above and, thus, enables employees to generate broader support and resources for a new idea when combined with educational depth. Hence, this study hypothesizes:

H3b. *Educational breadth moderates the relationship between educational depth and*
idea implementation such that the link between educational depth and idea
implementation becomes stronger when educational breadth is high.

However, theory proposes that contextual drivers might be necessary to turn employees' cognitive resources into behavior valuable for organizations (Ployhart & Molinterno, 2011) and that individual-level and contextual factors might jointly contribute to IWB (van Knippenberg & Hirst, 2015). Hence, this study theorizes on innovation-related team climates as boundary conditions of the links between educational breadth and depth and IWB in the next section.

4.3.3 Team climates as boundary conditions of the relationship between educational breadth and depth and innovative work behaviors

The person-in-situation perspective proposes that personal characteristics predispose individuals' behavior, while situational cues relevant to these personal characteristics may influence the extent to which they translate into behavior (depending on the strength and resources related to situational cues; van Knippenberg & Hirst, 2015). Thus, according to the person-in-situation perspective, IWB should result from interactions between educational

breadth and depth and situational cues thematically connected with these two cognitive resources. Consistently, prior empirical research on predictors of innovative behaviors suggests that social factors such as team climates (i.e., socially shared perceptions of teams' and organizations' strategic imperatives; Kozlowski & Ilgen, 2006) may influence the link between individuals' cognitive attributes (such as knowledge) and idea generation (Cai, Parker, Chen, & Lam, 2019; Harari, Reaves, & Viswesvaran, 2016; van Knippenberg & Hirst, 2015). Thus, it is reasonable to expect that team climates concerning innovation behavior may interact with educational breadth and depth in the prediction of early-career professionals' IWB.

Specifically, prior research suggests that different team climates might be needed to transfer educational breadth and educational depth into the three IWB f interest in this work (cf., Wang et al., 2017). Thus, this study examines two team climates which differ as they direct employees' attention to familiar or new knowledge areas and, thus, deepen or broaden employees' knowledge structures. These are team exploration climate and team exploitation climate.

Team exploration climate is defined as employees' "shared perception of the extent to which the team encourages broad search and discovery through trying new techniques, experimenting and considering new or differing ways of solving applied problems" (Hirst et al., 2018: 4). As such, team exploration climate should motivate team members to search for information in different knowledge domains, for example, by communicate with coworkers in different areas. Thus, team exploration climate arguably supports educational breadth and complements educational depth by leading individuals to broadening their existent knowledge.

In contrast, *team exploitation climate* reflects employees' common perception of the scope to which work teams prioritize efficiency, cost-effectiveness, reliability, timeliness and

a methodical and structured completion of work tasks (Hirst et al., 2018). As such, team exploitation climate arguably leads employees to using work approaches they are familiar with and, in turn, to deepen their knowledge. Consequently, team exploitation climate arguably fosters educational depth and complements educational breadth.

Regarding the question of which team climates may interact with educational breadth and depth in support of idea generation, this study returns to the theory proposing that idea generation occurs when individuals can combine or reorganize multiple knowledge elements (cf., Dane, 2010). Considering that the knowledge structures individuals developed from higher education are arguably quite limited (compared to the knowledge elements employees additionally develop over several years of work experience) and flexible (rather than rigid), this study argues that team climates which enlarge educational breadth and depth support idea generation. Consequently, team exploration climate should interact with educational breadth while team exploitation climate should interact with educational depth in support of idea generation. Therefore, this study proposes:

> **H4a.** *Team exploration climate moderates the relationship between educational breadth and idea generation such that this relationship is stronger when team exploration climate is high.*

> **H4b.** *Team exploitation climate moderates the relationship between educational depth and idea generation such that this relationship is stronger when team exploitation climate is high.*

As stated above, employees tend to disseminate ideas with the purpose of convincing key stakeholders (gatekeepers) of new ideas such that stakeholders support the implementation of new ideas politically and through resource investments (e.g., Howell, 2005; Perry-Smith & Mannucci, 2017). Idea implementation typically involves handling coworkers' hesitations and resistances towards changes (Baer, 2012; Ng & Lucianetti, 2016).

Thus, both idea dissemination and idea implementation arguably require employees to take the risks of personal failure and a loss of reputation if coworkers do not react positively towards the new ideas they hear of or that are going to be implemented.

Literature on proactive behaviors (such as idea dissemination and idea implementation, Parker & Collins, 2010) suggests that "reason to" motivation (i.e., knowing why behavior is relevant and ascribing value to it) is an important driver of risk-involving behaviors (Parker et al., 2010). This motivation may be provoked by characteristics of employees' social work context, for example, positive feedback from colleagues (Parker et al., 2010). In this regard, meta-analyses find that perceived organizational support for innovation and positive work climates (including participative safety, open group climate and socio-political support) drive employees' innovative performance (Hammond et al., 2011). Furthermore, prior research has found that positive outcome expectations drive idea implementation (Baer, 2012). Therefore, this study argues that team climates that reflect organizational encouragement for experimenting with new techniques and procedural approaches facilitates idea dissemination and idea implementation among employees who have the cognitive resources for these two IWB. It hypothesizes:

> ***H4c.*** *Team exploration climate moderates the relationship between educational breadth and idea dissemination such that this relationship is stronger when team exploration climate is high.*

> ***H4d.*** *Team exploration climate moderates the relationship between educational depth and idea implementation such that this relationship is stronger when team exploration climate is high.*

Considering that idea implementation may involve resisting or overcoming interpersonal tensions and methodological challenges (cf., Ng & Lucianetti, 2016), it is reasonable to expect that the combination of team exploration and team exploitation climate

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supports idea implementation. This is because team exploitation climate emphasizes efficiency and timeliness (Hirst et al., 2018) and, thus, should encourage employees to complete the task of implementing an idea despite personal challenges involved in this task (cf., Ng & Lucianetti, 2016). This team climate is arguably especially relevant for early career professionals with the task of idea implementation because early career professionals tends to experience innovative behavior at work as particularly challenging (e.g., Harris et al., 2014; Kane & Rink, 2016) and tends to engage in behaviors besides their core job tasks such as socialization (Ashforth & Saks, 1996) and career-enhancing behaviors (Simosi, Rousseau, & Daskalaki, 2015). Hence, this study argues that team exploitation climate (which places value on finishing tasks despite challenges) and team exploration climate (which creates perceived relevance among team members for innovation) jointly strengthen the link between educational depth and idea implementation as stated by the following hypothesis:

> *H4e.* *Team exploitation and team exploration climate jointly moderate the relationship between educational depth and idea implementation such that this relationship is stronger when both team exploitation and team exploration climate are high.*

The next section describes the methods used in this study.

4.4   Methods

4.4.1   Data and sample

For this study, higher education graduates of 2015 and 2016 were surveyed. These have obtained a degree from German higher education institutions about 1.5 years before the survey took place. Respondents to the survey questions relevant for this study were either employed, articled clerk or in a traineeship at the time of the survey. They were on average of 15 months on the job and should therefore drew substantially from the knowledge they

developed during higher education to fulfill their job tasks. Moreover, these respondents likely remembered the subject composition of their university studies (the information for the independent variables of interest in this study) because they should have used this information quite recently before the survey (e.g., for their job applications).

It could arguably be anticipated that these survey data contained sufficient variance. For example, data on educational breadth and educational depth should contain sufficient variance because participants studied in different subject areas (e.g., in humanities, social and economic sciences, law, mathematics and natural sciences and engineering) and spent different time lengths in higher education (e.g., 59% of the participants completed a master degree or equivalent, while 41% completed a bachelor degree). The data on innovation-related team climates should have sufficient variance since participants worked in a broad variety of organizational units, firms and industries (e.g., industrials, consumer goods, information technology and health). Hence, as indicated by studies on the innovativeness of German industries (Rammer et al., 2017), participants likely worked in teams which pushed to different extents for the explorative and exploitative work activities represented by the team climates examined.

Finally, it was likely that survey participants indicated sufficiently different levels of engagement in the three IWB (dependent variables) examined as they held degree in different fields of study and, consequently, worked in diverse occupations which should have demanded different levels of innovative behavior (Paul, 2011; Vila et al., 2014). Moreover, research on organizational newcomers indicated that this study's survey participants experienced IWB as more and less challenging tasks (e.g., Harris et al., 2014; Kane & Rink, 2016), for example, because they needed to gain institutional ("fitting in") and innovative ("standing out") legitimacy (De Clerq & Voronov, 2009) before they were able to

successfully disseminate or implement ideas. These conditions gave reason to anticipate sufficient variance in the data on IWB analyzed.

