HYBRID AMBIDEXTERITY: HOW THE ENVIRONMENT SHAPES INCUMBENTS' USE OF STRUCTURAL AND CONTEXTUAL APPROACHES

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Published in *Organization Science*

Please cite this article as: Ossenbrink, J., Hoppmann, J., & Hoffmann, V. H. 2019. Hybrid ambidexterity: How the environment shapes incumbents' use of structural and contextual approaches. *Organization Science*, 30(6): 1125-1393.

Keywords

Ambidexterity; Organizational Learning; Environmental Discontinuity; Organizational Design; Incumbent Adaptation; Renewable Energy

Acknowledgements

The first two authors contributed equally. The authors acknowledge valuable comments by Shiko Ben-Menahem, Stefano Brusoni, Magali Delmas, Raghu Garud, Rahul Kapoor, Jochen Markard, Johannes Meuer, Johann Peter Murmann, Nicole Rosenkranz, Charlene Zietsma, and Ann-Kristin Zobel on earlier drafts. We thank Tom Albrighton for his editorial assistance. Moreover, we are very grateful to Gautam Ahuja and two anonymous reviewers for their excellent comments and suggestions throughout the review process. This research was financially supported by Innosuisse, the Swiss Innovation Agency, under Grant No. 1155000154.

ABSTRACT

According to the literature on ambidexterity, organizations can use structural or contextual approaches to simultaneously explore novel opportunities and exploit existing ones. So far, however, we know very little about what induces organizations to focus on structural vs. contextual ambidexterity, or how they combine the two approaches to maximize organizational learning. To shed more light on these questions, we investigate how the environment shapes a firm's use of structural and contextual ambidexterity. Drawing on a comparative, longitudinal case study of the four largest electric utility companies in Germany, we show that firms focused on structural ambidexterity whenever they perceived emerging opportunities in the environment as requiring organizational culture and capabilities fundamentally different from their own. Contextual ambidexterity, on the other hand, became particularly important when opportunities in the environment were both numerous and uncertain, requiring the organization to leverage the distributed attention and expertise of its frontline employees. We show that environments characterized by opportunities that are numerous/uncertain and require novel culture and capabilities lead organizations to invest in initiatives that combine elements of both structural and contextual ambidexterity—an approach we label *hybrid ambidexterity*. Our theory framework synthesizes and complements existing work that has started to investigate the antecedents of structural vs. contextual ambidexterity. We challenge the prevailing understanding of contextual and structural ambidexterity as dichotomous categories, and re-conceptualize them as two ends of a continuum. In addition, we provide initial evidence that firms' ambidexterity approaches are influenced by managers' perceptions of capabilities and opportunities.

INTRODUCTION

Organizational ambidexterity, i.e. a firm's ability to simultaneously pursue exploitation and exploration as two distinct modes of learning, helps protect incumbents against discontinuities in their environment (Andriopoulos and Lewis 2009; March and Simon 1958; Tushman and O'Reilly 1996). A quickly growing body of literature shows that organizational ambidexterity can be attained through structural or contextual approaches (Gibson and Birkinshaw 2004; Tushman and O'Reilly 1996). Structural ambidexterity entails

assigning exploration and exploitation to separate business units, while senior management balances the two and develops a shared vision to avoid intra-organizational tensions (Burgers et al. 2009; O Reilly and Tushman 2004). With contextual ambidexterity, organizational members freely allocate their time between the two modes of learning, with no structural separation. This requires a supportive organizational context that can be attained, for example, by cultivating a culture that reconciles seemingly contradictory elements, such as discipline, stretch, support, and trust (Gibson and Birkinshaw 2004).

The extant literature provides detailed insights into structural and contextual ambidexterity individually. However, we currently lack integrated studies of (a) what induces organizations to focus on one mode vs. the other, and (b) when and how they combine the two within change initiatives (Kauppila 2010). Understanding the antecedents of structural vs. contextual ambidexterity and their combination in organizational settings is critical for providing targeted recommendations to managers on when to use each mode and how best to leverage synergies between them. In fact, previous research suggests that the relative focus on the two modes of ambidexterity may depend on firms' environment (O'Reilly and Tushman 2013). Moreover, scholars propose that rather than being alternatives, structural and contextual ambidexterity may be complementary with regard to their advantages and shortcomings, such that organizations often use both in combination (Raisch and Birkinshaw 2008). So far, however, evidence on the relationship between the two approaches remains largely anecdotal and inconsistent; the few empirical studies provide little detail on antecedents or how firms combine their elements (Chang and Hughes 2012; Raisch and Birkinshaw 2008; Simsek 2009).

In this paper, we focus on the role that firms' environment plays in their ambidexterity approach and investigate *how the environment shapes a firm's use of structural and contextual ambidexterity*. To this end, we conducted a comparative, longitudinal case study among the four largest incumbent electric utility companies in Germany. This setting is well suited for our purpose because (a) in recent years the sector has undergone two major environmental discontinuities—the emergence of "new upstream" and "new downstream" businesses—that required incumbents to engage in ambidexterity, and (b) firms differed in their ambidexterity approaches. By contrasting in detail 18 initiatives that firms engaged in—both over time

and across organizations—we can draw important conclusions about how the use of structural and contextual elements is related to environmental characteristics. Furthermore, we explore how firm characteristics affect firms' responses to environmental stimuli.

Our study makes three main contributions to the literature on ambidexterity. First, we show how a firm's use of structural and contextual elements of ambidexterity is strongly affected by its environment. When the environmental discontinuity required fundamentally new culture and capabilities, but involved a clearly delimited set of potential new opportunities, firms drew mainly on structural elements when trying to become ambidextrous. This was done to avoid cultural clashes and quickly build new capabilities top-down. When the discontinuity involved a vast array of uncertain potential new opportunities, firms drew on contextual elements to take advantage of the distributed attention and expertise of their frontline employees to enhance opportunity search. By providing detailed insights into the mechanisms linking firms' environments and their ambidexterity approaches, our research both synthesizes and complements existing anecdotal evidence on the antecedents of the different types of ambidexterity within organizations.

Second, we show in detail how firms combine structural and contextual elements in their quest for ambidexterity. While literature has primarily studied these two approaches in isolation, we demonstrate that firms use initiatives that combine both—something we call *hybrid ambidexterity*. By showing that the firms in our sample pursued hybrid initiatives that differed in their focus on structural and contextual elements, our research challenges the prevailing understanding of contextual and structural ambidexterity as dichotomous categories, and re-conceptualizes the constructs as two ends of a continuum. This re-conceptualization opens up the field for a more nuanced investigation of the various organizational designs, initiatives, and integration mechanisms firms use to balance exploration and exploitation, and offers important implications for managerial practice.

Third, we also provide preliminary evidence for how firms' approaches to ambidexterity are influenced by firm-level factors. While the environment induced specific responses in all firms, we find some differences in the timing and design of ambidexterity approaches across firms. We show that these differences can be explained primarily by differences in managers' perception of capabilities and

opportunities, which are shaped by differences in the geographic location of firms' operations, markets, and headquarters.

THEORETICAL BACKGROUND

Although the tension between flexibility and efficiency has long been recognized in the literature on organizational theory, March (1991) was one of the first to identify exploration and exploitation as two distinct modes of learning. Exploration comprises searching for and experimenting with options far from the existing knowledge base to enhance organizational flexibility. Exploitation, on the other hand, involves building upon and refining existing knowledge to foster efficiency (March 1991). While these modes compete for resources, March noted that organizations had to pursue both to be competitive in the short run, while ensuring long-term survival in times of environmental discontinuities.

Following March's article, a long stream of literature has investigated how firms can manage the trade-off between exploration and exploitation (Lavie et al. 2010). While some scholars suggested temporal cycling between the two modes (e.g., Nickerson and Zenger 2002; Siggelkow and Levinthal 2003) or inter-organizational balancing, e.g. through joint ventures, alliances, or acquisitions (e.g., Lavie and Rosenkopf 2006; Stettner and Lavie 2013), a third stream has investigated how organizations can organize internally to accommodate both types of learning simultaneously. The concept of *ambidexterity* was coined to describe a firm's capacity to explore and exploit simultaneously[1] (Duncan 1976; Tushman and O'Reilly 1996). A plethora of studies shows a positive relationship between ambidexterity and firm performance (see Junni et al. 2013, for a review), innovation (e.g., Burgers et al. 2009; Tushman et al. 2010), and survival (e.g., Mitchell and Singh 1993), particularly in times of environmental discontinuities.

[1] Some authors subsume temporal cycling and inter-organizational balancing through joint ventures, alliances, or acquisitions under the concept of ambidexterity. In our study, we follow the narrower definition of ambidexterity proposed by Lavie et al. (2010), which describes firms' capacity to *simultaneously* (rather than sequentially) engage in exploration and exploitation *within the same organization*. Accordingly, in the following, we focus on structural and contextual ambidexterity as the two major ways described in the literature that allow firms to achieve this end.

Two types of ambidexterity: structural and contextual

The literature distinguishes two ideal types of ambidexterity: structural and contextual (Raisch and Birkinshaw 2008). These two types differ with regard to three core criteria: (a) the degree of structural separation between exploration and exploitation activities; (b) the degree of employees' specialization on exploration or exploitation; and (c) the role of managers in facilitating ambidexterity (see Table 1).

Insert Table 1 about here

Structural ambidexterity

The literature on *structural ambidexterity* suggests that in order to deal with the inherent tension between exploration and exploitation, organizations should structurally separate them by forming separate units (O'Reilly and Tushman 2013; O Reilly and Tushman 2004; Tushman and Rosenkopf 1996). This allows them to create units with competencies, incentives, processes, and cultures that are internally aligned and specifically tailored to the need to explore or exploit (Gilbert 2006; O'Reilly and Tushman 2008; Tushman and O'Reilly 1996). According to Denison (1990, p.2), organizational culture comprises "the underlying values, beliefs, and principles that serve as a foundation for an organization's management system as well as the set of management practices and behaviors that exemplify and reinforce those basic principles." Whereas organizational units focusing on exploitation usually follow a mechanistic design, with centralized decision-making, tight cultures, and a focus on efficiency and control (Benner and Tushman 2003), exploration units tend to be more organic, with more decentralized decision-making, entrepreneurial cultures, and a focus on flexibility (Boumgarden et al. 2012; Lavie et al. 2010).

In structural ambidexterity, frontline employees in each unit specialize in activities related to exploration or exploitation. This specialization safeguards the activities of the exploration units from potentially harmful cultural and procedural spillovers from the mainstream business (Benner and Tushman 2003; Gilbert 2006). Similarly, exploitative units can focus on improving existing products and serving existing customers without being distracted by the need to consider future alternatives (Simsek 2009).

To hold the different units together, the literature stresses the importance of a "common strategic intent, an overarching set of values, and targeted structural linking mechanisms to leverage shared assets"

(O'Reilly and Tushman 2008, p.193). Developing these integration mechanisms and managing the tensions between exploration and exploitation units is the task of senior management (Burgers et al. 2009; Jansen et al. 2009a; Lubatkin et al. 2006). Senior managers need to recognize the contradictions inherent in exploration and exploitation, and devise strategic measures that reconcile the tensions at the organizational level—e.g., by managing budget allocation to potentially conflicting activities (Andriopoulos and Lewis 2009; Burgelman and Grove 2007; Smith and Tushman 2005).

Contextual ambidexterity

An alternative perspective on how firms can achieve ambidexterity is offered by the literature on *contextual ambidexterity*. According to this approach, organizations should not structurally separate exploration and exploitation activities, but instead create a context that allows employees to simultaneously explore and exploit within the same unit (Birkinshaw and Gibson 2004; Birkinshaw and Gupta 2013; Gibson and Birkinshaw 2004). Rather than specializing in either exploration or exploitation, employees decide themselves how to divide their time between exploration and exploitation (Gibson and Birkinshaw 2004; Raisch and Birkinshaw 2008). As an example, Adler et al. (1999) describe how employees at Toyota working on routine tasks such as automobile assembly (exploitation) continuously improve processes, change jobs, and experiment with alternative solutions to enhance the cost, performance, and quality of products (exploration). This contextual switching allows business units to flexibly respond to changes in demands without having to manage the tensions between disparate units. At the same time, however, the need to balance exploration and exploitation puts a strain on the frontline employees, who must deal with conflicting tasks and demands (Andriopoulos and Lewis 2009; Gibson and Birkinshaw 2004).

Since, in contrast to the structural approach, the decision on how much to explore or exploit lies with individual employees, management is not directly involved in integrating or balancing exploration and exploitation initiatives. Rather, the key task of management lies in providing a context that facilitates and incentivizes employees' flexible switching between exploration and exploitation. According to Ghoshal and Bartlett (1994), the context comprises the "systems, processes, and beliefs that shape individual-level behaviors in an organization." In other words, managers must devise an organizational design (including

structures, practices, culture, and climate) that promotes both efficiency and flexibility (Cordery et al. 1993; Patel et al. 2013; Simsek 2009). Previous work suggests that this includes creating an organizational culture that reconciles seemingly contradictory elements such as discipline, stretch, support, and trust (Andriopoulos and Lewis 2009; Gibson and Birkinshaw 2004; Patel et al. 2013).