The survey questions on the constructs of interest in this study were offered to 6,997 respondents who met the selection criterion of being employed described above. Of these, 2,561 agreed to respond to the questions for this research. Finally, 1,358 participants provided complete information on all items included in this study and met the selection criteria of working in a team (of at least two persons) and of being at a typical age for obtaining a German higher education degree (above 22 and below 34) and, thus, considerable as early career professionals. Participants in the sample were on average 27 years old. Gender (53% female) and highest degree from higher education (59% master-level or equivalent) were about equally distributed in this sample.

4.4.2 Measures

The dependent variables idea generation, idea dissemination and idea implementation were assessed on a 7-point Likert scale from 1 "(almost) never" to 7 "(nearly) always" using a German translation of the nine-item scale by Ng and Lucianetti (2016) which is originally based on Scott and Bruce (1994). Sample items for idea generation, idea dissemination and idea implementation were "I create new ideas for improvements", "I mobilize support for innovative ideas" and "I transform innovative ideas into useful applications" respectively. Cronbach's alphas were 0.86, 0.92 and 0.88 respectively.

To assess *educational breadth*, respondents were asked to select all fields of study that were part of the degree they obtained in 2015 or 2016, and, where applicable, part of their earlier (e.g., Bachelor), or later (e.g., Master) degree. For each degree, survey participants selected a maximum of ten fields of study from drop down lists. These included the 61 fields of study from German universities and universities of applied sciences that were classified by the German Federal Bureau of Statistics (2015) for this graduate cohort. As part of the data

edition, each study subject that was indicated more than once within the same degree was set as missing. After that, educational breadth was calculated as the number of different subjects that the respondents indicated over a maximum of two degrees from higher education.

Educational depth was assessed by asking participants to indicate the share of credit points each subject had in the degree they obtained in 2015 or 2016 according to the European Credit Transfer System (ECTS)[1] and, where applicable, a second degree they obtained earlier or later. As part of the data edition, participants who indicated shares that did not add up to 100 percent per degree were excluded and it was ensured that each subject was considered only once per degree. Additionally, participants indicated the total number of credit points they completed as part of their degrees (maximum of two degrees). Based on this information, the field of study in which participants completed most credit points over all their indicated degrees was identified. Finally, educational depth was calculated as the share of credit points in the discipline individuals studied most at a total number of credit points individuals completed over all degrees.

Team climates were assessed using a German translation of the 7-point Likert scale from 1 "very strongly disagree" to 7 "very strongly agree" used by Hirst and co-authors (2018). In line with these authors, to measure *team exploration climate*, respondents were asked to indicate the extent to which their team viewed activities such as experimenting with new approaches and methods as important. Cronbach's alpha of this scale was 0.88. Similarly, *team exploitation climate* was assessed by asking participants to state how important activities such as refining tried and tested methods were for their team. Cronbach's alpha for this scale was 0.78.

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[1] According to the ECTS, credit points reflect the estimated number of hours (the workload) students need to spend on a subject "to complete all learning activities […] to achieve the defined learning outcomes in formal learning environments" (European Commission, 2015: 10).

4.4.3 Analytic approach

To assess whether educational breadth and depth as well as interactions between these two variables and team climates affect the three outcome variables (idea generation, dissemination, implementation) independently (H1-H4), this study used multivariate OLS regressions with bootstrapped standard errors. Specifically, bootstrapped standard errors were calculated because inferences from this analytic approach are not based on assumptions of the shape of the sampling distribution and are, thus, are more likely to be accurate (Hayes, 2017). Moreover, its tests typically have greater power than normal theory approaches (Hayes, 2017).

The regression models were built up stepwise (for each of the three outcome variables separately). First, to test hypotheses 1a, 1b, 2a and 3a, an outcome variable was regressed on the main variables of interest (namely, educational breadth and depth). Next, to assess hypotheses 2b and 3b, the interaction between educational breadth and depth was included into this regression models Afterwards, to examine hypotheses 4a to 4e, four separate regression models were ran which included educational breadth and depth, team exploration and team exploitation climate as well as different interactions between these four predictor variables. For instance, to test hypotheses 4a and 4b, the included interactions were between educational breadth and team exploration climate as well as between educational depth and team exploitation climate. As established in empirical studies using linear regressions (e.g., Hayes, 2017), this study concludes that a regression coefficients is significant if its 95 percent confidence interval does not include zero. The next section presents the results of these analyses.

4.5 Results

Before testing the hypothesis as described in the previous section, the model fit for the conceptualized five factor model was assessed. This consisted of idea generation, idea

dissemination, idea implementation, team exploration and team exploitation climate. Confirmatory factor analyses (CFA) indicated an acceptable fit of this model ($\chi2[109] =$ 910.39, p < 0.000; $\chi2$/df = 8.35; CFI = 0.95; SRMR = 0.06; RMSEA = 0.07; Iacobucci, 2010) that was better than the model fit of any four- to one-factor model which combined two or more of these factors considering these fit indicators. The squared correlations between the latent constructs and all other constructs were smaller than the average variances obtained for each latent construct as Fornell and Larcker (1981) recommend. Hence, sufficient discriminant validity in data on these variables was assumed.

Further, Harman's one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) was conducted to identify potential problems of common method bias. An individual factor justified at maximum 45.607% of the variance and all surveyed items linked to the factors intended. Furthermore, recalling that the CFA mentioned above indicated a poor fit of the one factor model, it was reasoned that the data examined did not involve any relevant problems of common method bias. Table 1 shows the descriptive statistics of the constructs of interest in this study.

The stepwise inclusion of variables as well as the smallest tolerance (0.40; Models 1+3, Tables 2a+b) and the largest VIF (2.51; Models 1+3; Tables 2a+b) did not point to major problems of multicollinearity (Hair , Black, Babin, & Anderson, 2014).

Table 1: Description of correlations between main variables

	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7
1 Idea generation	4.76	1.49	1	7	(0.85)						
2 Idea dissemination	3.93	1.64	1	7	0.67***	(0.92)					
3 Idea implementation	4.00	1.62	1	7	0.70***	0.78***	(0.88)				
4 Educational breadth	2.93	1.98	1	11	0.03	-0.01	0.01	--			
5 Educational depth	72.88	23.89	12	100	0.01	-0.00	-0.01	-0.78***	--		
6 Team explor. climate	4.65	1.48	1	7	0.49***	0.37***	0.46***	0.02	-0.00	(0.88)	
7 Team exploit. climate	5.00	1.21	1	7	0.39***	0.26***	0.33***	0.05	-0.03	0.61***	(0.79)

Note. N = 1,358; Cronbach's alpha in parentheses. Variables are not standardized.
  * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.5.1 Results from linear regression analyses

Contrasting hypotheses H1a and H1b, H2a and H3a, the analyses described above did not reveal any significant independent effects of educational breadth or depth on idea generation, idea dissemination and idea implementation (Models 1, Tables 2a-c). Furthermore, opposing hypotheses H2b and H3b, their results did not show any interactions between educational breadth and depth that influenced the three IWB independently (Model 2, Tables 2a-c). Similarly, contradicting hypotheses H4a, H4b, H4c, H4d and H4e, the results did not indicate any independent interaction effects between educational breadth or depth and team exploration or team exploitation climate on the three outcome variables (regarding idea generation, see Model 4, Table 2a; regarding idea dissemination see Model 4, Table 2b; regarding idea implementation see Models 5 and 6, Table 2c). Remarkably, team exploration climate showed positive independent effects on all three IWB and team exploitation climate related positively to idea generation and idea implementation (Model 3, Tables 2a-c).

Table 2a: Effects of educational breadth and depth and their interaction with team climates on idea generation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Educ. breadth *(H1a)*	0.07	0.06	0.04	0.04	0.04
	[-0.01, 0.16]	[-0.03, 0.15]	[-0.02, 0.11]	[-0.03, 0.11]	[-0.03, 0.11]
Educ. depth *(H1b)*	0.06	0.06	0.05	0.04	0.05
	[-0.02, 0.15]	[-0.03, 0.14]	[-0.03, 0.12]	[-0.03, 0.12]	[-0.02, 0.12]
Breadth*Depth		-0.02			
		[-0.07, 0.03]			
Team exploration climate			0.40^{***}	0.40^{***}	0.40^{***}
			[0.34, 0.46]	[0.34, 0.46]	[0.34, 0.46]
Team exploitation climate			0.15^{***}	0.15^{***}	0.15^{***}
			[0.09, 0.21]	[0.09, 0.21]	[0.09, 0.21]
Breadth*Exploration *(H4a)*				0.00	
				[-0.05, 0.05]	
Depth*Exploitation *(H4b)*				-0.01	
				[-0.06, 0.05]	
Breadth*Exploitation					0.05^{*}
					[0.00, 0.10]
Depth*Exploration					0.05
					[-0.00, 0.11]
Constant	-0.00	-0.01	-0.00	-0.00	-0.00
	[-0.05, 0.05]	[-0.08, 0.05]	[-0.05, 0.05]	[-0.05, 0.05]	[-0.05, 0.04]
R^2	0.002	0.003	0.257	0.257	0.260

Note. $N = 1,358$; 95% confidence intervals in brackets. All variables are standardized.
    educ. = educational
    exploration = team exploration climate
    exploitation = team exploitation climate
    $^{*} p < 0.05,$ $^{**} p < 0.01,$ $^{***} p < 0.001.$

Table 2b: Effects of educational breadth and depth and their interaction with team climates on idea dissemination

	(1)	(2)	(3)	(4)	(5)
Educ. breadth *(H2a)*	-0.03	-0.02	-0.05	-0.05	-0.05
	[-0.12, 0.06]	[-0.12, 0.07]	[-0.13, 0.03]	[-0.13, 0.03]	[-0.13, 0.03]
Educ. depth	-0.03	-0.02	-0.04	-0.04	-0.04
	[-0.11, 0.06]	[-0.11, 0.06]	[-0.11, 0.04]	[-0.11, 0.04]	[-0.11, 0.04]
Breadth*Depth *(H2b)*		0.01			
		[-0.05, 0.07]			
Team exploration climate			0.33^{***}	0.33^{***}	0.33^{***}
			[0.27, 0.40]	[0.27, 0.40]	[0.27, 0.40]
Team exploitation climate			0.06	0.06	0.06
			[-0.00, 0.13]	[-0.00, 0.13]	[-0.01, 0.13]
Breadth*Exploration *(H4c)*				-0.02	
				[-0.07, 0.04]	
Depth*Exploitation				-0.02	
				[-0.08, 0.04]	
Breadth*Exploitation					0.04
					[-0.01, 0.10]
Depth*Exploration					0.05
					[-0.01, 0.10]
Constant	-0.00	0.01	-0.00	-0.00	-0.00
	[-0.05, 0.05]	[-0.06, 0.08]	[-0.05, 0.05]	[-0.05, 0.05]	[-0.05, 0.05]
R^2	0.000	0.000	0.139	0.139	0.141

Note. $N = 1,358$; 95% confidence intervals in brackets. All variables are standardized.

    educ. = educational

    exploration = team exploration climate

    exploitation = team exploitation climate

    $^{*} p < 0.05,$ $^{**} p < 0.01,$ $^{***} p < 0.001.$

Table 2c: Effects of educational breadth and depth and their interaction with team climates on idea implementation

	(1)	(2)	(3)	(4)	(5)	(6)
Educ. breadth	0.01 [-0.08, 0.10]	0.02 [-0.08, 0.12]	-0.01 [-0.09, 0.06]	-0.01 [-0.09, 0.06]	-0.02 [-0.09, 0.06]	
Educ. depth *(H3a)*	0.00 [-0.09, 0.09]	0.00 [-0.09, 0.09]	-0.01 [-0.09, 0.06]	-0.02 [-0.09, 0.06]	-0.01 [-0.09, 0.06]	-0.02 [-0.07, 0.03]
Depth*Breadth *(H3b)*		0.01 [-0.05, 0.07]				
Team explor. climate			0.41*** [0.35, 0.48]	0.41*** [0.35, 0.47]	0.41*** [0.35, 0.48]	0.42*** [0.35, 0.48]
Team exploit. climate			0.08* [0.01, 0.14]	0.08* [0.01, 0.14]	0.08* [0.01, 0.14]	0.09** [0.02, 0.16]
Breadth*Explor.				0.00 [-0.05, 0.05]		
Depth*Exploit.				-0.01 [-0.07, 0.05]		-0.02 [-0.09, 0.04]
Breadth*Explor.					0.06* [0.00, 0.11]	
Depth*Explor. *(H4d)*					0.04 [-0.01, 0.10]	0.04 [-0.02, 0.10]
Exploit. *Explor.						0.03 [-0.01, 0.08]
Depth*Exploit. *Explor. *(H4e)*						0.03 [-0.02, 0.07]
Constant	-0.00 [-0.05, 0.05]	0.01 [-0.07, 0.08]	0.00 [-0.05, 0.05]	-0.00 [-0.05, 0.05]	-0.00 [-0.05, 0.04]	-0.02 [-0.08, 0.03]
R^2	0.000	0.000	0.214	0.214	0.217	0.218

Note. N = 1,358; 95% confidence intervals in brackets. All variables are standardized.

    educ. = educational
    explor. = team exploration climate
    exploit = team exploitation climate
    * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.5.2 Robustness checks using demographics as control variables

To rule out some alternative explanations for IWB (cf., Spector & Brannick, 2011), all regression models were repeated but with job tenure, age, gender and main field of study included as control variables. The rationale for doing so was that *gender* has been shown to affect self-rated IWB (Janssen, 2000; Hernaus, Maric, & Černe, 2019). Furthermore, *tenure* and *age* should be associated with the complexity of employees' knowledge schemas and, in turn, their cognitive resources for idea generation (Mannucci & Yong, 2018). Additionally, higher (rather than lower) tenure and age should be related to more resource-rich social

networks and, in turn, influence employees' dissemination and implementation of ideas (Hammond et al., 2011; Ng & Feldman, 2013). Moreover, dummies for participants' *main field of study* (over two university degrees at maximum) were included as control variables into its regressions arguing that the main field of study proxies participants' occupation and thus, job demands and actual IWB (Paul, 2011; Vila et al., 2014).

The results from these analyses showed that including these control variables (tenure, age, gender and main field of study) into the regression models did not change the significance and the direction of the previously identified betas. Specifically, *tenure* showed independent positive effects on all three IWB; *age* did not relate significantly to any of the three outcome variables and *gender* (being male) related positively to idea implementation. In consistence with prior research (Paul, 2011; Vila et al., 2014), different effects of participants' *main field of study* on IWB appeared. For instance, participants who studied mainly arts or art sciences appeared to generate and implement ideas more often than participants who studied mainly economics, law or social sciences.

The following sections present supplementary analyses that base on a configurational analytic perspective.

4.5.3 Supplementary analyses using a configurational perspective

Quite recently, scholars began to recommend Qualitative Comparative Analysis (QCA) as a beneficial complementary analytic approach to regression analysis (Greckhamer, Misangy, & Fiss, 2013; Misangy et al., 2017). For example, QCA may yield relevant additional empirical insights if regression analyses do not find any significant effects (García-Castro, Aguilera, & Artiño, 2013).

Specifically, QCA might offer a comprehensive understanding of causal complexity by identifying all combinations of theoretically relevant attributes (in this study, educational breadth and depth, team exploration and team exploitation climate) which are *necessary* (this

is the case when all incidents of an outcome show the same causal attributes) and/or *sufficient* (this is the case when all cases with particular attributes show an outcome; Greckhamer et al., 2013; Misangyi et al., 2017). Moreover, QCA accounts for *causal complexity*, consisting of *conjunction* (i.e., the idea that multiple attributes interdependently produce outcomes), *equifinality* (i.e., the idea that there is more than one path to an outcome) and *asymmetry* (i.e., the idea that the presence and the absence of attributes may be linked to an outcome). Furthermore, QCA includes *counterfactual analysis* (i.e., examinations of combinations of attributes which do not exist in the data) on logical remainders (i.e., cases which do not meet an *a priori* set frequency threshold) to identify *core* and *peripheral* conditions (Fiss, 2011).

Considering this analytic potential of QCA, this study examined the role of educational breadth and depth for IWB additionally from a configurational perspective (Ragin, 2006, 2008) as described in the following section.

4.5.3.1 Fuzzy-set Qualitative Comparative Analysis

Specifically, fuzzy-set QCA (fsQCA) was conducted supplementary. This analytic approach reveals the relative importance of a condition in a configuration by applying Boolean algebra to a conceptual vector space and identifying a minimum set of indispensable, peripheral and irrelevant characteristics (Fiss, 2011). For this, each case with a specific outcome and an arrangement of interconnected elements is organized in a truth table (Misangyi et al., 2017). This study used the truth table algorithm implemented in the fsQCA software for running sufficiency analyses (Ragin & Davey, 2016). This algorithm demands *a priori* minimum thresholds for *consistency* (i.e., the share of cases consistent with an outcome) and the *frequency* of cases per accepted configuration (Ragin & Davey, 2016).