The relation between structural and contextual ambidexterity

While a plethora of empirical studies have looked at structural and contextual ambidexterity *individually*, we currently lack *integrated* studies that span both types. In particular, we currently know very little about (a) when firms might focus on one approach or the other, and (b) how firms might combine the two approaches to leverage their respective strengths.

When do firms focus on structural vs. contextual ambidexterity?

Building on the studies by March (1991) and Tushman and O'Reilly (1996), much work has gone into identifying the antecedents of ambidexterity as a whole (e.g., Jansen et al. 2012; Jansen et al. 2009a; Jansen et al. 2006; Mom et al. 2007). In this context, for example, it has been found that ambidexterity may be particularly important in times of high environmental dynamism (Jansen et al. 2006; Junni et al. 2013; O'Reilly and Tushman 2008) and environmental uncertainty (Jansen et al. 2009b; Sidhu et al. 2007). Moreover, scholars have identified firm-level antecedents that contribute to ambidexterity, such as firm size and resources (Cao et al. 2009; Sidhu et al. 2004), financial performance (Holmqvist 2004; O'Reilly and Tushman 2008), organizational identity (Tripsas 2009), and senior managers' experience and cognition (Mom et al. 2015; Raisch et al. 2009; Smith and Tushman 2005; Tripsas and Gavetti 2000).

So far, however, few studies have addressed why a firm might focus on structural vs. contextual ambidexterity (Lavie et al. 2010). Initial studies suggest that the choice of approach may depend on firm size, the radical vs. incremental nature of innovation, or the firm environment. Thus far, however, evidence remains anecdotal and inconsistent. First, studies suggest that contextual ambidexterity might be better suited to small to medium-sized firms (Duncan 1976; Lubatkin et al. 2006; Raisch et al. 2009). For example, Lubatkin et al. (2006) argue that smaller firms lack the slack resources and hierarchical administrative

systems to manage separate business units, suggesting that structural ambidexterity might be used primarily by larger firms. While this argument is plausible, it begs the question of when large firms with the resources to do *both* contextual and structural ambidexterity actually opt for one or the other.

Second, scholars have argued that structural and contextual ambidexterity differ in how far they allow firms to address discontinuities in their environment. Proponents of structural ambidexterity suggest that developing radical innovations requires exploration and exploitation to be structurally separated, which suggests that firms' ambidexterity approaches are driven by their need to develop incremental vs. radical innovations (Kauppila 2010; O'Reilly and Tushman 2013). This view is in line with the literature on inter-organizational ambidexterity, which suggests that balancing exploration and exploitation across organizations is more effective than doing so within organizations (Hess and Rothaermel 2011; Lavie et al. 2010), since organizational separation "buffers conflicting routines while maintaining operational consistency in each mode, thus avoiding potential tradeoffs" (Stettner and Lavie 2013, p. 1908). In contrast, proponents of contextual ambidexterity suggest that contextual ambidexterity is "potentially a more sustainable model [for organizational adaptation] than structural separation because it facilitates the adaptation of an *entire* business unit, not just the separate units or functions responsible for new business development" (Gibson and Birkinshaw 2004, p. 211). Moreover, there is some evidence that radical ideas can emerge when exploration and exploitation are not separated. For example, House and Price (2009) show that Hewlett-Packard's laser printing business resulted from exploration within established units.

Third, scholars have proposed that the relative focus on structural vs. contextual ambidexterity may depend on environmental factors, such as a firm's market or its technology's stage in the innovation life-cycle (Raisch and Birkinshaw 2008). Jansen et al. (2013) and House and Price (2009), for example, show that firms may switch between structural and contextual ambidexterity depending on the maturity of the technology. Similarly, O'Reilly and Tushman (2013, p. 330) argue that "the different ways of achieving ambidexterity may be more or less useful contingent on the nature of the market faced." These arguments suggest that firms might have to adjust their ambidexterity approach over time in line with their environment. So far, however, it remains unclear what characteristics of the environment induce firms to

change their approach, leading to specific sequences of contextual and structural ambidexterity. For example, whereas Jansen et al. (2013) found that incumbents often created new businesses through structural ambidexterity, and switched to contextual once the technology had become more accepted in the firm, House and Price (2009) show that Hewlett-Packard developed its laser-printing technology using contextual ambidexterity, only later using structural ambidexterity to form a separate business unit.

Given these conflicting views, we answer O'Reilly and Tushman's (2013) and Raisch and Birkinshaw's (2008) call to investigate how organizations' choice of ambidexterity approaches is contingent on the organizational environment. If the effectiveness of the two approaches does indeed depend on the environment, this has important implications for corporate managers wishing to implement ambidexterity. In this case, studying the relationship between the environment and ambidexterity would allow us to derive targeted recommendations for managers on when to focus on which approach. Moreover, insights into the usefulness of ambidexterity approaches in different environments could help us refine our understanding of the link between ambidexterity and organizational performance.

How do firms combine structural and contextual ambidexterity?

Besides providing limited insights into the antecedents of structural vs. contextual ambidexterity, the literature also has relatively little to say about how firms combine the two approaches in practice. Recently, more scholars have pointed to the complementary nature of structural and contextual approaches to ambidexterity (Hill and Birkinshaw 2014; O'Reilly and Tushman 2013; Simsek 2009). For example, Birkinshaw and Gibson (2004) state that "contextual ambidexterity differs from structural ambidexterity in many important ways […], but the two approaches are best viewed as complementary." Similarly, referring to Lawrence and Lorsch's (1967) foundational work, Raisch and Birkinshaw (2008) argue that approaches building on differentiation, such as the structural approach, need to be complemented by integrative approaches for organizations to deliver effective outcomes.

Following this line, scholars have suggested that rather than using only one type of ambidexterity, in reality firms can be expected to combine structural and contextual approaches (Fang et al. 2010; Kauppila 2010; Raisch and Birkinshaw 2008). This argument is backed up by the classical literature on organizational

change, which suggests that successful change often results from a combination of managerially induced, top-down strategic processes (including setting up separate exploration units as part of structural ambidexterity) and autonomous, bottom-up developments (resulting from employee initiatives in contextual ambidexterity) (e.g., Weick and Quinn 1999; Zimmermann et al. 2015).

Thus far, however, although several authors have called for studies that investigate the complementarities between structural and contextual ambidexterity, we lack insights into how firms combine different elements of structural and contextual approaches in change initiatives (Chang and Hughes 2012; Raisch and Birkinshaw 2008; Simsek 2009). Extant empirical work has shown how firms move between structural and contextual ambidexterity over time (Jansen et al. 2013) or combine temporal with structural ambidexterity (Chen and Katila 2008). To our knowledge, however, empirical research has not systematically investigated how firms simultaneously combine structural and contextual elements within initiatives to develop ambidexterity approaches that offer advantages over applying the ideal types individually. The lack of empirical evidence may be due to the fact that most studies have focused on studying either structural or contextual ambidexterity. A notable exception is the study by Adler et al. (1999). Although the authors do not explicitly refer to structural and contextual ambidexterity, they do show how the simultaneous use of both structural and contextual elements allowed a Toyota subsidiary to attain both superior flexibility and efficiency. Taking a similar approach to other studies in the field, however, Adler et al. (1999) focus on describing how firms use structural and contextual initiatives in parallel, rather than describing how firms combine structural and contextual elements within individual initiatives. By combining ambidexterity approaches and leveraging their respective strengths, organizations may be able to improve both their performance and their chances of long-term survival. Therefore, deeper insights into when and how organizations blend structural and contextual ambidexterity could yield important implications for managers and help refine the concept of ambidexterity used in the literature.

METHOD

To investigate *how the environment shapes a firm's use of structural and contextual ambidexterity* we use qualitative case study research. Case study research is well suited for deriving rich descriptions of empirical phenomena for which little theory exists (Eisenhardt 1989; Siggelkow 2007). Since existing literature has not yet fully explored and conceptually modeled environmental influence on organizational ambidexterity, we use qualitative research to explore the mechanisms at work (Yin 2009).

Research setting

We conducted an in-depth, longitudinal, comparative case s tudy of the four largest German electric utility companies—E.ON, RWE, EnBW, and Vattenfall—in the period 2005–16 (Eisenhardt and Graebner 2007). From a theoretical sampling perspective, this setup is ideal for exploring our research question, since (a) the German electricity sector faced two major environmental discontinuities in this time frame that required incumbent firms to engage in ambidexterity, and (b) firms differed in their ambidexterity approaches. Moreover, Germany is widely regarded as a frontrunner in transitioning to environmentally friendly energy technologies. Therefore, studying the German case can provide important insights for managers and policy makers in other countries that have started similar transitions, e.g., the U.S. or Switzerland (Hoppmann et al. 2018).

Until the early 2000s, the German electricity sector was organized into regulated, regional monopolies, which allowed incumbents to reap above-normal returns and focus on exploitation. Starting in 2005, the sector faced two major discontinuities in the regulatory, competitive, and technological environment that radically challenged incumbents' ways of doing business. [2] In the first phase, the sector

[2] The two discontinuities are not completely distinct, since the emergence of renewables partly drove the trend toward downstream technologies. We still treat the environmental changes as two separate discontinuities, since (a) renewables are only one of many drivers that contributed to the new downstream trend and (b) our informants stressed that distinguishing between the two phases was important. As we will explain in more detail in the results section, besides an increase in renewable capacity, the trend of going downstream was fueled by a general overcapacity in the German market as well as low coal and CO_2 prices (all of which contributed to falling electricity prices and lower profit margins) and the emergence and increasing economic viability of new downstream technologies (such as distributed solar PV, battery storage, digital, smart-home, and energy-efficiency technologies). While both discontinuities were strongly shaped by public policy interventions, the nature of the policies gave firms considerable leeway in designing strategic responses. Specifically, while policies were designed to decarbonize the electricity sector, electric utilities were free to choose which technologies, products, and business models they invested in; how

saw the rise of renewable energy as a technological alternative to conventional power generation[3], which we label "new upstream" (Hoppmann et al. 2014). In the second phase, starting around 2009, the electricity sector faced a sharp decline in profit margins on upstream power generation, which forced utilities to search for new business models and technologies in the downstream part of the electricity value chain (so-called "new downstream").

While both trends affected the entire German electricity sector, we concentrate on studying the ambidexterity activities of the four largest utilities (the "Big Four"). We do so since these firms represent classical incumbents that faced a strong incentive to enhance their level of exploration and pursue ambidexterity approaches in response to the aforementioned discontinuities. All four possessed sufficient resources to engage in the costly adaptation processes necessary to achieve organizational ambidexterity, which clearly distinguishes them from their smaller competitors[4]. At the same time, however, a closer look at the firms' activities revealed that each chose ambidexterity approaches that differed in their emphasis on the structural and contextual elements discussed in the literature. Contrasting firm responses across time allowed us to draw important conclusions about how the use of structural and contextual elements is related to environmental characteristics. Studying differences across firms at each point in time showed us how firm responses to environmental stimuli depend on firm characteristics.

Data collection and analysis

To arrive at a thorough understanding of firms' ambidexterity approaches and environmental antecedents over time, we drew on a wide array of data sources, namely (1) archival data, (2) interviews with industry experts, and (3) personal interviews with representatives of the four utilities (Boumgarden et al. 2012).

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they redesigned their organizational structures; and when they responded to the changes in their environment. In this sense, firms' ambidexterity approaches were not predetermined by their policy environment. Instead, as our interviewees reported, during both phases firms were free to select structural or contextual approaches to respond to the changes in their environment.

[3] Between 2000 and 2014 the share of electricity generated from onshore wind turbines or solar PV modules rose from 1.6% to 14.6%. The installed generation capacity from these sources grew from about 6.2 gigawatts to about 76.3 gigawatts, i.e. it increased from less than 5% to more than 38% of the total power plant fleet in Germany.

[4] This assumption was confirmed in a pre-study interview with the CEO of a German municipal utility, who told us that the responses of smaller utilities to environmental change were often lagging behind, since they could not afford larger investments in novel technologies or business models.

First, we used archival data to develop a granular event timeline for the utility sector and a holistic overview of each firm's history, strategy, and scope of activities. For this purpose, we collected several thousand company-external documents such as annual reports, letters to shareholders, corporate brochures and profiles, employee presentations, corporate news releases, corporate webpages, videos of top managers' talks, and presentations. Moreover, we used the DowJones Factiva[5] database to gather an extensive body of press articles (journals, magazines, newspapers, news wires). Based on this large empirical dataset we developed comprehensive archival data dossiers for each firm in our sample. These dossiers comprised information on the initiatives that firms launched in response to renewable energy and downstream opportunities, as well as the demographic background of selected senior executives involved.

Second, we used semi-structured interviews with industry experts to validate our findings on environmental changes and gain further insights into the approaches chosen by our sample firms as well as the rationales behind them. Industry experts included strategy consultants; technology providers; representatives from other utilities and industry associations; and well-informed trade journalists. Besides conducting 14 formal telephone interviews, we discussed our emergent findings in a series of informal interviews with industry experts and utility representatives during the 2015 annual meeting of VGB Powertech[6], the leading technical association of utilities in Europe. The expert interviews confirmed that the company approaches differed considerably over time. Based on the interviews, we developed a preliminary theoretical framework. In particular, we established initial links between the ambidexterity approaches used by our sample firms and the organizational environment.