To set these demanded thresholds, this study adopted the analytical procedure by Minsangy and Archaya (2014). Consistently, all configurations with a minimum raw consistency above 0.80 and at least three cases were identified firstly. Secondly, all

configurations with a *proportional reduction in consistency* below 0.75 were deleted from the configurations identified in the first step. Thirdly, "the natural break in raw consistency scores [was used] as the threshold consistency" (Misangy & Archaya, 2014: 1692).

4.5.3.2 Calibration

Employing fsQCA requires calibrating data such that values of variables are operationalized as membership scores within predefined sets (Fiss, 2011). In this study, the points for membership, non-membership and crossover points were set by applying the direct method of calibration (Ragin, 2008). In these membership sets, a score of 1 reflected "full membership" and a score of 0 reflected "full non-membership" (Fiss, 2011).

Following the qualitative information given by the seven-point Likert scale of the three *outcome variables (idea generation, idea dissemination and idea implementation)*, full members were respondents who stated that they behaved innovatively "(nearly) always" and a little fewer; non-members were respondents who indicated that they behaved innovatively "(nearly) never" and a little more often; and the group of crossovers included respondents who indicated that they behaved innovatively halfway between "(nearly) never" and "(nearly) always". Consequently, the points for full-membership were set at the scale mean of six and for non-membership at the scale mean of two and the crossover point was set at the scale mean of four.

Research suggests that individuals' cognitive combinations of several different knowledge attributes are associated with their innovation behaviors (Dane, 2010). Therefore, respondents who stated an *educational breadth* of one (i.e., having studied one field) were calibrated as non-members as they could not combine knowledge from different fields of study. Respondents who indicated an educational breadth of two were considered as crossovers since they were able to draw knowledge from more than one but not from several fields of study. Finally, respondents with an educational breadth of three or more were

calibrated as full members as they were able to combine educational knowledge from several fields of study.

This study posited that respondents had *educational depth* if they had developed one knowledge schema in higher education which was clearly more complex and, thus, was arguably cognitively more present than knowledge schemas that respondents had developed in other fields of study. This would arguably be the case when respondents spent at least 60 percent of their study time on one field of study. Conversely, respondents would not have developed educational depth if they spent at maximum 40 percent of their study time on one field of study. Thus, for educational depth, the anchors for full-membership and non-membership were set at 60 and at 40 percent respectively. As established in QCA literatures (Fiss, 2011), the crossover point for educational depth was set at the halfway mark between full- and non-membership, thus, at 50 percent.

Team climates were assessed on a seven-point Likert scale on which respondents expressed very strong disagreement (value one) to very strong agreement (value seven) with statements on the importance of explorative and exploitative activities for their team. In line with the qualitative information given by this scale, this study assumed that respondents experienced team exploration and team exploitation climate when they agreed on the average with statements expressing the importance of the respective activities for their team at mean scale of five to seven. Conversely, it assumed that respondents did not experience a team climate when they disagreed on the average with statements expressing the importance of explorative and exploitative activities for their team at mean scale of three or lower. Hence, the anchors for full-membership and non-membership of team exploration climate and of team exploitation climate were set at mean scale of five and three respectively. Again, as experts in QCA recommend (Fiss, 2011), the halfway mark between full- and non-membership, namely, the mean scale of four, was chosen as the crossover point.

The next section presents the findings on the necessity and sufficiency of the conditions for IWB.

4.5.3.3 Results from analyses of necessity and sufficiency

This study tested if there was any necessary condition among educational breadth and depth, team exploration and team exploitation climate for the presence of the three IWB separately. As established in literatures on QCA, it considered a condition as necessary if its consistency score was higher than 0.90 (Emmenegger, Schraff, & Walter, 2014). It found that this criterion was not met by any of the conditions examined (Table 3).

Table 3: Results from analyses of necessity

	Idea generation		Idea dissemination		Idea implementation	
	Cons.	Coverage	Cons.	Coverage	Cons.	Coverage
Breadth	0.64	0.71	0.65	0.54	0.65	0.56
~Breadth	0.44	0.73	0.45	0.55	0.45	0.57
Depth	0.81	0.69	0.82	0.52	0.82	0.53
~Depth	0.24	0.74	0.24	0.55	0.24	0.57
Exploration	0.79	0.80	0.81	0.60	0.83	0.64
~ Exploration	0.30	0.59	0.31	0.45	0.29	0.43
Exploitation	0.88	0.75	0.89	0.56	0.90	0.58
~ Exploitation	0.19	0.59	0.21	0.48	0.20	0.47

Note. N = 1,358.
   ~ Absence of a condition;
   Cons. = Consistency

Next, this study examined if there were any combinations of educational breadth and depth and team exploration and team exploitation climate sufficient for frequent idea generation, idea dissemination and idea implementation (for each behavior separately). As recommended (Ragin, 2008) and done in recent QCA analyses (e.g., DeVos & Cambré, 2017; Liu, Wang, & Li, 2019; Meuer, Rupietta, & Backes-Gellner, 2015), intermediate solutions (which restricted the logical remainders to the most plausible ones) are reported.

FsQCA identified two configurations associated with frequent *idea generation* (Table 4). These two configurations represented an acceptable overall solution consistency (cf., Greckhamer et al., 2013) of 0.83 and an overall solution coverage of 0.71. One of these

configurations (C1, Table 4) indicated that the absence of educational breadth and the presences of educational depth and team exploration climate constituted a bundle sufficient for frequent idea generation. The other configuration (C2, Table 4) indicated that the presences of educational breadth, team exploration and team exploitation climate were a bundle sufficient for frequent idea generation. Hence, these two configurations suggest that team exploration climate is key for frequent idea generation, while educational breadth and depth may contribute to frequent idea generation depending on the team climates they are accompanied by.

For frequent *idea dissemination* and *idea implementation*, fsQCA analyses did not reveal any configuration which met the criteria for acceptable raw consistencies and proportional reductions in consistencies (> 0.80 and ≥ 0.75 respectively; Misangy et al., 2017).

Table 4: Combinations of educational breadth and depth and team climates sufficient for frequent idea generation

Condition\Outcome	C1	C2
Educational breadth	⊗	●
Educational depth	●	
Team exploration climate	●	●
Team exploitation climate		●
Raw coverage	0.35	0.48
Unique coverage	0.23	0.36
Consistency	0.85	0.84
Overall solution coverage	0.71	
Overall solution consistency	0.83	

Note. Black circles represent the presence of a condition, crossed-out circles indicate the absence of a condition, and empty cells represent an irrelevant condition.

4.5.3.4 Robustness results checks from fsQCA

Configurations may be considered as robust if prime implicants remain the same across frequency and consistency thresholds (Emmenegger et al., 2014). Thus, to gain more confidence with the findings described above, this study re-ran the sufficiency analyses

described in the previous section with the frequency thresholds at ten (rather than three) cases, the previously used consistency level of 0.80 and the PRI consistency of 0.75. Moreover, it re-ran these sufficiency analyses using the raw consistency threshold of 0.75 (instead of 0.80), which is acceptable for large N studies (Straatmann, Rothenhöfer, Meier, & Mueller, 2018), (while neglecting PRI consistencies) and the initial frequency threshold of three. Results of these robustness checks indicated that the prime implicants for the presence of frequent idea generation remained the same despite these changes in frequency and consistency thresholds.

4.6   Discussion

Concerning organizations' constant need for innovation to ensure their competitiveness and survival (Anderson et al., 2014; Yuan & Woodman, 2010), this study enhances the empirical understanding on the roles of early career professionals' cognitive and teams' social characteristics for IWB. Specifically, it introduces the concepts of educational breadth and educational depth which arguably reflect the particular knowledge structures of early career professionals. Furthermore, this study applies a net-effect perspective and (supplementary) a configurational perspective to reveal the roles of educational breadth and depth jointly with two distinct team climates for employees' IWB. Empirical evidence from linear regression analyses do not point to any significant role of educational breadth and depth for IWB. However, supplementary findings from fsQCA (Fiss, 2011; Ragin, 2008) indicate that, in the absence of educational breadth, educational depth may contribute to frequent idea generation when combined with team exploration climate. Furthermore, they indicate that educational breadth may contribute to frequent idea generation when both team exploration and team exploitation climate are present. The following section outlines the theoretical and practical implications of these findings.