Finally, we used interviews with 30 current and former representatives of the four firms to shed light on the firms' ambidexterity initiatives in terms of their design and antecedents. Previous research suggests that ambidexterity is a multi-level phenomenon that may involve a wide variety of actors and processes. Thoroughly understanding ambidexterity in our focal firms therefore required us to collect data

[5] To narrow down the search scope we developed a string of keywords that contained the name of the firm in combination with the most important power-generation technologies.
[6] The members comprise 480 European power and heat generators, which operate and maintain a global generation fleet totaling 458 gigawatts.

on multiple levels (from individuals to entire business units) and on employees in different positions in the organizational hierarchy (both frontline staff and top managers) (Birkinshaw and Gupta 2013).

To explore individual firm initiatives, we approached current and former organizational members at different hierarchical levels who we knew were (or had been) involved in the company's new upstream or new downstream activities. In addition, we made use of snowball sampling, asking each interviewee whether there were important members of their organization with whom we should discuss our research. Interviews lasted between 30 and 90 minutes (60 minutes on average) and were audio-recorded and subsequently transcribed. As part of the interviews, we asked interviewees to describe specific initiatives their organizations used to deal with the two challenges of renewable energy and new downstream (setting up new business units, projects, or change efforts). We decided to capture a firm's ambidexterity effort at the level of individual initiatives, since (a) this allowed us to draw a complete picture of the diverse ways through which firms tried to achieve ambidexterity; and (b) by discussing concrete initiatives with our informants, we could obtain very detailed information about their setup and underlying rationale.

For each initiative, we then drew on the three categories described in Table 1 to inquire whether it possessed characteristics of the structural or contextual ambidexterity approach. Since the literature provided sufficient guidance on how to differentiate the two ambidexterity approaches, for this step we directly drew on concepts described in the literature. Moreover, we explicitly asked our informants why the initiatives had been set up as they had; how initiatives for renewable energy compared to those for new downstream; and how their firm's initiatives differed from those of the other "Big Four". Since the antecedents of ambidexterity approaches were not well described in the literature, we used a more inductive approach here, asking open questions and experimenting with alternative constructs. To ensure the validity of our findings, we triangulated between the interviews as well as the archival data.

Going back and forth between data collection and theory development, we then iteratively refined our preliminary theoretical framework until theoretical saturation was reached (Miles and Huberman 1984). In this context, to fully capture the richness of the constructs, we developed a coding scheme according to the guidelines of Flick (2009), which we implemented in the qualitative data analysis software MaxQDA.

In particular, for each of the firms, we created a list of all initiatives for both renewable energy and new downstream and coded our interview transcripts according to whether the initiatives exhibited features of structural and/or contextual ambidexterity. Similarly, we scanned our transcripts for statements that described the characteristics of the two environmental discontinuities or links between environmental characteristics and the firms' initiatives, as well as company characteristics that could explain differences across firms. Using pattern matching, we then established the relationships between the nature of environmental change, firm characteristics, and the design of the firms' ambidexterity initiatives. Tables 2 and 3 provide an overview of the data sources used in the study as well as some important organizational descriptives.

Insert Tables 2 and 3 about here

Once we felt that the theoretical framework was robust, we re-interviewed four company representatives to present our findings and framework and ask them to critically consider whether our results concurred with their observations and experience. The interviewees responded that, from their perspective, our framework summarized their perspective in a very useful way, and made only minor suggestions for improvements, which we subsequently implemented.

FINDINGS

The starting point: monopolies, profits, and exploitation

Until 1998, the German electric utility market was organized into regional monopolies, which granted electric utilities exclusive rights to generate, transmit, and sell electricity. In this stable environment, firms had a mandate to ensure the security of supply, and concentrated their generation business on large-scale power plants that used hard coal, lignite, or nuclear fuel. When the monopolies were dissolved as part of the German electricity market liberalization in 1998, the utility industry was restructured through a series of mergers and acquisitions. This led to the rise of the four large utility firms—RWE, E.ON, EnBW, and Vattenfall Germany, later dubbed the "Big Four"—that provided electricity to more than 40M customers and had a market share of 54% by 2003. In later years, the Big Four leveraged their dominant position in

the German electricity system and exploited their written-down power generation fleet. As the manager of a local utility stressed, "[n]uclear power plants, black coal power plants, gas power plants—all plants were money-printing machines back then" (E8[7]). In the words of one E.ON manager, this led to a situation where "there were essentially no limits for the electric utilities. […] The share prices frequently reached new highs, profits went up every year, there was no way you could have prevented this from happening" (U4). Consequently, technological activities mostly focused on maintaining and incrementally improving existing plants that had been put into operation in the 1960s and 1970s. "You had a business model that had worked for 40, 50 years. No one thought this would change any time soon" (E10).

The first challenge: new upstream opportunities

The situation was transformed by the advent of renewable energy technologies as an additional pillar of the upstream power-generation business. Since the 1970s, social movements had been urging the German government to phase out nuclear power and incentivize renewables. That pressure finally bore fruit in the first public demonstration projects for wind and solar power in the 1990s; the political decision to exit nuclear power in 1998; and the inauguration of the Renewable Energy Source Act in the year 2000. This last policy measure granted investors in renewable energy plants the right to sell their electricity at well above the going wholesale price. This, in turn, led to a surge in annual installations of solar, wind, and biomass power plants by new market entrants, which triggered technological learning and cost reductions in renewable technologies.

Of course, the rise of renewables did not go unnoticed by the Big Four, but they hesitated to embrace the trend. Renewables were "not taken seriously" (E3), were considered "insanely expensive, a case of excessive subsidization" (U9), and "inefficient" (U15). Managers were convinced that "electricity could not be generated safely and cheaply using renewables" (E3) and that "policymakers will eventually come to their senses" (E3). Accordingly, the firms first tried to "block the market entry of renewables and protect

[7] We use the codes E1–E16 and U1–U30 to reference industry experts and utility representatives respectively.

the conventional generation business" (U4) through lobbying. In addition, apart from minor activities in local niche markets, the Big Four made no notable investments in renewables, such that by 2007 their share of the German renewable market was still less than 8% (see Figure 1). As one manager stressed, the utilities were "practically inactive in the renewable business" (E10) and "there were a few people who were doing things in renewables, but when it came to strategic investments, renewables were—simply speaking—the enemy. One did not want to 'create competition for oneself'" (E10). Only in 2007, when the Big Four began losing market share, did managers see that they had to invest or risk being left behind. As one manager recalls, "We realized that […] the share of conventional energy would shrink and that growth would primarily take place in renewables. […] And of course, you don't want to lose market share, so we said that we must enter the renewable technologies" (U4).

Insert Figure 1 about here

The approach: structural ambidexterity

Entering renewables required the utilities to develop new processes to engineer, build, run, and maintain renewable plants. One option would have been to assign these activities to existing business units, which well understood how to carry them out for conventional plants. Yet, our analysis shows that all the Big Four opted to create dedicated business units for renewables, clearly separated from the rest of the organization. RWE created the unit "Innogy," E.ON "Climate and Renewables," EnBW "Renewables," and Vattenfall "Vattenfall Wind."

The new units were often staffed with external hires with previous experience in renewables, tasked with working on renewables full-time. As a consultant explained, "Everything that has to do with renewable generation can be found in these units; the old generation units don't deal with renewable energy" (E3). Only at EnBW was the unit more closely integrated, such that plant maintenance was done by employees who switched between working on conventional and renewable technologies. In all cases, top managers' job was to allocate budgets between the new and old units. Moreover, the top managers were heavily involved in selecting the technologies and projects to be pursued by the new units.

Table 4 categorizes the utilities' initiatives into structural and contextual ambidexterity approaches according to the criteria presented in Table 1. It shows that to address the challenge of renewable energy, all utilities closely followed the structural approach, with the exception of EnBW. In addition, Table A.1 in the appendix provides more details and exemplary quotes.

Insert Table 4 about here

The rationale: dealing with a limited number of opportunities requiring different culture and capabilities

So why did the Big Four opt for the structural approach when entering renewables? Our findings suggest three main reasons (see Table 5). First, separation was deemed necessary because the *great distance between environmental opportunities and the organizations' culture* implied a *lack of support for renewables in the existing units*. Due to longstanding experience with fossil-fuel technologies, the culture in the conventional business strongly favored large-scale nuclear, coal, and gas power plants. Over the years, engineers in the companies had come to see reliability, technological efficiency, and cost effectiveness as the most important criteria for judging the merits of energy generation technologies. Since these values had become deeply engrained into the companies' culture, renewables were regarded as technologies that were immature, inefficient, and strongly dependent on public subsidies. As one manager reported, engineers in the conventional units "saw renewables as a threat: 'What's all this nonsense? It's too expensive anyway!'" (U9). Therefore, it was "considered difficult from the perspective of the companies' DNA to bring together engineers responsible for conventional plants with the entrepreneurs working on renewables" (U30). Any attempt to develop renewables within the existing business units would have caused "strong resistance" (U22) and would have instantaneously killed the initiative. As all our interviewees stressed, it was therefore "a good decision" (U1) to separate renewables from the conventional business and develop "a new entity where you can foster a new culture" (E5).

Insert Table 5 about here

Second, forming separate business units and staffing them with external hires was deemed important since *the organization lacked the necessary capabilities to pursue the technologies in the existing units.* Having been slow to embrace renewables, the Big Four had only very limited capabilities and experience in this area. Therefore, setting up dedicated units with a clear mission to explore renewables promised much quicker results than having frontline employees explore renewables as part of their daily routines. As one E.ON manager recalls, "We set it up outside the normal E.ON organization because we wanted it to be fast and efficient. […] For example, we have a different HR structure, employees cost less, we have younger employees, the teams are smaller, we have a smaller overhead, etc." (U19). An RWE manager agreed that "it was important to start the new business without all the legacy, the personnel processes, and the bureaucracy. Therefore, we decided to form a new unit" (U28).

Third, specialization of employees and top-down integration by management were deemed appropriate because the *environmental opportunities were few and relatively clear*. As one Vattenfall manager recalled, "[t]he generation side is relatively straightforward. There's maybe five or six, seven [renewable] generation technologies you can use […]" (U14), such as onshore and offshore wind power, solar photovoltaics ("PV"), concentrated solar power, biomass, geothermal, and wave/tidal technologies. In fact, in several of the companies, such as RWE, the management selected the focal technologies to be pursued even before the unit was set up, based on personal experience and a superficial evaluation of alternatives. Among the seven main technologies available, offshore wind power was perceived to have the greatest synergies with the conventional business, as it involved "developing large-scale, central plants, building large assets" (U19). Consequently, all four firms strongly focused on this technology over others. The limited number of opportunities allowed managers to get a "central understanding of our portfolio of options" and "take central decisions about where to invest the funds" (U2). As a result of these top-down decisions and the clearly separated setup of the new units, all four electric utilities were able to quickly expand their activities in renewable energy. For example, between 2008 and 2013, RWE and E.ON alone invested more than USD 15.1B in renewable energy projects. By 2015, renewables already made up 16% of the revenues and more than 50% of the profits in RWE's power-generation business.

The exception: managerial cognition influences ambidexterity approaches

While we embarked on our investigation expecting sharp contrasts between the companies, the previous section shows that all four took the structural ambidexterity approach to renewables. Only at EnBW was the renewable business more closely integrated: Whereas the engineering and construction of renewable plants was performed by the newly founded renewable unit, operation and maintenance activities were integrated with the conventional power-plant business. According to several interviewees, this was because EnBW's managers perceived a greater potential for synergies between the conventional and renewables businesses than their competitors did. Since EnBW was active in only one of the 16 German states, it had a more regional focus in its operations compared to its peers. As a result of this regional focus, while managers in other firms perceived the capabilities required for conventional and renewable businesses as being quite distant from each other, managers at EnBW stressed similarities, which prompted them to make less use of structural separation. As one manager of the company stressed, "We are concentrated. Most of our plants are in Baden-Wuerttemberg, and therefore, it pays off to do this integration. The distances are short, so you can generate financial benefits if you do it this way. I believe that, for example, E.ON, with plants in Bavaria and Lower Saxony, would have many more difficulties pursuing such an approach" (U5).

However, another EnBW manager admitted that it was "far from clear whether the company can actually leverage such synergies" (U23), and whether the benefits of co-location would outweigh its downsides. For example, building larger wind power plants in areas of more favorable wind resources in Northern Germany or other European countries might have allowed EnBW to leverage its core capabilities in building and maintaining large infrastructure projects more strongly. This suggests that EnBW's regional focus primarily influenced the *perceived* rather than the *actual* distance between environmental opportunities and existing capabilities. Indeed, in the course of our interviews, EnBW "started to expand [its geographic focus] across Germany" (U2) by "developing wind projects outside Baden-Württemberg" and founding "centers for wind onshore all over Germany, in Hamburg, Berlin, Trier, Erfurt…" (U23).

The second challenge: new downstream opportunities

Even as the utilities expanded into renewables, the energy sector was struck by several developments that challenged the incumbents' position once again. First, continued political support for renewable technologies led to a steady rise in electricity generation capacity, which, in conjunction with falling CO_2 and coal prices, resulted in a "collapse of market prices" (U9) in the German electricity wholesale market (see Figure 2). Previously, utilities had predominantly relied on electricity generation for earning reliable profits of around 15%. With the increasing share of renewable power, which entered the market at zero variable cost, and falling commodity prices, "the profit margins in the conventional business were completely eroded" (U12). From being the "bread-and-butter business" (U29) that built the companies' foundation, conventional generation became "an economic basket case" (U29), with companies "having to write down many of the assets" (U29). The German government's decision, in 2011, to phase out nuclear power by 2022 in response to the nuclear meltdown in Fukushima further reduced the scope for easy profits from depreciated plants. Companies were "shocked […] that they had to phase out their best nuclear plants. […] They were really paralyzed" (E3).

Insert Figure 2 about here

Second, many new downstream technologies that allowed consumers to generate their own electricity, as well as monitor and reduce their electricity consumption, began penetrating the market. For example, due to politically induced mass deployment, costs for residential PV systems "fell drastically" (E10) by almost 50% between 2010 and 2013. As a result "within a very short time […] electricity from small PV systems became cheaper than electricity from the plug" (E10). By 2012, 1.3M German households and firms were already generating their own electricity, implying a considerable loss in electricity sales for the incumbent electric utility companies. As one manager reported, within the utilities, this trend "triggered discussions like, 'Whoops, help! […] This is a huge market and we're not participating. Prices have come down and somehow we aren't part of the game'" (U28). As another manager concurred, "When it all started,

we said, 'That's too expensive, that doesn't work.' Now we see the incredible disruptive potential of PV, simply due to the constantly falling costs" (U12).

The trend toward self-generation was further spurred by the increasing profitability of energy storage technologies that allowed private consumers to considerably reduce their electricity bill and even "completely get rid of their grid connection eventually" (E10). In addition, new digital, smart-home, and energy-efficiency technologies allowed companies to offer new products and services that allowed consumers to save electricity and created a completely new user experience. As two managers summarized, "The energy world is becoming more decentralized" (U15), and "margins are moving from the conventional generation business to the downstream business" (U13).

Together, lower margins in the upstream generation business and the emergence of new downstream technologies fundamentally challenged the utilities' existing business models. Revenues declined considerably, and the four leading firms' market value plummeted by between 24% (EnBW) and 54% (RWE) between 2008 and 2013. Despite these clear economic signals, it took the Big Four a long time to finally face up to the altered reality of their business environment. This was due to "a combination of missing capabilities and a very strong [cognitive] frame stuck in conventional, centralized generation, which only broke very late" (E2). Two experts expressed that "traditionally, the business of the electric utilities was to take a lot of money and build a huge asset that generated revenues for a very long time" (E9), and that the business logic of all utilities was "clearly aligned with the central generation business; the understanding of decentralized models was missing" (E1). A utility manager we interviewed admitted that, "We are simply really bad at developing and producing products that are tailored to the customer" (U24). However, since it became increasingly clear that the "companies could no longer earn money with the traditional business" (U18) and there was an increasing threat of new entrants, such as Google, around 2011 the utilities started to look for new opportunities downstream in the electricity value chain.

The approach: hybrid ambidexterity

Interestingly, the utilities' approach when engaging in new downstream businesses differed sharply from the one they had used for new upstream opportunities. Rather than just assigning the new activities to new

business units— i.e. pursuing structural approaches—all four firms additionally engaged in contextual approaches and employed approaches that combined elements of structural and contextual ambidexterity.

First, all four firms created business units dedicated to the new downstream business, following the *structural ambidexterity* approach: RWE formed "Effizienz," E.ON "Connecting Energies," Vattenfall "Customers & Solutions," and EnBW "Sales and Solutions." Like the renewable units, these were clearly separated from the rest of the organization and "given a specific budget, where we can say, 'We want to work on this and that topic'" (U17). Employees were "deliberately recruited from different industries […] to preserve some distance from the classical electric utility" (U17). Hence, the role of top management was to provide resources and protect the unit from being swallowed by the conventional business. In the case of RWE Effizienz, for example, one manager said, "I don't believe we would have got this far, if Mr. Grossmann [CEO] had not founded RWE Effizienz rather than relying on all the little activities that were taking place in the company" (U17).

Second, all four firms launched comprehensive cultural change initiatives throughout the entire organization. In line with the concept of *contextual ambidexterity*, the goal was to enable and motivate all employees to flexibly switch between exploration and exploitation in their daily work. Rather than working on new technologies full-time, staff were encouraged to reflect on their established routines and break out of them when necessary. As one manager observed, "It has to come from the bottom, the conditions need to develop, so that the entire organizational culture changes. […] There needs to be the willingness to quickly respond to ideas and external changes" (U12). Another manager stated that the goal of the cultural initiatives was to "find the right balance between flexibility and rigidity. On the one hand, to have milestones and goals that define our focus and allow us to push things and deliver. On the other hand, to leave some freedom, freedom to develop new ideas, freedom to explore things, to test things and make mistakes" (U9). In line with the literature, management's task was to provide context for this new approach. In several (but not all) companies, the cultural shift was promoted by hiring new CEOs who put this aspect high on their agenda. While some CEO changes had already occurred during the first discontinuity (e.g., at RWE and EnBW) without an emphasis on cultural initiatives, our interviewees told us that the nature of the second

discontinuity made changes in the organizational culture necessary. At RWE, for example, Peter Terium, who succeeded Juergen Grossmann, was soon nicknamed "Esoterium" for putting a strong emphasis on cultural initiatives. One manager, for example, reported spending "10 days in seminars together with other managers, where we practiced things like mindfulness, yoga, and different formats of how to communicate with each other. […] And this leads to people interacting with each other in a more relaxed, more honest, faster way—that's cultural change" (U9).

Third, and most importantly, all the utilities except Vattenfall *drew on approaches that merged ideas of structural and contextual ambidexterity in one organizational initiative*, something we label *hybrid ambidexterity*. Comparing their initiatives, we find evidence for at least three specific examples of hybrid approaches: ideation, incubation, and integration hybrids.

Ideation hybrids, such as idea competitions and crowdsourcing initiatives, were implemented to generate a large number of new business ideas. For example, as part of RWE's "Jump!2011" initiative, "more than 300 employees from all parts of the company submitted 223 ideas for new business models" (RWE annual report 2013), from which managers subsequently selected "20 finalists in the first phase and five winners in the second" (U20). Such initiatives were close to contextual ambidexterity, as they provided an opportunity for frontline employees to switch from their daily work toward suggesting new products or business ideas (e.g., a novel service that helped customers save costs by using off-peak electricity). At the same time, however, compared to the cultural change initiatives, these initiatives involved a sharper structural separation, as firms created temporary organizational entities to facilitate the process of idea generation. This allowed much faster and more coordinated idea development than would have been possible using a purely contextual approach. For example, although RWE's Jump!2011 was not formally integrated into the organizational structure, a project team and a jury were set up to manage it. Top management supported these initiatives with both financial resources and time. For example, Juergen Grossmann, CEO of RWE, personally sponsored Jump!2011 and was a member of the jury that selected the projects.

Besides ideation initiatives, RWE, E.ON, and EnBW formed *incubation hybrids*, such as internal start-up accelerators, as part of which frontline employees were given the time, space, and budget to explore and further develop innovative ideas they had come across in their daily work. For example, EnBW formed the "Innovation Campus," as part of which employees could use "20 to 30 percent of their time" to "develop an idea, formalize and describe [it], and conceptually refine the business model. Then you go into the piloting according to the Lean start-up methodology, develop hypotheses […], and eventually you hit the market" (U20). An example of a product developed through the EnBW Innovation Campus was "SM!IGHT", an innovative street lighting solution that included public Wi-Fi, environmental sensors, vehicle charging points, and traffic and parking management technology. RWE and E.ON launched initiatives similar to the "Innovation Campus" with their "Innovation Hub" and ":agile accelerator" respectively. All these initiatives pulled in frontline employees from the old business units. In contrast to a purely contextual approach, however, the new organizational entities provided spaces that were "deliberately set apart from the Group's structures" and "intentionally housed in [their] own building[s] outside headquarters to promote the development of new business ideas in an independent and creative environment" (EnBW annual report, 2013). The advantage of using a hybrid structure for incubation initiatives lay in the possibility of developing radically new ideas while flexibly leveraging employees' existing expertise through a network approach. Using the biological analogy of an amoeba, one RWE manager described their Innovation Hub as "a network organization. We are a platform. We have a very fluid structure that allows us to quickly take on new topics and absorb them" (U15).

Top management played a mixed role in these incubation initiatives. On the one hand, it created and protected them to ensure sufficient resources. As one manager stressed, "top-down support is important, as the initiatives work with different processes" (U26). In the case of RWE (but not E.ON or EnBW), top management even defined specific "lighthouse" topics to provide strategic direction and narrow down the scope of potential business opportunities. On the other hand, once created, the initiatives had considerable autonomy over which technologies, products, or business models to investigate. Management then mostly served to provide the context to ensure a steady supply of ideas and human resources. As one manager

explained, in order to help the initiatives succeed, "I need to do everything to create an environment that fosters idea generation, but also enhances the ability to quickly bring products to the market as pilots and test them" (U15). However, as the same manager also pointed out, this environment was not present from the start: "the topic of innovation would have been immediately killed by the firm's 'antibodies' if we'd put it on the agenda right away. It took us two and a half years to build the foundation" (U15).

Finally, companies also made use of *integration hybrids*, which were set up to pool existing knowledge within the company on a specific topic of strategic importance by flexibly drawing on experts in the organization. For example, E.ON created the "Digital Transformation Unit," a task force specifically dedicated to "driving and coordinating E.ON's digitization" efforts (E.ON annual report, 2013). In contrast to the ideation and integration initiatives, the Digital Transformation Unit was clearly set up around digitization as a topic, which management had identified as strategically relevant for the firm. Thus, frontline employees did not engage in open search for new business models, but were selectively brought into the task force to work on specific projects, such as developing a new E.ON social-media platform. In contrast to the ideation or incubation hybrids, moreover, the Digital Transformation Unit was clearly anchored in the organizational structure by means of a matrix organization. An E.ON manager described the Digital Transformation Unit as "a matrix. We didn't want to create a new, central ivory tower, but a well-connected wire-mesh fence, in a positive sense" (U21). At the same time, due to the top-down approach and selective involvement of employees, the Digital Transformation Unit did not require employees to switch frequently between exploration and exploitation. In this sense, integration hybrids strongly resembled structurally separated exploration units, but provided the advantage that they allowed the knowledge of frontline employees from across the organization to be leveraged for selected topics.

Summarizing our findings, Table 6 categorizes the firms' initiatives for new downstream into structural and contextual ambidexterity, using the criteria introduced in Table 1. It shows that, in contrast to the initiatives for new upstream, some of the initiatives for new downstream clearly fall under the category of contextual ambidexterity. Moreover, all the firms except Vattenfall set up initiatives that merged features

of contextual and structural ambidexterity. Backing up the information presented in Table 6, Table A.2 provides detailed evidence for the categorization of initiatives from our interviews.

Insert Table 6 about here

The rationale: exploring a large number of uncertain opportunities

Why did the four firms use both contextual and structural approaches, and also combine them to form hybrid initiatives when exploring new downstream opportunities? Our interviews show that it was due to the fundamentally different environment they were facing compared to the challenges they faced in their upstream business (see Table 7). As with renewables, *the environmental opportunities were considered to be distant from firms' culture and capabilities*. However, whereas the opportunities in renewables were few and relatively clear, the opportunities in the new downstream business were *numerous and uncertain*. As one E.ON manager pointed out, it was far from clear which new downstream technologies, products, and services might turn out to be viable:

> My impression is that new downstream is not that simple. If we just start with the question: "What is the role of electric mobility, and what role is it going to play?" That is already a very broad field. And then you can start thinking about storage or smart applications and smart home. Each of those is a broad field, because if you look into storage, you can say: "What exactly are we talking about—batteries or power to heat?" […] It is an incredibly broad field. (U12)

Insert Table 7 about here

In addition, moving outside the well-known upstream generation market implied a search not just for new technologies, but for entirely new business models, which brought more complexity. As an expert noted:

> These days, you can't make sense of anything. You have a vague idea how the new energy world and a smart home works. But you have no idea what a business model could look like. You don't know what the products, what the markets are. You don't know what your value chain, your value added, your revenue structure is. You just don't know it today. In the case of [renewable energy, such as] PV, a wind turbine, or biomass, all that is 100% clear. (E15)

To deal with these myriad potential opportunities, the firms had to rely on an open search strategy that included *distributed decision-making and leveraging the attention and expertise of frontline employees*.