4.6.1 Theoretical implications

This study enhances research in two areas. On the one hand, research on the kinds of university study programs that enable graduates to behave innovatively at work (Paul, 2011; Van der Velden, 2013; Vila, 2019) is expanded through the definition and empirical assessment of educational breadth and educational depth. Specifically, these two concepts offer a new operationalization of educational profiles in this literature. This operationalization arguably reflects early career professionals' cognitive resources for behavior more adequately than the concepts knowledge breadth and knowledge depth established in innovation research (Boh et al., 2014; Leahey et al., 2017; Mannucci & Yong, 2018; Wang et al., 2017). Since these four concepts (namely, educational breadth and depth and knowledge breadth and depth) are closely linked, the present study offers an opportunity for linking individual-level (higher) education and innovation research. Moreover, scholars in this area might take away from this study that future research could fruitfully investigate team climates as facilitators or boundary conditions of graduates' innovative behaviors at work building on the person-in-situation perspective (cf., van Knippenberg & Hirst, 2015).

On the other hand, this study contributes to research on the emergence of IWB (Hammond et al., 2011; Zwick et al., 2017) by revealing that educational breadth and depth (arguably proxies for early career professionals' cognitive resources for behavior) do not drive IWB independently. However, its results indicate that educational breadth and depth may contribute to frequent idea generation among early career professionals when combined with particular team climates. This finding corresponds with earlier theoretical propositions, for example, that individual-level knowledge requires incentives from employees' shared perceptions of organizational goals and values (i.e., *cognitive emergence-enabling states*) to translate into human capital valuable for organizations (Ployhart & Molinterno, 2011).

Finally, the empirical insights in the present study based on both linear regression analysis and fsQCA suggest that investigating IWB not only from a net-effect but also from a

configurational perspective yields more conclusive insights on the behaviors examined. This supports QCA-scholars' recent suggestion to examine individual-level behavior also from a configurational perspective (Misangy et al., 2017). The next section the limitations of this study that future research might want to address.

4.6.2 Limitations and suggestions for future research

Based on the cross-sectional data used in the present analyses, this study cannot draw any conclusion about causality (although QCA literature often refers to analyzing "causal complexity"; Misangyi et al., 2017; Ragin, 2008). Regarding the relationships between educational breadth and depth and IWB, this study assumes that reversed causality is not a major issue as participants' self-reported factual kind of information on their higher education studies is unlikely affected by their self-reported innovation behavior as gainfully employed in a later phase a life. However, considering prior research on the development of team climates (e.g., Newman, Round, Wang, & Mount, 2020), this study cannot rule out the likelihood of reversed causality between the outcome variables and the two boundary conditions (team exploration and team exploitation climate). Hence, future research that seeks to replicate findings from this study using experimental or longitudinal data would sure be appreciated. This study particularly recommends the assessment of team climates (boundary conditions) and IWB (dependent variables) at different points in time considering research on the development of team climates over time (for an overview see Newman et al., 2020; on the identification of causal relations see, e.g., Antonakis, Bendahan, Jacquart, & Lalive, 2010; Spector, 2019).

The data on participants' educational breadth and depth are limited to two university degrees. Thus, this study could not examine the whole complexity of participants' knowledge structures. For example, it lacks information on institutionalized training after graduation from university and the knowledge structures participants might have developed through

practical experience (e.g., during internships or after graduation on the job). Therefore, future studies could benefit from conducting a more detailed survey on and analysis of both *educational* and *knowledge* breadth and depth among early career professionals.

The sample examined in this work is limited to highly qualified professionals. Hence, future research should be conducted to examine whether combinations of educational depth and team exploration climate also turn out as key conditions for idea generation by less qualified early career professionals. This suggestion is made because level of formal education likely influences innovative behavior (Potočnik et al., 2015; Zwick et al., 2017).

Since the findings in this work indicate that combinations of educational breadth and depth and particular team climates may be sufficient for frequent idea generation, this study encourages future research to examine combinations of educational breadth and depth and other social attributes of work contexts (e.g., aspects of leadership, knowledge transfer, on-the-job training) that might be associated with frequent IWB. As the present study suggests, studies that compare results from different analytic approaches could be of particular interest in this regard. However, it remains for future studies to explicitly examine the importance of applying different quantitative analytic approaches (especially net-effect and configurational approaches) for the achievement of conclusive empirical insights on innovative behaviors.

Finally, concerning fsQCA as an analytic approach, this study echoes recent calls for appropriate and definite standards for frequency and consistency thresholds, especially for large-*N* studies (Straatmann et al., 2018) and for data calibration to minimize effects of researchers' subjective choices. For instance, the data calibration in this study bases on sound theoretical knowledge and recommendations. Nonetheless, other scholars might define different thresholds, especially since data calibration is currently subject of discussion among QCA scholars (e.g., Misangyi et al., 2017; Thiem, Baumgartner, & Bol, 2016). Standards for data calibration that allow a full exploitation of the potential of fsQCA for higher concept-measure consistency would be appreciated.

4.6.3   Practical implications

The results in this study indicate that combinations of educational breadth and depth contribute to idea generation when combined with particular team climates. Hence, this research suggests to practitioners involved in career counseling and early career job applicants that the latter should be aware that team climates have the potential to facilitate innovative work behaviors, for example, by activating their cognitive resources.

On the other hand, this study has implications for team leaders, innovation and human resources managers. Its findings suggest that early career professionals with educational depth might unfold their cognitive resources for idea generation in teams which value explorative behaviors, while early career professionals with educational breadth should also perceive that their team values the exploitation of existent resources to generate ideas. Hence, to support organizational innovation, human resources recruiters might want to pay particular attention to the fit between early career professionals' educational profiles and the team climates they would work in. Additionally, considering the positive links between the team climates and the three IWB identified in this study, leaders seeking IWB among early career professionals might want to monitor and carefully influence their team members' shared perceptions and beliefs regarding the relevance of organizational innovation.

4.7   Conclusion

This study is the first which examines the role of educational breadth and depth for early-career professionals' IWB, namely, idea generation, dissemination and implementation. Empirical analyses point to configurations of educational breadth and depth and two team climates (rather than to independent effects of these factors) as relevant for idea generation. Specifically, the combination of educational depth and team exploration climate as well as the combination of educational breadth, team exploration and team exploitation climate appear to contribute to idea generation. No significant net effects and no configurations were found

regarding idea dissemination and idea implementation. Overall, this study encourages future studies on individual-level innovation behaviors to complement results of regression analysis with findings of QCA, especially when hypothesizing interactions of variables as predictors of behavior.

4.8   References

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5   Discussion and conclusion[1]

Over the last years, macro-level developments such as digitalization render the world of work very dynamic. The skills and work behaviors that allow organizations and members of the workforce to thrive change remarkably in many areas (Eggers & Park, 2018; Frey & Osborne, 2017; Sousa & Rocha, 2019). This thesis enhances empirical understanding of three individual-level behaviors that have gained importance these days and hence, are worth investigating. These are *proactive skill development* (study 1, chapter 2), *engagement in paradoxical work activities* (study 2, chapter 3) and *innovative work behaviors* (study 3, chapter 4). In particular, these studies mainly expand the set of known antecedents in these literatures by variables reflecting employees' cognitive resources (namely, *interpretations of macro-level factors*, *diversity of professional experience* and *educational breadth and depth*). To this end, theories on the roles of individuals' cognition, meso- and macro-level factors for behavior are introduced into the respective literatures.

The large-scale survey data analyzed in this work were collected from early career professionals and are hosted either at the Bavarian State Institute for Higher Education Research and Planning (IHF) or the German Centre for Higher Education Research and Science Studies (DZHW; Brandt, Briedis, de Vogel, Jaksztat, & Teichmann, 2018). The survey participants responded to three distinct online surveys (one for each study) about 1.5 years after obtaining a degree from German higher education. Data from the Mannheim Innovation Panel 2016 (Rammer et al., 2017) were merged with the survey data collected for study 1.

The remainder of this chapter is structured as follows. Firstly, this chapter summarizes the findings of this dissertation (chapter 5.1) and outlines its contributions (chapter 5.2). Secondly, it reflects the limitations of this dissertation and offers suggestions for future

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[1] This and the following sections in this chapter are partly based on chapters 2 to 4.

research (chapter 5.3). Thirdly, it presents the practical implications of the present work (chapter 5.4) and concludes (chapter 5.5).