For example, one manager stressed that "we are in a dilemma: We currently don't know what the answer will look like. Therefore, I think, we need to focus on staying broad enough in our approach" (U12). Another manager concurred that:

> In new downstream you cannot measure the business case from the start, with all the uncertainties. Instead, you only know it once you have learned more in the pilot phase, when you are in the market, when you know what the customer is willing to pay. […] And this is also why I said, "We need a different space where I have a different process setup that suits the distributed nature and the risk of the business." (U20)

Rather than an individual manager selecting among a limited set of opportunities, as was the case for renewables, utilities thus relied more strongly on their frontline employees. Managers acknowledged that frontline employees are often steeped in the existing business, which may lead them "to sometimes not see the forest for the trees" (U14). In the case of new downstream initiatives, however, involving frontline employees was considered important for several reasons. First, many interviewees stressed that the utilities had "an immense amount of knowledge in-house […] There's probably no one who knows the energy industry better than [employees of utility firms]" (U14). Leveraging this "large body of knowledge" (U20) was considered important, since "to open up different paths and identify the future business models [in new downstream] you need a wide range of capabilities" (U23). Second, "the frontline employee, who works at grassroots level as an installer, foreman, or manager, has a better understanding of local needs" (U30) and "knows the customer" (U18). Given the great uncertainty and broad range of opportunities, the utilities needed "hints from the operational business on where it makes sense to look [for new business opportunities]" (U17) and "on where our strengths are" (U1). This required "a constant dialogue with the people who are out there with the customer" (U18). Third, the breadth of new opportunities meant that environmental changes would affect the entire company, and involving frontline employees helped "win people over to the idea of change" (U20) and "connect the new ideas with the [old] business" (U10).

Tapping into employees' ideas and initiative, however, required a culture of bottom-up idea generation that fundamentally differed from what the utilities had developed in their decades of operating in a monopolistic environment. The bottom-up approach included exactly what the literature has described as elements of contextual ambidexterity. At the same time, the companies did not choose a pure bottom-up

approach, but made simultaneous use of structural elements. This was done purely because relying on cultural change would have taken too long, and engendered highly dispersed, uncoordinated exploration initiatives. Therefore, besides fostering a broader context for ambidexterity through cultural change, the management used structural means to create dedicated units to generate ideas, develop new downstream technologies and business models, and work on topics of strategic importance. As one RWE manager emphasized, "we deliberately do not use some of the processes and systems that we have in the company. That would make us too slow" (U15). Moreover, the structural elements were seen as a means of speeding up cultural change. EnBW's 2013 annual report, for example, states that "[t]he Innovation Campus is expected to provide considerable impetus in establishing a culture of innovation throughout the entire company." Similarly, managers at E.ON and RWE mentioned that besides identifying and developing new business models, their hybrid incubation initiatives were designed to "foster [E.ON's] innovation culture" (U24) and expected to "sustainably shape the culture of RWE" (U15).

While it seems too early to judge the effectiveness of the utilities' new-downstream initiatives, several managers revealed that the firms had started many promising projects that would play an important role in ensuring the utilities' future survival and performance. As an RWE manager pointed out, "This isn't a youth research competition or a hobby—ten years from now we are expected to contribute a significant share of the future EBIT. That's the framework we have been given" (U15).

The exception: managerial cognition influences ambidexterity approaches

As in renewables, all four firms acted surprisingly similarly in response to the challenge of new downstream. Just one, Vattenfall, did not make use of organizational designs that combined structural and contextual elements. We find that this difference can largely be explained by differences in how managers perceived the opportunities and exposure to the discontinuity, which in turn were shaped by differences in the geographic location of firms' markets and headquarters.

According to a manager, Vattenfall had its largest customer base in the cities of Hamburg and Berlin. In these cities, however, the potential for customers to generate their own electricity by putting PV on their rooftops was clearly limited, as most people lived in rented apartments. As one manager explained,

"Berlin and Hamburg are places where there simply isn't much demand for PV. That's just the way it is" (U13). As a consequence, Vattenfall had actually seen an increase in customers, lessening the urgency to explore downstream technologies. Moreover, Vattenfall's headquarters are located in Sweden and its Swedish managers were too remote from the market in Germany to recognize the many opportunities that opened up in new downstream. One manager, for example, noted that "at our parent company, they are still living a bit in the old energy world, as it was here 10 years ago. […] The disruptions that we see here, they don't exist up there. They build a wind power plant once in a while, but PV doesn't play a role; they don't have the self-generation and the trend toward distributed power" (U14).

Since Vattenfall's Swedish managers perceived a lower exposure to the environmental discontinuity and fewer opportunities, they saw less need to set up initiatives that merged elements of structural and contextual ambidexterity. The lack of hybrid ambidexterity, however, also meant that Vattenfall showed the least activity among the four utilities in developing new downstream business models and technologies, e.g., in the field of PV. As a German Vattenfall manager admitted, "In the area of new downstream, the other utilities were much faster than us. Both E.ON and RWE are much better positioned than us, to be fair. […] But we are going to launch [a new idea competition] this year."

Emerging theoretical framework

Figure 3 shows the emerging theoretical framework that describes how the environment shapes incumbents' use of structural and contextual ambidexterity. Our study provides evidence that the relative focus on either structural or contextual ambidexterity depends on the nature of the environmental change a firm faces, specifically (a) the perceived distance of new opportunities from the organization's culture and capabilities, and (b) the perceived number and uncertainty of (potential) environmental opportunities. If the perceived distance of new opportunities in the business environment from the existing culture and capabilities of the firm is high and (potential) opportunities are few and relatively clear, this favors the use of *structural ambidexterity*. This is because marked differences between the new opportunities and the existing culture and capabilities may prohibit the exploration of such opportunities in existing units, requiring structural

separation. Especially if change is rapid, firms generally do not have the time to adjust their culture and capabilities to the new opportunities, such that setting up new units becomes necessary.

Insert Figure 3 about here

Contextual ambidexterity, in turn, allows firms to leverage the expertise and knowledge of their entire workforce. We find that our sample firms therefore shifted their focus toward contextual ambidexterity whenever the perceived number and uncertainty of (potential) opportunities in their environment was high. In such a complex, uncertain environment, contextual ambidexterity allows for bottom-up scanning of opportunities without having to set up a unit with a dedicated vision or scope that might narrow a firm's search unnecessarily.

Our study shows that when opportunities are perceived as being numerous/uncertain *and* as requiring a different organizational culture and capabilities, organizations draw on what we label *hybrid ambidexterity*—i.e., initiatives that combine structural and contextual ambidexterity. We find that hybrid initiatives can differ significantly in their mix of structural and contextual elements. For example, we show that the firms in our sample used ideation, incubation, and integration hybrids, each of which combined structural and contextual elements in a unique way to achieve a specific purpose (see Table 8). Ideation hybrids, such as idea competitions, were set up to generate ideas for innovation by allowing all organizational members to submit ideas for new businesses or products. They drew more strongly on contextual elements than structural elements to encourage "blue sky thinking" in times of uncertainty, while drawing on some loose structures (e.g., juries) to foster quick idea generation. Incubation hybrids, such as internal start-up accelerators, were used to develop new business by giving organizational members the time, space, and resources to pursue their own business ideas. They drew equally on both contextual and structural elements to create a semi-permeable or loose network structure that separated exploration and exploitation activities yet also allowed frontline employees to flexibly join and leave exploration initiatives. This was done to leverage the existing expertise of employees while avoiding the potentially adverse effects of existing business activities on new businesses. Finally, integration hybrids, such as taskforces, pooled

existing knowledge within the organization on a specific topic of strategic importance by drawing on experts from different organizational units. Compared to ideation and incubation hybrids, these initiatives were more formally structured and less reliant on contextual elements, such as individuals' ability to frequently switch between exploration and exploitation. Firms used such hybrids as they allowed them to quickly tackle specific topics of strategic importance by pooling existing knowledge within the organization without having to move experts from their existing positions.

Insert Table 8 about here

Finally, our study also provides evidence that a firm's balance between structural and contextual ambidexterity is affected by managerial cognition, which in turn is shaped by the geographic location of the firm's operations, markets, and headquarters. Specifically, the example of EnBW shows that the location of operations may affect how distant managers perceive emerging opportunities as being from the organization's culture and capabilities. Moreover, the example of Vattenfall demonstrates that the location of markets and headquarters may shape whether managers attend to opportunities and environmental discontinuities. In this sense, the choice of ambidexterity modes portrayed in Figure 3 is by no means deterministically linked to environmental changes, but strongly depends on managers' perception of the organizations' capabilities and culture as well as their perception of environmental opportunities.

Alternative explanations

Several alternative factors might explain organizations' choice of ambidexterity approaches. In the following we discuss three important alternative explanations: complementary assets, modular vs. architectural innovation, and path dependencies.

First, firms' choice of ambidexterity approaches may be influenced by whether an environmental discontinuity destroys their complementary assets (Tripsas 1997; Wu et al. 2014). Specifically, one could argue that the new upstream business (i.e., the emergence of renewable energy) left their complementary assets intact, while the emergence of new downstream destroyed them. However, our analysis does not offer

uniform support for this. Many interviewees stressed that of all renewable technologies, only offshore wind clearly matched utilities' existing complementary assets, such as capabilities in "planning, building, and operating large power plants" (U4). Moreover, several interviewees expressed that utilities possessed many valuable complementary assets they could leverage when entering the new downstream business, such as "direct access to a large customer base" (U23), "the ability to generate economies of scale" (U1), "a huge database of customer data […], a real data treasure" (U1) and a deep understanding of the electricity system. These assets made it hard for new entrants to compete with the utilities, leading start-ups to frequently partner up with the large utilities. Thus, our analysis suggests that it is the decline of the generation business in conjunction with the emergence of new downstream opportunities, rather than the destruction of complementary assets, that led to the need for a broader search in the second phase.

Second, whether firms pursue modular vs. architectural innovation may explain their response in terms of organizational ambidexterity. Specifically, one might argue that renewable energy as a key element of the new upstream business can be characterized as a modular innovation, whereas the trend of new downstream requires both modular and architectural changes (Henderson and Clark 1990). Indeed, we find that, unlike new upstream business, new downstream required utilities to search for completely new business models and consider a large set of possible technologies that needed to be linked and integrated in a novel fashion (see above). Yet we chose not to use the labels of "modular" and "architectural" innovation in our model since we consider the number and uncertainty of opportunities to capture the dynamics we observe in a more precise way. Specifically, when we asked the firm representatives why they had chosen different ambidexterity approaches for the two discontinuities, they pointed out that this was due to the greater uncertainty and larger number of options they faced in the field of "new downstream." The uncertainty and number of opportunities, however, is not related to modular or architectural innovations in a straightforward manner. Even if an innovation is modular, there may be great uncertainty about which of several technological options a firm should choose for the module. Conversely, even if an innovation is both modular and architectural, the solution space may be clear and delimited. For example, our interviewees reported that they would have used a more contextual approach as early as the first phase, had the number

of renewable energy technologies been larger. In a similar way, companies have recently moved toward more structural approaches to address new downstream business models as clarity about viable business models has increased. In sum, our study suggests that which ambidexterity approach a firm chooses is driven less by whether the innovation is modular or architectural than by the number and uncertainty of opportunities firms perceive for a specific innovation, as well as the perceived distance of those opportunities from the firms' capabilities and culture.

A third potential explanation for the dynamics we observe is organizational path dependencies. For example, one might assume that firms' choice of ambidexterity approaches for new downstream was influenced by their initiatives to develop new upstream business. However, our interviews suggest that when developing the new initiatives, managers deliberately used a "greenfield strategy," such that the initiatives were not linked to or strongly influenced by the firms' previous initiatives in renewable energy. Two managers, for example, pointed out that "the Innovation Hub was newly founded […] I mean, RWE hadn't been an innovative company before" (U8) and that "we started [the Innovation Hub] with two people and adjusted the structure over and over again as we learned what we needed" (U15). Similarly, an EnBW manager stressed that the CEO had given him the mandate to define the setup for the InnovationCampus, since "we didn't have anything, there was only a green field" (U20).

DISCUSSION

Implications for the literature

Our study makes at least three contributions to the literature on ambidexterity. First, we show that the choice of a given ambidexterity approach strongly depends on the nature of the environment that an organization faces. The previous literature has studied the antecedents of ambidexterity as a whole, but provides limited insights into why companies would invest in structural vs. contextual ambidexterity (Lavie et al. 2010; O'Reilly and Tushman 2013). Addressing this gap, we investigate the determinants of a firm's balance between structural and contextual ambidexterity. We find that when new opportunities in a firm's environment require a fundamentally different culture and capabilities but are few and relatively clear, firms

draw primarily on structural elements to achieve ambidexterity. This is because structural ambidexterity involves creating separate business units, which allows firms to maintain different sub-cultures concurrently. At the same time, the limited number of clearly identifiable business opportunities lets managers pursue a top-down approach to balancing exploration and exploitation. Conversely, if the array of opportunities in the firm's environment is vast, open, and uncertain, this favors a more contextual approach to ambidexterity, which leverages the attention, knowledge, and capabilities of frontline employees throughout the organization. When the firm's environment is characterized by opportunities that are both distant in terms of capabilities and culture *and* large in number and uncertain, firms can combine elements of contextual and structural ambidexterity.