5.1   Summary of findings

Study 1 (chapter 2) theorized and found that macro-level factors (namely, industry digital maturity) translate into employees' proactive skill development (Claes & Ruiz-Quintanilla, 1998) via employees' interpretations of these macro-level factors as being controllable or an opportunity (cf., Jackson & Dutton, 1988) for their employer organization. The indirect effect via opportunity interpretation seems to be driven by proactive personality. Other than hypothesizing, data did not indicate any relationship between employees' interpretation of digitalization as threatening and proactive skill development.

Study 2 (chapter 3) hypothesized and found that diversity of professional experience supports employees' engagement in paradoxical work activities by taking the example of individual ambidexterity (Mom, Van den Bosch, & Volberda, 2009). This study's results from multivariate regressions and fuzzy-set Qualitative Comparative Analysis (fsQCA) suggest that employees' quite complex rather than simple changes of work contexts (namely, country and industry variety but not firm variety) are factors contributing to this behavior.

Study 3 (chapter 4) first defines the concepts educational breadth and depth and links them to research on innovative work behaviors (namely, idea generation, idea dissemination and idea implementation; Janssen, 2000). Subsequent results from a net-effect approach (namely, multivariate regressions) do neither indicate any independent effects of educational breadth or depth, nor joint effects of educational breadth or depth and team climates on the innovative work behaviors examined. Nevertheless, analyses from a configurational perspective (namely, fsQCA; Greckhamer, Misangyi, & Fiss, 2013; Ragin, 2008) revealed two distinct combinations of these four factors that are associated with frequent idea generation. These combinations suggest that educational breadth and depth might contribute

to frequent idea generation when combined with team exploration climate (and, as regards educational breadth, also with team exploitation climate). However, data did not indicate any combination of these four predictors associated with frequent idea dissemination or idea implementation (at least, no combination which met the frequency and consistency thresholds established in fsQCA research; cf., Misangy & Archaya, 2014).

5.2   Contributions to research

As the particular theoretical contributions of each study are discussed in detail in their respective chapters (chapters 2 to 4), this section takes a meta-perspective on the theoretical contributions of these three studies. From this perspective, this dissertation informs micro-organizational behavior scholars interested in the roles of employees' cognitive resources (namely, interpretations of macro-level factors and breadth and depth of cognitive schemas) and contextual factors in the prediction of future-oriented career and work behaviors (namely, proactive skill development, paradoxical and innovative work behaviors). With that, this dissertation provides new insights for scholars on these particular behaviors by expanding their sets of known predictor variables and, herein, offering links to previously barely related research streams, particularly those on individual cognition.

For instance, research on the determinants of proactive career behaviors largely focused on examining personality (e.g., proactive personality) and motivational factors (e.g., "can do", "reason to" and "energized to" motivation; Parker, Bindl, & Strauss, 2010) as antecedents of this outcome (Bindl & Parker, 2011; Wu, Parker, Wu, & Lee, 2018), often considering demographics and job qualification as control variables. Study 1 (chapter 2) suggests that employees' interpretation of industry digital maturity contributes to explaining proactive skill development. Hence, this study informs scholars interested in proactive career behaviors that employees' interpretations of macro-level factors can be fruitfully considered

and investigated as predictors of proactive skill development (and presumably other proactive behaviors; cf., Parker & Collins, 2010).

Research on individuals' engagement in paradoxical work activities revealed particular cognitive and behavioral capabilities which contribute to explaining engagement in paradoxical activities (e.g., paradoxical thinking, behavioral complexity and integration; Schad, Lewis, Raisch, & Smith, 2016). Study 2 (chapter 3) expands this knowledge by providing a new link between research on individuals' engagement in paradoxical work activities (e.g., Schad et al., 2016) and relationships between individuals' experience and behavior (e.g., Quiñones, Ford, & Teachout, 1995). Especially, this study proposes and finds that cognitively quite complex (rather than simple) types of diversity of professional experience drive individual ambidexterity. Thus, this study encourages scholars researching on individuals' engagement in paradoxical work activities to further examine how individuals' experience relate to these behaviors, for example, through particular cognitive attributes (cf., Miron-Spektor et al., 2018).

Prior research on innovative work behaviors examined a broad variety of individual-level, job and inner-organizational factors as determinants of these behaviors (Anderson, Potočnik, & Zhou, 2014; Hammond et al., 2011; Standing et al., 2016). However, this research barely provides empirical insights on the relationship between early career professionals' education-based knowledge and innovative work behaviors. Study 3 (chapter 4) addresses this gap by developing and empirically examining the concepts *educational breadth* and *educational depth* (based on similar concepts in research on professionals' innovative performance). Findings from this study lend support to theories proposing that employees' knowledge needs to be activated by contextual conditions to be translated into a valuable resource for organizations (Ployhart & Molinerno, 2011). Thus, study 3 indicates to scholars on early career professionals' innovative work behaviors that further research on the

conditions under which education-based knowledge facilitates innovative work behaviors is relevant and therefore deserves further scientific attention.

Moreover, the studies in this thesis provide new insights for research on future-oriented micro-organizational behaviors interested in the role of context in these behaviors. Particularly, study 1 (chapter 2) broadens the scope of Cognitive-Affective Personality Systems theory (Heslin, Keating, & Minbashian, 2019; Mischel & Shoda, 1995). Yet, this theory (as well as its foundational trait activation theory, Tett & Burnett, 2003) focused on *meso*-level factors (namely, task, team and inner-organizational variables) as direct predictors or boundary conditions of individuals' cognitive resources for behavior (e.g., perceptions and interpretations of context) and their subsequent behavior. Broadening this situated person perspective, study 1 (chapter 2) found that *macro*-level factors (precisely the extra-organizational phenomenon of digitalization) are relevant for understanding employees' proactive career behaviors via employees' interpretations of these macro-level phenomena.

Study 3 (chapter 4) informs theories on person-situation interactions as predictors of innovative behaviors (e.g., van Knippenberg & Hirst, 2015). This study lends support to the assumption that not only personality but also cognitive (specifically, knowledge-related) factors act jointly with contextual variables on particular innovative behaviors (e.g., idea generation). However, this finding appeared only in analyses from a configurational but not a net-effect approach. Thus, this study indicates to empirical research on this theory that a more conclusive empirical understanding on the interactions between and combinations of cognitive and contextual factors associated with innovative behaviors might be achieved through a mixed method approach (e.g., the combination of net-effect and configurational approaches).

From a methodological perspective, studies 2 and 3 support emerging empirical evidence for the value that complementing findings from a net-effect approach with findings from a configurational approach has for understanding outcomes comprehensively (e.g.,

Misangy et al., 2017). Yet, this combined analytic approach is barely applied in research on engagement in paradoxical activities and innovative work behaviors. Thus, these studies should also offer new insights into this methodological regard to scholars on these behaviors.

Figure 1: Contributions to research

Prior research in brief

Known predictors of proactive career behaviors:
- *Individual differences:* personality and proactive motivational states
- *Context:* mostly job and intra-organizational factors

Known individual-level approaches to paradoxes:
- Thinking syles (e.g., paradoxical, discursive thinking) and behavioral complexity
- Humor and rhetorical skills
- Demographics (culture)

Known predictors of innovative work behaviors:
- *Individual differences:* Personality, personal orientations, motivation and related concepts
- *Context:* job and intra-organizational factors

Contributions to research from this thesis

First theorizing and empirical evidence on
- employees' **interpretations of extra-organizational trends** (cognitive schemas)
- **macro-level phenomena** (expansion of CAPS theory on career behaviors, Heslin et al., 2019)

as predictors of proactive career behavior

First theorizing and empirical evidence for **diversity of professional experiences** (breadth of cognitive schemas) as a predictor of paradoxical work activities

First theorizing empirical evidence on **educational breadth and educational depth** (i.e., early career professionals' knowledge schemas) as predictors of innovative work behavior

Contribute to more conclusive understandings of three future-oriented micro-organizational behaviors by
- **expanding established set of predictor variables** and, thus, pointing to "anchors" for linking research streams
- offering **empirical evidence supporting emerging calls for a mixed-method approach**, namely, complementing net-effects with configurational analytic approaches

Having outlined how this dissertation enhances research on the cognitive and contextual determinants of employees' future-oriented career and work behaviors, the next section discusses its limitations and proposes how future research could address them.

5.3 Limitations and suggestions for future research

Like most research, this dissertation has limitations that readers should consider when drawing conclusions from its findings. This section discusses the common limitations of this work, while the particular limitations of each study are reflected in detail in the respective chapters (chapters 2 to 4).