By providing a coherent framework, our work synthesizes existing, anecdotal evidence on the antecedents of structural vs. contextual ambidexterity, as it specifies the concrete mechanisms and processes that link firms' environment to their ambidexterity approaches. Specifically, our findings suggest that the factors described in the literature—such as the radical vs. incremental nature of innovation, the life-cycle stage of firms' technologies, or the nature of the market—do affect firms' ambidexterity approaches, since they affect the number and uncertainty of environmental opportunities as well as their distance from firms' capabilities and culture. For example, our findings suggest that the radical vs. incremental nature of innovation shapes firms' ambidexterity approaches as it is linked to the distance between (potential) opportunities and firms' existing capabilities and culture. Radical innovations, for example, by definition require capabilities that are far from those the firms possess, thus favoring a structural approach over a contextual one. In this sense, our observations are in line with previous research stating that "it is harder to see how [contextual ambidexterity] would permit a company to adjust to disruptive or discontinuous changes in technologies and markets" (O'Reilly and Tushman 2013, p.329).

In addition to synthesizing existing explanations, however, our work also complements previous findings and helps resolve inconsistencies in the literature by painting a more nuanced picture of environmental contingency factors. For example, proponents of structural and contextual ambidexterity disagree over which of the two types of ambidexterity is most effective for addressing environmental

discontinuities. Our findings suggest that the answer to this question strongly depends on the nature of the environment firms face. While we find that structural ambidexterity is better suited to dealing with environments that require fundamental shifts in capabilities and culture, contextual ambidexterity may be needed in those cases where firms need to rely on the distributed attention and "hive mind" of their frontline employees. In this sense, our research links to the work on organizational networks, which has shown that "diverse ties might help the organization access quality information to recognize opportunities and/or threats hidden in a complex environment" and that "with sources of expertise that are widely dispersed, network ties tend to become salient predictors of the organization's innovation performance" (Simsek 2009, p. 615; see also Powell et al., 1996, Fang et al. 2010). Broadly speaking, our findings are therefore in line with the literature on strategic fit (Hambrick 1983), which suggests that firm performance strongly depends on firms' ability to achieve congruence between organizational variables (such as structure) and environmental contingencies. In addition, by identifying a number of environmental characteristics that influence firms' approaches to ambidexterity, our research answers recent calls to disentangle the various dimensions of environmental dynamism (Birkinshaw and Gupta 2013; Junni et al. 2013; Markides 2013).

Second, we provide systematic empirical evidence on how firms combine structural and contextual ambidexterity. Several scholars have suggested that firms may not draw on either structural or contextual ambidexterity exclusively, but may use the two types concurrently (Kauppila 2010; Raisch and Birkinshaw 2008). However, so far, existing studies have focused on either structural or contextual ambidexterity. The few studies that investigate both types (e.g., Adler et al. 1999) study structural and contextual ambidexterity in isolation, and shed limited light on how firms combine them within individual initiatives. Our study provides empirical evidence on how firms combine elements of the two approaches to leverage their respective advantages, an approach we label *hybrid ambidexterity*. Specifically, our research reveals that firms launch different types of hybrid approaches, which differ in their mix of contextual vs. structural elements. This variety reflects the extent to which the initiatives are intended to broadly and openly search for opportunities by involving a large number of employees vs. shielding new initiative from the existing business to quickly build new capabilities and avoid cultural conflicts.

By showing how firms flexibly combine structural and contextual elements, our research challenges the prevailing understanding of contextual and structural ambidexterity as dichotomous categories, and re-conceptualizes the constructs as two ends of a continuum. This opens up the field for a more nuanced investigation of the various organizational designs, initiatives, and integration mechanisms firms use to balance exploration and exploitation. We believe that treating contextual and structural ambidexterity as dichotomous categories has constrained our scholarly thinking, and that our study can help rejuvenate the ongoing debate in the literature on ambidexterity. In this context, our study also more closely links the literature on ambidexterity to the work on corporate venturing (Burgelman 1983) and parallel structures (McDonough III and Leifer 1983), which suggests that organizations may use networks, project teams, or flexible venturing units to perform non-routine tasks. By mapping initiatives that have been described in these literatures along the continuum of structural and contextual ambidexterity, our work helps bridge previously separate literatures and provides novel insights into when these different forms are used in organizations.

In addition, our study provides significant value for practitioners, as it expands our understanding of how firms can use separation and integration mechanisms at the level of individual initiatives to foster ambidexterity. Previous work provides detailed insights into the top-down integration mechanisms organizations use to integrate separate units and form an organizational context (Jansen et al. 2009a). Our study indicates that making use of permeable organizational designs and network organizations that simultaneously integrate and separate organizational units at lower levels may lead to initiatives that are better tailored to the specific organizational context, thus potentially giving firms a better ability to adjust to environmental changes than would be possible by using structural or contextual approaches in a disintegrated way. In this sense, our research suggests that firms may not only have to strike a balance between exploration and exploitation, and between different modes of exploration and exploitation (such as internal R&D, alliances, M&A), but may also need to balance different types of ambidexterity.

Third and finally, we show that firms' ambidexterity approaches are shaped by managers' cognition. Previous work has pointed to the possibility that cognition may influence whether firms pursue

ambidexterity (Heavey and Simsek 2017; Lin and McDonough III 2014). However, thus far, studies in the field predominantly assume environmental discontinuities to affect all firms in an industry to an equal degree, and provide limited insights into how cognition shapes firms' ambidexterity approaches. We show that differences in how managers perceive opportunities and capabilities may shape their choice of structural vs. contextual ambidexterity, and that managerial cognition, in turn, is influenced by firms' geographic location of operations, markets, and headquarters. We find that firms within the same industry may differ significantly with regard to the geographic location of their operations, markets, and headquarters, which affects whether managers attend to environmental discontinuities or opportunities and how distant they perceive emerging opportunities to be from the organization's culture and capabilities. For example, our findings imply that firms that are less exposed to specific environmental discontinuities may be less inclined to adjust their organizational design. While this seems reasonable from a management perspective, it also creates a risk for multinational firms that face discontinuities in only a few of their country markets. Particularly if a firm's headquarters is located in a country that is not exposed to environmental discontinuities, this may delay its response in regions with higher exposure, impairing firm performance.

Limitations and future work

Our study has at least two limitations, which could provide avenues for future research. First, since it is based on an in-depth observation of four firms in the electric utility industry, it remains open to what extent our findings are generalizable to incumbent organizations in other sectors. To scrutinize the external validity of our findings, we conducted interviews with experts from the banking and manufacturing industries, which suggested that many of our findings might be applicable to other sectors. Still, the electricity sector is idiosyncratic in that is highly regulated and was only recently opened up to market competition. Future research should therefore analyze the use of structural, contextual, and hybrid ambidexterity in other sectors to identify potential contingencies.

Second, additional research is needed that investigates the role of isomorphism in firms' ambidexterity approaches. Our study provides direct evidence that the design of ambidexterity approaches

is linked to the nature of the firms' environment and that differences in exposure to environmental discontinuities lead to differences in firm responses. Yet, given the strong similarities in firm approaches, it seems possible that firms at least partly emulate each other's approaches when reacting to the same environmental shock. When asked whether this was the case, our interviewees stressed that they did not pay much attention to their competitors and designed their approaches according to best practice in other sectors. Still, future research should investigate how competitive dynamics and imitation might moderate firms' choice of ambidexterity approaches in times of environmental discontinuities.

CONCLUSION

This study addressed the question of how the environment shapes incumbents' use of structural and contextual approaches to ambidexterity. Studying how four major incumbent electric utility companies reacted to two major environmental discontinuities, we show how firms combine structural and contextual elements, and what drives the balance between the two types of ambidexterity. By introducing the notion of hybrid ambidexterity, our work breaks new ground in the literature on ambidexterity, which has mostly treated the two approaches in isolation and as dichotomous. Our case descriptions show that, in practice, structural and contextual approaches are combined by organizations in many ways to accommodate specific environmental demands. Yet, we see our study as just the first step toward a better understanding of the many conceivable ways in which firms "live" ambidexterity. In this sense, we hope that our work inspires future research that takes a closer look at organizational designs that firms can use in their quest for hybrid ambidexterity.

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FIGURES

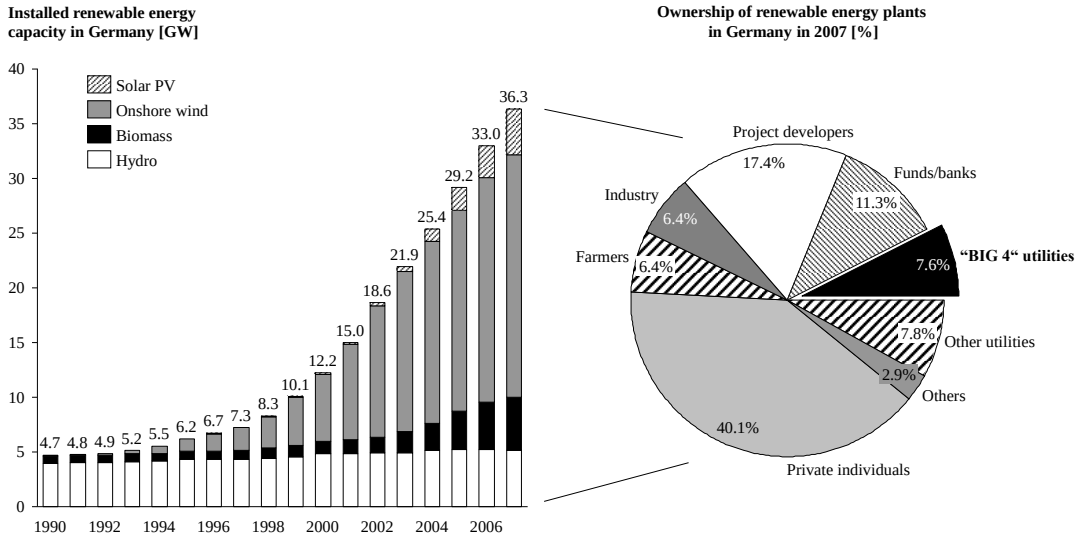

FIGURE 1: Development of renewable energy capacity in Germany and market share of the "Big Four" utilities in 2007

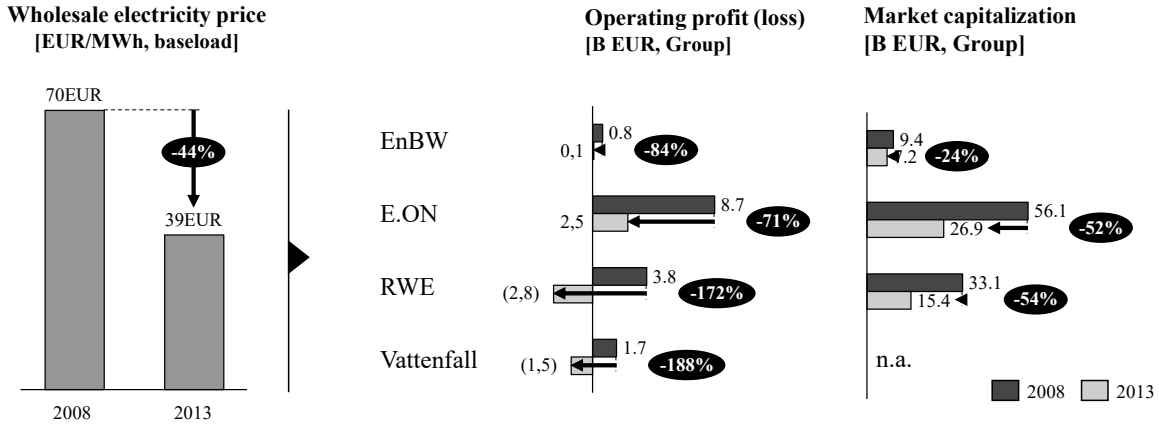

FIGURE 2: Development of the wholesale electricity price, operating profits, and market capitalization of the "Big Four"

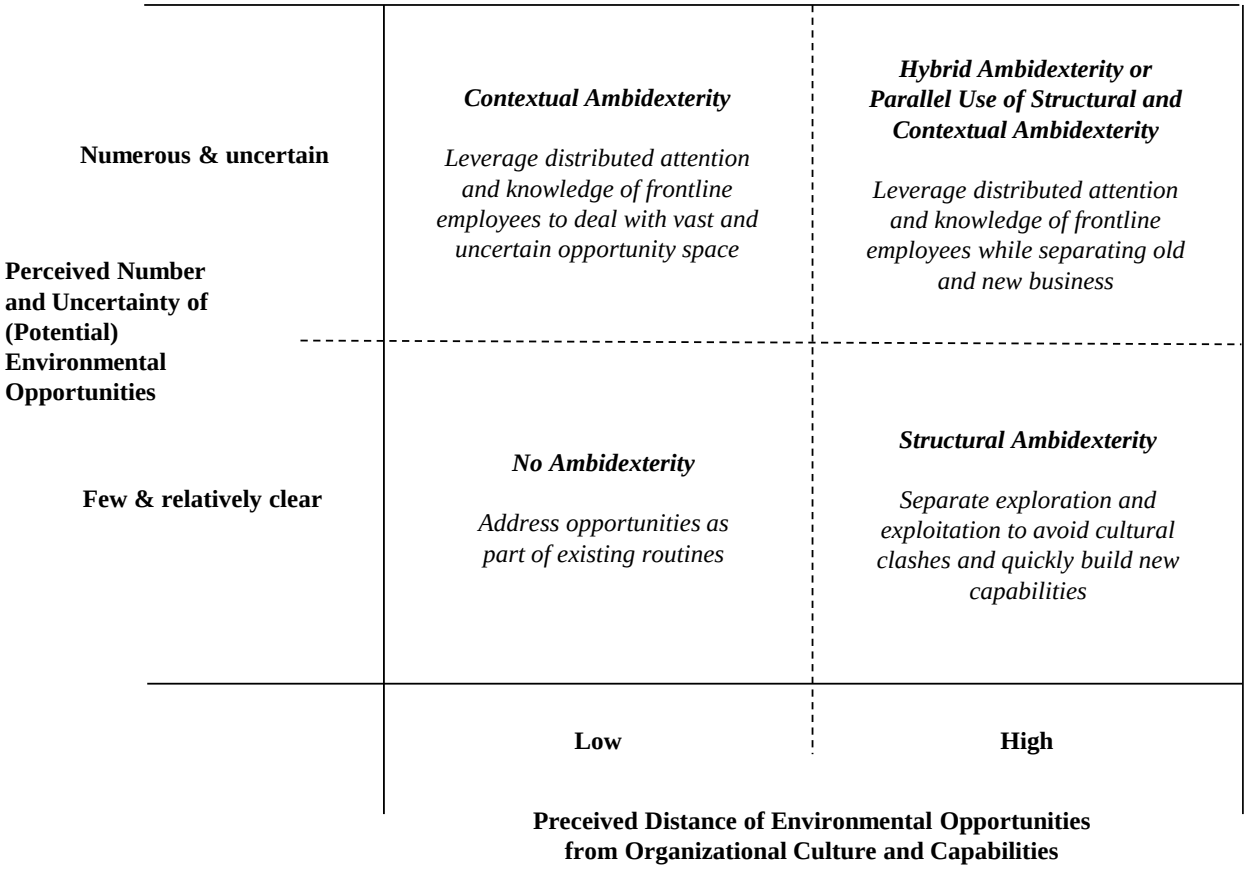

FIGURE 3: Emerging theoretical framework describing how perceived environmental characteristics influence firms' ambidexterity approach

TABLES

TABLE 1: Characteristics of structural and contextual ambidexterity

Criterion	Structural Ambidexterity	Contextual Ambidexterity
Degree of structural separation between exploration and exploitation	Exploration and exploitation structurally separated	Exploration and exploitation not structurally separated
Degree of specialization of frontline employees in exploration and exploitation	Frontline employees in units strongly specialized in either exploration or exploitation	Frontline employees switch between exploration and exploitation
Role of senior managers in facilitating ambidexterity approach	Senior managers integrate and balance between exploration and exploitation units	Senior managers provide context that facilitates cycling of frontline employees between exploration and exploitation

TABLE 2: Overview of firm sample and data sources

Category		Firm				Sum
		RWE	**E.ON**	**EnBW**	**Vattenfall**	
Firm interviewees[a]	Power Generation (conventional, renewable)	3/2	2/2	3/2	1/1	9
	New Downstream (R&D, NPD, In-house, Sales)	6/5	3/1	2/1	3/2	14
	General Management/Strategy	2/2	1/1	1/1	1/1	5
	Other	1/0	1/0			2
	Sum	**12**	**7**	**6**	**5**	**30**
Expert interviewees	Consulting	X	X	X	X	8
	Utility	X	X	X	X	2
	Technology Provider	X	X	X	X	1
	Advocacy	X	X			1
	Banking	X	X	X		2
	Sum					**14**
Archival data	Annual Reports	1974-*	1999-*	1998-*	2002-*	**87**
	Press Articles (Factiva)	4,123	3,134	1,826	3,438	**12,566**
	Press Articles (Desk Research)	78	89	26	22	**215**

[a] Numbers indicate "Persons in function interviewed/number who were members of the executive board"

TABLE 3: Organizational descriptives

	RWE	E.ON	EnBW	Vattenfall
Employees (2007)	63,439	87,815	20,449	21,060
Revenue (M EUR, 2007)	42,507	68,731	14,712	15,214
Location of operations (share of generation capacity in gigawatts, 2007)	Germany (55.2%), UK (30.3%), Rest of Europe (15.0%)	Germany (44.4%), Russia (16.3%), Rest of Europe (39.0%), USA (0.3%)	Germany, specifically Baden-Württemberg	Germany (48.1%), Sweden and Finland (37.8%), Rest of Europe (14.2%)
Location of markets (revenue share, 2007)	Germany (58.4%), UK (22.5%), Rest of Europe (18.5%)	Germany (54%), Rest of Europe (44%), USA (3%), Others (0.1%)	Germany, specifically Baden-Württemberg	Germany (51%), specifically Hamburg, Berlin, Cottbus, Sweden and Finland (36%), Poland (7%), Others (6%)
Location of headquarters (2007)	Essen, Germany	Essen, Germany	Stuttgart, Germany	Stockholm, Sweden

TABLE 4: Firm initiatives to address new upstream opportunities

				Structural ambidexterity			Contextual ambidexterity		
Firm	**Initiative**	**Launch**	**Activity**	**Ex/ex separated**	**Employees specialize**	**TMT integrate**	**Ex/ex not separated**	**Employees switch**	**TMT set context**
RWE	Innogy	2008	Engineering, procurement, construction, and operation of renewable energy technologies	X	X	X			
E.ON	Climate & Renewables	2007	Engineering, procurement, construction, and operation of renewable energy technologies	X	X	X			
EnBW	Renewables	2008	Engineering, procurement, construction, and operation of renewable energy technologies	X	X	X		X	
Vattenfall	Wind	2008	Engineering, procurement, construction, and operation of renewable energy technologies	X	X	X			

TABLE 5: Rationales for the approach chosen toward new upstream opportunities

Perceived Environmental Characteristics	Impact on Ambidexterity Approach	Exemplary Quotes
High distance between environmental opportunities and organizational culture and capabilities	Lack of support for new technologies in existing units requires separation	"There's no culture that would allow engineers to say, 'Hey, we'll take a few conventional plants offline. And then we'll save the company by developing renewables instead.' Forget it. I believe that when you notice as a firm that you don't have the power to develop it from within, then a more inorganic, separate setup is useful." (U29) "And it was probably useful to set up a separate, legal entity. Because in the existing business that's successful with conventional plants and that sees renewables as a threat […], the new business probably would not have grown that much." (U9) "And therefore we chose a separate entity, which directly reports to the executive board. I believe that this is a reasonable solution, since people would strongly resist the new topic otherwise." (U20) "Then we said—which was a wise decision—that we'd found a subsidiary, since we wouldn't get this done with the normal people in the company. That's a question of will, a cultural question and so forth." (U14) "In 2007, it was a cultural challenge. […]. If I had not had Innogy as a separate entity, but had integrated it into RWE Power, there would have been the danger that the business would not have been able to survive; [it] would have been crushed by the conventional business." (U19) "Cannibalizing your own business—that's always an issue that plays a role in such large organizations. And I think that's something you can only fix if you develop something new in parallel. That's what we tried with [RWE] Innogy, or what BMW tries with its i Series." (U22) "The business culture in the renewable setting is significantly different from the one in conventional technologies. It is a question of speed of decision-making, whether you would be able to excite people within the conventional units [about renewables] and whether [people working on renewables] would feel comfortable. All of this led to the decision to separate the renewables." (E1)
	Lack of capabilities for new technologies in existing units favors separation	"I believe it was a very wise decision, whoever took it, to set our unit up as a separate legal entity that gets its expertise and experience from the renewable energy market." (U28) "I need new processes etc. I can't just do it with the routines of a large corporate; I need to have employees explore things. On paper, this is definitely the right approach." (E10) "Of course this is also a matter of building competences, both in project development and operation. We need to generate added value and reap optimization potential, both of which have to do with bundling competences." (U12) "But when you start such a business, you want to try and keep bureaucracy small and decision processes lean. That's very positive, absolutely." (U28)
Few and relatively clear environmental opportunities	Allows quick, top-down decisions and specialization of employees	"I believe that, when I look back to 2007, one could quickly write down a list of fewer than five technologies, maybe plus geothermal and such things. You could say relatively quickly: 'Let's focus on five or six.' That wasn't rocket science." (U12) "And you needed three attempts and then you could narrow the five or six options down to three." (U12) "PV has been available for a long time and wind, I remember well, has also been around since the 1980s. What we experienced was an improvement of the efficiency of the plants, economies of scale, learning curves […]. But you didn't need to sit for 60 days in an incubator and develop new business models. Those are developments that have taken place over many, many years." (E15) "When you talk about large renewables, this is not so much about piecemeal competition in your own backyard. […] You need more central decision-making, more of a project approach than in decentralized energy."(U19)

TABLE 6: Firm initiatives to address new downstream opportunities

				Structural ambidexterity			Contextual ambidexterity		
Firm	**Initiative**	**Launch**	**Activity**	**Ex/ex separated**	**Employees specialize**	**TMT integrate**	**Ex/ex not separated**	**Employees switch**	**TMT set context**
RWE	Effizienz	2009	NPD and sales unit for B2C solutions	X	X	X			
	Innovation Hub	2014	Business model innovation platform	X		X		X	X
	Jump!2011	2011	Idea competition	X			X	X	X
	Cultural Change	2011	Cultural change initiative				X	X	X
E.ON	Connecting Energies	2012	NPD and sales unit for B2B solutions	X	X	X			
	Digital Transformation Unit	2014	Digital task force	X	X		X		X
	:agile accelerator	2013	Internal start-up accelerator platform	X		X		X	X
	Cultural Change	2010	Cultural change initiative				X	X	X
Vattenfall	Europe Innovation	2010	Unit for business model innovation	X	X	X			
	Customers & Solutions	2014	Sales unit for B2B solutions	X	X	X			
	Cultural Change	2011	Cultural change initiative				X	X	X
EnBW	Sales and solutions	2013	Sales unit for B2B solutions	X	X	X			
	Innovations Campus	2012	Internal start-up accelerator platform	X		X		X	X
	Cultural Change	2012	Cultural change initiative				X	X	X

TABLE 7: Rationales for the approach chosen toward new downstream opportunities

Perceived Environmental Characteristics	Impact on Ambidexterity Approach	Exemplary Quotes
High distance between environmental opportunities and organizational culture and capabilities	Lack of support for new technologies in existing units requires separation	"And what becomes more important, and what's difficult for us, is customer orientation. I mean, looking at the needs of the people in the market. This is something that utilities are not used to traditionally. We always said that it just wasn't part of our DNA." (U30) "When we started with the renewables, started the wind business, it was clear that we couldn't do it in the conventional business, which thinks very differently. That's why we founded the renewables unit to enter the wind business. Today, you basically have to do it the same way, do it externally or create a new unit that is not caught in the old structures." (U14) "You know as well as I do how difficult it is to suddenly develop new business models […] that are partly disruptive in the existing organization, in a culture that has been shaped by a different business model over decades. I would say that doesn't work." (U20)
	Lack of capabilities for new technologies in existing units favors separation	"The starting point is not that we do old things better. The starting point is that we do something completely different. And for this, we need a different crew and a new way of thinking." (U21) "The classic renewable business has been located in the core business of EnBW for a long time, and is also part of the generation strategy. What is behind 'new downstream' has a lot to do with new roles and new business models that all have the characteristics of being highly distributed, having small margins, where you reach an interesting profit situation only through mass and summing up the parts. This is why, I think, we need a different setup for this. […] To develop a business model with a small profit margin […] we decided to use start-up methodology exclusively, and develop it in a space where we can tolerate mistakes, where we can experiment and maybe one or two out of 10 [ideas] make it." (U20) "We don't use the processes [of the main organization], since we're developing something completely new here—not only technologically, but also with regard to the business models." (E15)
Numerous and uncertain environmental opportunities	Requires distributed decision-making and leveraging the attention and expertise of frontline employees	"I believe that the topic of new downstream is more difficult than the question of upstream, since we are looking into a huge crystal ball and you really don't know which direction it will go in. And that's why at ENBW we formed this new innovation center in which we continuously probe new business models and develop new ideas, bring them to market and see if they work or not. And I believe you need an incredible breadth at the moment to recognize the trends and developments that will confront us in the downstream business and be able to partake." (U23) "In the case of renewables, one deliberately took the decision to set it up as a separate unit with a separate culture, in a positive sense. But now we noticed that it isn't enough to have small, innovative units, since change becomes 'business as usual.'" (U21) "Back then, we said, 'We have conventional power generation and, oh, damn, there's an opportunity in renewables that we might miss.' Therefore we quickly had to use a structural approach. And now, we say we want to redirect the entire organization toward the customer […]. And you can only do that if you use a contextual approach, which involves a real cultural change. This takes some time, but you need this approach since the opportunities are not as clearly defined, ok?" (U24) "If we're heading for a world where it's not about just producing kilowatt hours but where customers produce their own electricity, then we need a new business model where we are close to the customer. In this case, it doesn't help me if I set up a central unit and say 'Now, let's do decentralized energy.' I have to be very, very close to sales. […] They know the market, they know what's going on and how the customer rules." (U19) "And at the moment there's a lot of change taking place related to [new downstream topics such as] digitization, concepts for energy saving, regionally distributed generation, and storage. And there's just an incredible level of uncertainty with regard to what energy supply will look like in five or 10 years. And that's why we need to position ourselves broadly to be prepared for different trends, different scenarios, and paces. And that's what I mean with 'search'—it's more of a trying out, staying broad, to have the right business model at the right point in time." (U23) "I believe that the customer business [downstream] is much more diffuse than the business with the renewables. […] That's why we have this large funnel where you throw in a huge number of ideas, try to test them quickly, build the first prototype and filter quickly. […] If you do it this way, you need to believe that in the market it's far from clear what the winning solution will be […]. And in the large-scale renewable business, in the end we're project developers. We don't develop the turbines, nor the new business models around them. […] That's not rocket science. […] The business model is extremely clear. In the [downstream] customer business, that's different, right?" (U24)