Firstly, findings are based mostly on self-reports. This kind of data may involve common method biases and, thus, lead to results with reduced validity (Podsakoff, MacKenzie, & Podsakoff, 2012). All studies apply established procedural remedies to limit the likelihood of common method biases and, prior to testing of hypotheses, they use statistical methods to assess whether common method bias is a major concen for their results. In particular, respondents' confidentiality was assured and Harman's single factor test was conducted (cf., Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Nonetheless, future research investigating whether the findings in the present work can be sustained if different data sources for same criterion and predictor variables are used will be appreciated. For example, concerning study 2 and 3 (chapters 3 and 4 respectively), self-reports on educational breadth and depth and diversity of professional experience could be validated with data from higher education certificates and employers' references respectively (both were not accessible from the survey participants questioned as part of this thesis).

Moreover, observer ratings could be used as alternatives for self-reports and objective information. However, observer ratings may be less reliable than self-reports, especially when behaviors that challenge the status quo (e.g., proactive and innovative behaviors; Parker & Collins, 2010) are assessed. This case might occur because observers perceive such behaviors as rebellious and, thus, respond with a negative bias (Frese & Fay, 2001). Observer ratings can also be less reliable than self-reports if observers are not aware of the extent to which particular behaviors are actually shown or do not recognize fine-grained differences in the different facets of behaviors (e.g., in the case of proactive behaviors, Tornau & Frese, 2013). For instance, in study 1 (chapter 2), colleagues and supervisors are assumed not to know of all skill development activities an employee pursues during and beyond regular workdays (cf., Orvis & Ratwani, 2010). Likewise, colleagues and supervisors might not be aware of the extent to which an employee pursues two different kinds of work activities (e.g., paradoxical activities; study 2) and not cognizant of all new ideas an employee develops, disseminates and

implements (study 3). Thus, in the latter case, they might give an overall rating of an employee's innovative behavior rather than its facets (study 3). Nonetheless, it is arguably relevant for for future research to investigate links between employees' attributes and the self-rated behaviors examined in this work. For example, regarding study 3, future research could examine to what extent educational breadth and depth affect employees' ratings of their innovative work behaviors. Potentially, employees with relatively broad experience and educational background under-estimate their innovativeness and, hence, rate the extent to which they generate new ideas comparatively low. Such insights appear to be relevant, considering that self-ratings are quite often used in studies on innovation-related behaviors (Ng & Feldman, 2013; Potočnik, Anderson, & Latorre, 2015) and that firms' performance ratings of employees are often based on observable characteristics only.

Secondly, as mentioned in chapter 1, analyses of the cross-sectional data collected for studies 1 and 3 do not offer full emprical evidence of causal relations but meet two (out of three) important criteria for establishing causal relations (cf., Antonakis, Bendahan, Jacquart, & Lalive, 2010; Spector, 2019). Specifically, the criteria adopted in this dissertation are *establishing the existence of covariation* and *ruling out alternative explanations* for the behaviors examined (cf., Spector, 2019). Consequently, the next empirical step from the studies presented in this work is to conduct studies that could reveal if the hypothesized predictor variables preceed the proposed outcomes in time (cf., Spector, 2019; probably with the need of more personnel and financial resources than the present studies used).

Specifically, to causally investigate the theorized relations in study 1 (chapter 2), employees' interpretations of industries' digital maturity should be assessed in one survey and their proactive skill development in a follow-up survey among the same participants. Further, as in this study, information on industry digital maturity could be added from external sources such as the Mannheim Innovation Panel (Rammer et al., 2017). To establish temporal precedence of the predictor and outcome variables examined in studies 2 and 3 (chapters 3

and 4 respectively), scholars could assess participants' cognitive resources (the antecedents) via official documents (e.g., employer references and educational certificates) and conduct surveys to measure the outcomes, namely, employees' paradoxical work activities and innovative work behaviors respectively. Boundary conditions such as work contexts (study 3, chapter 5) could be assessed via observer ratings or temporary separated additional surveys.

Thirdly, findings of this dissertation are based on data from a particular group of people, namely, early career professionals with a degree from German higher education. Yet, the relationships between career age, work experience, national cuture and level of qualification and the outcomes of interest in this work are not sufficiently understood (concerning proactive skill development, see Claes & Ruiz-Quintanilla, 1998; Raemdonck, van der Leeden, Valcke, Segers, Thijsssen, 2012; Zacher & Kooij, 2016; regarding innovative behaviors, see Hammond et al., 2011; Lukes & Stephan, 2017; Ng & Feldman, 2013). Hence, future research might assess whether findings of this dissertation hold for more experienced professionals, samples with degrees from non-German higher education and lower qualified. Of these three factors, empirical studies on career age and national culture as predictors and boundary conditions of the behavioral outcomes examined in this thesis seem particularly relevant as the diversity of employees in terms of age and nationality tends to increase (Schreiber, 2018).

Fourthly, future research could fruitfully examine the effects that the independent variables of interest in this dissertation have on future-oriented career and work behaviors similar to those examined in this thesis (e.g., *proactive consultation* and *networking behaviors*, Claes & Ruiz-Qunitanilla, 1998; *career adaptability*, Savickas & Profeli, 2012). For instance, a deeper empirical understanding of the relationships between macro-level factors and future-oriented career and work behaviors appears to be worth developing. This is arguably because current trends such as the advent of social media and other digital communication technologies (Cascio & Montealegre, 2016; Colbert, Yee & George, 2016)

could imply that employees are ever more aware of macro-level trends which likely affect their behavior (cf., Johns, 2018; Schneider & De Meyer, 1991; Thomas & McDaniel, 1990). Furthermore, education and careers tend to become more diverse (Bathmaker, 2017; Biemann, Zacher, & Feldman, 2012). This development suggests that a new quality of cognitive resources emerges which could affect employees' career and work behaviors. Hence, future reseach that considers these developments and examines breadth and depth of cognitive resources in relation to career and work behaviors other than the ones examined in this work should be appreciated.

Fifthly, future research that builds on this work might want to adopt scholars' recent call for more studies on *how* managers can translate the *what-to-dos* researchers identify into practice to offer more practice-oriented recommendations (Doughterty, 2018). As regards study 1 (chapter 2), this call (Doughterty, 2018) particularly implies the need for further investigations on how managers can communicate macro-level developments such as digitalization as controllable or an opportunity for their organization to facilitate proactive skill development among their employees. Questions such as which words should managers use to describe macro-level phenomena (cf., Jackson & Dutton, 1988); how diverse (cf., Anderson & Nichols, 2007) or personalized (cf., Williams & Wood, 2015) do information need to be; what kind of information (e.g., statistics, best practices from their own or other organizations) support particular interpretations of and, in turn, behavioral response to macro-level phenomena most effectively could be examined in this regard. Adding to the results of study 2 (chapter 3), which indicate positive relationships between diversity of professional experience and engagement in paradoxical work activities, future research could reveal what managers can do to motivate and enable their employees to diversify their careers (cf., Kornblum, Unger, & Grote, 2018; Rubenstein, Eberly, Lee, & Mitchell, 2018).
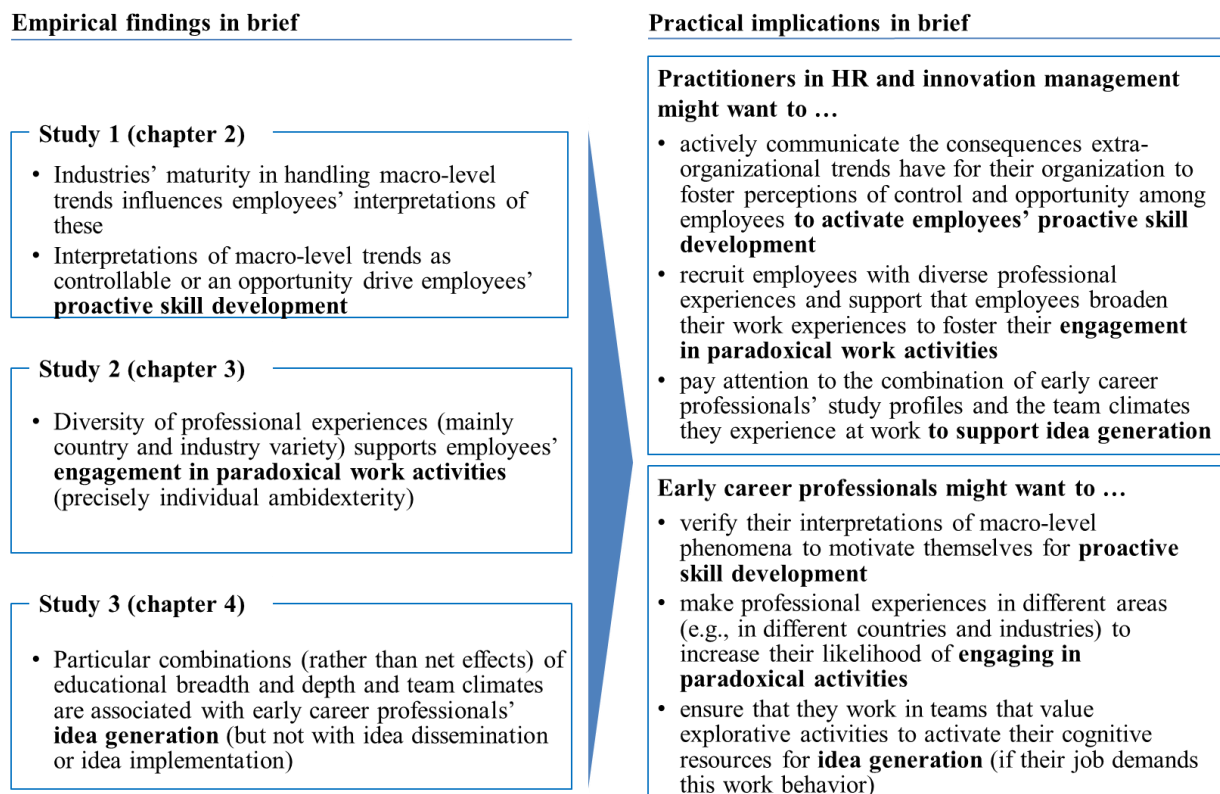
5.4 Implications for practitioners

The findings in this dissertation have implications for practitioners in the field of human resources and innovation management as well as for the working population interested in self-directed career behaviors (Figure 2). Study 1 (chapter 2) suggests that employees engage in proactive skill development if they interpret macro-level factors as controllable and an opportunity for their organization. Hence, human resources managers aiming at supporting self-initiated learning activities for their employees might want to explicitly communicate the anticipated consequences macro-level developments have on their organization and employees. For instance, in view of digitalization, human resources managers could explain to employees what their organization does to control this trend and describe to them the opportunities digitalization might have for their business. Notably, telling employees that digitalization could threaten their organization should not affect employees' proactive skill development.

Further, empirical results of this study suggest that employees are more likely to interpret macro-level factors as controllable and an opportunity for their organization if there are many other organizations in their industry that acted to handle such development. Thus, human resources managers who want to foster these interpretations could actively communicate what actions comparable organizations did to handle contextual changes. For example, in the context of digitalization, they could show the digital applications other organizations use for networking, internal and external communication and information processing (cf., Rammer et al., 2017). The finding that particular kinds of personal interpretations of macro-level trends tend to support proactive skill development is also relevant for employees who likely need to update their skills on their own rather than on their employers' initiative nowadays (cf., Hall, Yip, & Doiron, 2018; Hirschi, 2018). Employees can learn from this study that information on the controllability and opportunity of occurrences outside their organization could motivate themselves for self-initiated learning. In

this aim, they might want to observe what similar organizations do in response to new occurrences. Also, employees might want to talk with their managers and colleagues about what extra-organizational occurrences imply for their employing organization to verify their understanding and behave adequately in response.

Study 2 (chapter 3) enlightens human resources managers who need to employ staff who are able to engage in paradoxical work activities such as exploration and exploitation (i.e., individual ambidexterity) within a certain time. Results from this study suggest that experience from complex changes of work environments (e.g., working in different industries and countries) supports employees' ambidextrous behavior. Hence, organizations with the need for such behaviors might want to recruit employees with experience in different work contexts and support them in diversifying their career. In particular, study 2 indicates that employees with work experience in different countries and/or sectors are comparatively likely to fulfill this requirement. Early career professionals can learn from this study that they might want to gain work experience in different industries and/or countries to enable their engagement in paradoxical work activities such as exploration and exploitation.

Study 3 (chapter 4) offers new insights for innovation and human resources managers who want to facilitate idea generation within their organization and to early career professionals who meet this job demand. To these, results of this study suggest that that early career professionals with deep (and without broad) knowledge from higher education should work in teams that encourage explorative activities and that early career professionals with broad knowledge from higher education should work in teams that value both explorative and exploitative activities to facilitate their idea generation.

Figure 2: Empirical findings and practical implications in brief

Empirical findings in brief

Study 1 (chapter 2)
- Industries' maturity in handling macro-level trends influences employees' interpretations of these
- Interpretations of macro-level trends as controllable or an opportunity drive employees' **proactive skill development**

Study 2 (chapter 3)
- Diversity of professional experiences (mainly country and industry variety) supports employees' **engagement in paradoxical work activities** (precisely individual ambidexterity)

Study 3 (chapter 4)
- Particular combinations (rather than net effects) of educational breadth and depth and team climates are associated with early career professionals' **idea generation** (but not with idea dissemination or idea implementation)

Practical implications in brief

Practitioners in HR and innovation management might want to …
- actively communicate the consequences extra-organizational trends have for their organization to foster perceptions of control and opportunity among employees **to activate employees' proactive skill development**
- recruit employees with diverse professional experiences and support that employees broaden their work experiences to foster their **engagement in paradoxical work activities**
- pay attention to the combination of early career professionals' study profiles and the team climates they experience at work **to support idea generation**

Early career professionals might want to …
- verify their interpretations of macro-level phenomena to motivate themselves for **proactive skill development**
- make professional experiences in different areas (e.g., in different countries and industries) to increase their likelihood of **engaging in paradoxical activities**
- ensure that they work in teams that value explorative activities to activate their cognitive resources for **idea generation** (if their job demands this work behavior)

5.5 Conclusion

The three quantitative surveys (with 720, 1,385 and 1,981 participants) included in this dissertation offer new theoretical and empirical insights into how individuals' cognitive resources and contextual factors contribute to explaining early career professionals' future-oriented career and work behaviors. Specifically, findings of this dissertation suggest that industries' maturity in handling macro-level phenomena influences employees' interpretations thereof and, subsequently, their proactive skill development. Moreover, these studies point to diversity of professional experience as a predictor of employees' engagement in paradoxical work activities (precisely, individual ambidexterity). Also they indicate that combinations (rather than independent effects) of educational breadth and depth and particular team climates at work are associated with idea generation.

On the one hand, this work advances research on the determinants of employees' future-oriented career and work behaviors, especially by expanding the set of known predictor

variables and theories established in their respective literatures. On the other hand, this dissertation offers practical recommendations for human resources and innovation managers as well as for individual employees who face the demands of learning on their own initiative and engagement in paradoxical and innovation-oriented work activities. Overall, this dissertation intends to spur discussions on what human resources and innovation managers as well as early career professionals can do to support future-oriented and self-directed career and work behavior. These behaviors are needed for organizations' and employees' competitiveness in dynamic and ambiguous work contexts, such as those characterized by digitalization.

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Appendix

Eidesstattliche Erklärung

Ich erkläre des Eides statt, dass ich die bei der promotionsführenden Einrichtung Fakultät für Wirtschaftswissenschaften der TUM zur Promotionsprüfung vorgelegte Arbeit mit dem Titel: Competencies for Digital Transformation: Predictors of Proactive and Innovative Work Behaviors am Lehrstuhl Strategie und Organisation unter der Anleitung und Betreuung durch Frau Professorin Isabell M. Welpe ohne sonstige Hilfe erstellt und bei der Abfassung nur die gemäß § 6 Ab. 6 und 7 Satz 2 angebotenen Hilfsmittel benutzt habe.

Ich habe keine Organisation eingeschaltet, die gegen Entgelt Betreuerinnen und Betreuer für die Anfertigung von Dissertationen sucht, oder die mir obliegenden Pflichten hinsichtlich der Prüfungsleistungen für mich ganz oder teilweise erledigt.

Ich habe die Dissertation in dieser oder ähnlicher Form in keinem Prüfungsverfahren als Prüfungsleistung vorgelegt.

Ich habe den angestrebten Doktorgrad noch nicht erworben und bin nicht in einem früheren Promotionsverfahren für den angestrebten Doktorgrad endgültig gescheitert.

Die öffentlich zugängliche Promotionsordnung der TUM ist mir bekannt, insbesondere habe ich die Bedeutung von § 28 (Nichtigkeit der Promotion) und § 29 (Entzug des Doktorgrads) zur Kenntnis genommen. Ich bin mir der Konsequenzen einer Eidesstattlichen Erklärung bewusst.

Nürnberg, 10.11.2020