TABLE 8: Three examples of hybrid ambidexterity initiatives identified in the case study

	Ideation Hybrid	**Incubation Hybrid**	**Integration Hybrid**
Purpose	Generate ideas for innovation by allowing all organizational members to submit ideas for new businesses or products	Develop new business by giving organizational members time, space, and budget to pursue their own business ideas	Pool existing knowledge within organization on specific topic of strategic importance, without relocating organizational members
Exemplary initiatives	Company-wide idea competition; internal crowdsourcing platform	Internal start-up accelerator or incubator	Task force; cross-functional teams
Use of structural elements	Low: Few or no formal structures (e.g., project team or jury); no top-down influence on idea generation	Medium: Fluid structures that allow incubator to pick up new topics while shielding new businesses from corporate influence (e.g., network organization that is located outside formal organizational structure)	High: Formal integration into organizational structure (e.g., as matrix organization); top-down selection of topics by management
Use of contextual elements	High: Strong reliance on bottom-up idea generation by frontline employees and their ability to switch between exploration and exploitation	Medium: Limited switching required on the part of employees, but context important to motivate participation of frontline employees	Low: Limited switching between exploration and exploitation; still requires some openness to new ideas on the part of frontline employees
Advantage over purely structural initiative	Allows generation of large number of ideas by leveraging knowledge and expertise of all organizational members	Allows leveraging distributed expertise of frontline employees when developing and starting new businesses	Allows pooling of internal experts' distributed knowledge without having to move them from their current positions
Advantage over purely contextual initiative	Concerted, temporally limited effort that enhances speed of idea generation	Provides space that shields development of new business ideas from the potentially adverse influence of existing business activities	Can be formed around specific topics of strategic importance that need to be tackled quickly by the firm
Examples in case companies	RWE Jump!	EnBW Innovation Campus, E.ON agile: accelerator, RWE Innovation Hub	E.ON Digital Transformation Unit

APPENDIX

TABLE A.1: Evidence for the categorization of firm initiatives for new upstream opportunities

Firm	Initiative	Ex/Ex separated vs. not separated	Employees specialize vs. switch	TMT integrate vs. provide context
RWE	Innogy	**Separated:** "And [Innogy] had deliberately been set up in a way that it was not a department in the larger company, but a separate legal entity." (U28)	**Specialize:** "But we did not transfer people from the conventional generation business to the new unit to use their experience or know-how." (U4)	**Integrate:** "The role of top management was to secure funds [for Innogy], so they could build the projects." (U1)
E.ON	Climate & Renewables	**Separated:** "And therefore we chose an independent entity, which reports directly to the executive board in Düsseldorf." (U30)	**Specialize:** "The people that I know [in Climate & Renewables], all of them, are all specialized in this area." (U24)	**Integrate:** "At the end of the day, the top managers of E.ON allocate the budget for Climate & Renewables, especially CAPEX, to give them scope to invest." (U24)
EnBW	Renewables	**Separated:** "EnBW Renewables GmbH was formed effective 1 October 2008 with the objective of bundling and expanding the group's activities in the area of renewable energies." (EnBW annual report 2008)	**Specialize and switch:** "We have the category of people who only deal with conventional plants […]. Then, there's people who deal with both. […] And then, there's those things that are particular to renewables." (U5)	**Integrate:** "The core task of the management was budget allocation." (U2)
Vattenfall	Wind	**Separated:** "Of course, it makes sense to deliberately separate things, to leave the corporate world behind to a certain extent, to nurture a different culture and develop different ways of decision-making." (U7)	**Specialize:** "Then we said that we would directly found a subsidiary, since it was clear that we wouldn't get it done with the normal people in the company." (U14)	**Integrate:** "It was not an easy process. At some point, the CEO said: 'I'll just do it, the other managers should quit complaining.'" (U14)

TABLE A.2: Evidence for the categorization of firm initiatives for new downstream opportunities

Firm	Initiative	Ex/Ex separated vs. not separated	Employees specialize vs. switch	TMT integrate vs. provide context
RWE	Effizienz	**Separated:** "That is covered by the deliberately founded organizational units, such as Effienz GmbH." (E2)	**Specialize:** "Employees from other industries were an important pillar, which is why we purposefully recruited people from different industries and said that we want to preserve some distance from the classical electric utility." (U17)	**Integrate:** "We are given a specific budget, where we can say, 'We want to work on this and that topic.' That is part of the regular business unit meetings." (U17)
	Innovation Hub	**Separated:** "It is a network organization. We structured it according to companies like GoreTex or Kyocera. It is called 'cell structure' or 'cell management' or 'the amoeba principle.' De facto, you give the responsibility and freedom to teams, the	**Switch:** "And all the people who are interested in these new topics can participate and come to the open platform. There is a lot of communication going on, there are invitations to chats, brainstorming sessions, where everyone can come	**Integrate:** "It is top-down because the initiative is supported and ring-fenced by the executive board." (U15) **Provide context:** "The topic of innovation would have been immediately killed by the company's

		smallest possible units, to drive and develop ideas." (U15)	and pitch in their ideas." (U9)	'antibodies,' had we put it on the agenda right away." (U15)
	Jump!2011	**Separated:** "We did this as an individual initiative. The approach was successful but we didn't anchor it in the organization, as a continuous process." (U10) **Not separated:** „More than 300 employees from all parts of the organization participated in the competition."	**Switch:** "'Jump' is an idea competition, which was rolled out throughout the entire organization and as part of which the best ideas were awarded." (U1)	**Provide context:** "[CEO] Juergen Grossmann sponsored the initiative. And we had a jury, including a professor from Dortmund who deals with entrepreneurship." (U10)
	Cultural Change	**Not separated:** "But 'RWE 2015' is much more than this. In the end, it is about further developing the organizational culture. Striving for improvements in processes, structures and business models needs to be part of daily work." (RWE annual report, 2012)	**Switch:** "That means establishing a culture in which improvement of processes and products and structures are initiated by the employees themselves and do not require orders from 'above.' And this means that the improvements are part of daily business and don't have to be made the subject of 'projects.'" (RWE annual report 2013)	**Provide context:** "Our managers are ambassadors and multipliers of our organizational culture." (RWE annual report)
E.ON	Connecting Energies	**Separated:** "We founded a new business unit 1.5/2 years ago […]. That's called E.ON Connecting Energies. […] The business unit independently drives the business in this area." (U12)	**Specialize:** "The unit should work independently of E.ON. The guiding principle is that people should not be kept from doing their work, but should fully focus on what needs to be done [in the unit]." (U24)	**Integrate:** "A larger budget was reserved for the unit […]. The focus [of top management] is clearly on budget allocation." (U24)
	Digital Transformation Unit	**Separated:** "In my previous role […], I built a separate unit." (U21) **Not separated:** "Well, it is a network organization, set up as a matrix. We didn't want to create a new, central ivory tower, but a well-connected wire-mesh fence, in a positive sense." (U21)	**Specialize:** "The new unit, which will be launched on October 1, 2014, will be responsible for driving and coordinating E.ON's digitization." (E.ON annual report, 2013)	**Provide context:** "There's no classic chain, where the CEO initiates things and things are being broken down and just implemented as he said. […] The initiators are often just regular employees. Everyone has the possibility to initiate things, that's the philosophy behind it." (U21)
	:agile accelerator	**Separated:** "The projects [supported by 'Agile'] are completely independent." (U24)	**Switch:** "It's a modern suggestion scheme. You can hand in your idea, I believe through the intranet, and then there's a sort of contest in front of a jury where the ideas are presented. And if someone gets selected, then these people are released from work for this topic and have some time and budget to pursue their idea." (U12)	**Integrate:** "The task of the top managers is clearly to allocate budget. I mean, 'Agile' gets money. They need to invest this in projects, i.e., the top management needs to think about which projects to invest in." (U24) **Provide context:** "It is important that it can run for a while and doesn't get buried under the corporate routines, that someone says: 'We need to have a monthly reporting, performance discussion and all this.'" (U12)
	Cultural Change	**Not separated:** "I believe that we shouldn't pick any fields or technologies. Instead, I believe that it is better to change the corporate culture, the people and the way they behave in such an environment." (U12)	**Switch:** "In parallel to the 'E.ON-2.0' program, E.ON is developing a culture that focuses on faster decision-making, quick implementation of decisions, standardization of processes and activities, clear responsibilities as well as keeping in mind the value added for the company as well as the customers and stakeholders." (E.ON annual report, 2013)	**Provide context:** "Yesterday, we heard from the CEO that we want to be a customer-oriented organization. This means that we have to think and act in a customer-oriented way in every step we take and every sentence we speak." (U21)

Vattenfall	Europe Innovation	**Separated:** "To achieve Vattenfall's climate goals, the Vattenfall Europe Innovation GmbH was founded at the beginning of 2010. The company will develop new business areas, products, services and technologies in the area of energy technology, energy services as well as related business areas." (Vattenfall annual report, 2010)	**Specialize:** "Here we have the people working on innovation. We work on something new and then we get together and ask, 'What can we do?'" (U14)	**Integrate:** "Of course we need money to develop these things, so the budget is essential." (U14)
	Customers & Solutions	**Separated:** "What we used to call 'Sales' is now called 'Customers & Solutions.' It is an overarching organizational structure, i.e. Matein Hagen is now responsible for the sales business in Sweden, Finland, the Netherlands and Germany." (U18)	**Specialize**: "That's a separate business area and therefore it's clear that it works more like a silo." (U14)	**Integrate:** "The top management simply allocates the budget." (U14)
	Cultural Change	**Not separated:** "We have to bring innovation culture into the processes, not just ideas." (U14)	**Switch:** "We need to further enhance our flexibility by integrating a culture of operational excellence in our daily work." (Vattenfall annual report, 2012)	**Provide context:** "Of course you can order [cultural change] top-down. But you won't draw anyone through the change curve that way." (U18)
EnBW	Sales and solutions	**Separate:** "The development of new decentralized solutions is being accomplished in its own business department. We test newly developed business models in sales-oriented field trials in the areas of decentralized energy systems, energy efficiency, smart worlds and electric mobility." (EnBW annual report, 2013)	**Specialize:** "Sales & Solutions GmbH (SSG), with its EnBW and Watt brands, specializes in the national sale of electricity and gas to major industrial customers, redistributors, industrial customers, SMEs, chains and municipalities." (EnBW annual report, 2013)	**Integrate:** "Furthermore, €6.8 million or 2.5% of the investment in intangible assets and property, plant and equipment was primarily invested in strengthening sales by expanding the range of services offered as a supplier of decentralized solutions – such as contracting, for example." (EnBW annual report, 2013)
	Innovations Campus	**Separate:** "The campus is our incubator. It is a room that doesn't smell like corporate and doesn't look like it. It works like a start-up or a boot camp or accelerator. It is far enough from [the headquarters in] Karlsruhe." (U20)	**Switch:** "And there you'll find people who come from the respective business units, from sales, from marketing, from IT, but also technologies and capabilities that come from start-ups. That's where you meet." (U29)	**Provide context:** "At the core [the task of the top management] is cultural change. Because if you get stuck somewhere, which happens quite quickly, you need the top management to say that we're doing it because it's important." (U26) **Integrate:** "Without top management attention, the entire thing wouldn't work. […] What's important is that I can make my own budgets and finance things out of my own pocket. So, I am not dependent on the business unit; it would be fatal if this was the case." (U20)
	Cultural Change	**Not separated:** "We want to foster more ideas and creativity from within the company as part of the cultural transformation. There's a large body of knowledge that you have directly in front of you and that you can use in developing your own innovation agenda." (U20)	**Switch:** "The assessment of corporate culture also suffered downgrades as a result of the new requirement that employees should act increasingly entrepreneurially." (EnBW annual report 2013)	**Provide context:** "Actions aimed at direct contact between management and employees – for example, the 'Board of Management visits' – have proved to be very useful corporate development tools at some companies, and will be continued. […] We will significantly shorten our decision-making paths, thereby securing the requisite response speed within a constantly changing market environment." (EnBW annual report, 2013)