



Innovating as chains of interrelated situations

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ARTICLE INFO

Keywords:

Innovation

Open innovation

Practice theory

Product development

Situated action

ABSTRACT

Even though the practice perspective on innovation acknowledges that ambiguity is a key defining characteristic of innovating, it has rarely been considered conceptually. This paper argues that to fully consider ambiguity, it is necessary to focus on the situations in which those practices are enacted. Building on the work of Lucy Suchman, thus, this paper conceptualizes the innovation process as a chain of interrelated situations. Each situation is (partially) ambiguous at first and requires actors to define it. The paper elaborates on two mechanisms—focusing on matters of concern and drawing on formal procedures—that may be utilized to achieve this. The paper contributes to prior research by (a) shedding new light on the barriers to innovation, (b) reframing the meaning of ‘context’ in innovation research, and (c) emphasizing the role of ‘the mundane’ in innovating.

1. Introduction

Innovating—the “conceptualization, development, operationalization, manufacture, launch, and ongoing management of a new product or service” (Dougherty, 1999: 175)—is vital for contemporary organizations, because it enables them to compete in dynamic environments, and thus gain and sustain competitive advantage (Lawson and Samson, 2001). Therefore, it is crucial to understand how organizations successfully develop new products, hence “unlocking the fundamental mechanisms that make firms innovative” (Colombo et al., 2017: 394).

Several scholars suggested that a practice perspective is useful to better understand innovating and its underlying mechanisms (Brown & Duguid, 1991; Carlile, 2002; Deken, Carlile, & Berends, 2016; Do Vale, Collin-Lachaud, & Lecocq, 2021; Dougherty, 1992a,b, 1999, 2017; Dougherty & Hardy, 1996; Dougherty & Heller, 1994; Dunne & Dougherty, 2016; Hargadon & Bechky, 2006; Mahringer, Dittrich, & Renzl, 2019; Mengis, Nicolini, & Swan, 2018; Nicolini, Mengis, & Swan, 2012; Orlikowski, 2002; Pantzar & Shove, 2010; Salvato, 2009; Sele & Grand, 2016; Swan, Scarbrough, & Robertson, 2002). This stream of research focuses on “the actual work of innovation and explains how managers and innovation teams can readily carry out the contextualized, interpersonal, learning-based, and collective nature of the work of innovation” (Dougherty, 2017: 138). It further “emphasizes the emergent, problem-focused, hands-on nature of the work” (Dougherty, 2017: 146). Early work in this realm has identified typical barriers to innovation, and it has characterized practices that can help to overcome those barriers (e.g., Dougherty, 1992a; Dougherty and Heller, 1994;

Orlikowski, 2002). More recent work has started to unpack the underlying mechanisms through which practices are conducive to innovation (e.g., Deken et al., 2016; Mengis et al., 2018; Sele and Grand, 2016; Stigliani and Ravasi, 2018). For instance, these scholars have shown how innovative outcomes emerge from the connecting of multiple practices (Sele and Grand, 2016) or how actors stretch, flex and invent practices to account for novelty (Deken et al., 2016).

Even though these scholars have tremendously advanced our understanding of innovating, however, it remains less clear how actors deal with the *ambiguity* that they experience. This is problematic because ambiguity—the fact that innovating “contains several different qualities ... which do not fit well together” (Collins Dictionary, 2023)—is a key defining characteristic of the innovation process. For instance, actors often experience results that do not fit with their expectations (Mengis et al., 2018). While practice theorists acknowledge that this ‘fog of reality’ (Brown, 1997) is typical for innovating, it seems that prior research does not fully capture such ambiguity. A reason is that ambiguity is not a characteristic of the practice itself but rather of the situations in which actors find themselves as they innovate.

This paper argues that more fully understanding the role of ambiguity in innovating requires us to focus on the actual situations in which those practices are enacted. Fortwengel et al. (2017) differentiate between a moderate and a strong process ontology in the context of creative processes. While the moderate ontology examines general characteristics of practices, the strong process ontology focuses on fleeting moments and how stability can be accomplished in situ. The strong process ontology builds on the assumption that the world is

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<https://doi.org/10.1016/j.scajman.2023.101314>

Received 24 April 2023; Received in revised form 11 October 2023; Accepted 14 November 2023

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inherently ambiguous, as everything is in flow. The challenge, then, is how to render ambiguous situations less ambiguous (Tsoukas and Chia, 2002). Following this line of reasoning, I argue that examining situations more closely can help to better consider how actors experience and deal with ambiguity. The innovation process, then, can be conceptualized as a chain of interrelated situations that ultimately lead to the innovative outcome.

To conceptualize innovating as chains of interrelated situations, I draw on the work of Lucy Suchman (Suchman, 1985; 2007). Suchman's work was groundbreaking in early research on human-machine interaction because it challenged the prevailing cognitivist approach. It has also influenced practice-theoretical management and organization research (Feldman and Orlikowski, 2011). Key to Suchman's work is the concept of situated actions, which refers to "actions taken in the context of particular, concrete circumstances" (Suchman, 2007: 26). Her work ontologically aligns well with other scholars that have adopted a practice perspective (e.g., Dougherty, 2017; Knorr Cetina, 1999), but it foregrounds the situations that are characteristic of certain work settings.

Drawing on these arguments, I suggest that any situation is characterized by the presence of multiple elements, such as ideas, goals, and materials, which are (partially) incoherent (i.e., ambiguity). The challenge for actors is to connect these elements, thus rendering the situation collectively intelligible. I elaborate two mechanisms—focusing on matters of concern and drawing on formal procedures—that actors may use to accomplish this, thus temporarily reducing ambiguity. These mechanisms are not only visible in many empirical studies on innovating, but they also align well with the idiosyncratic characteristics of the innovation process. In sum, this paper adopts a more situated approach to innovating as opposed to most prior research. This approach is not per se superior, but it shall be viewed as complementary, as it helps us to better consider the role that ambiguity plays in innovating.

2. Theoretical background

2.1. The practice perspective on innovation

Innovating is known to be an ambiguous activity. One reason for ambiguity is that innovating is per definition concerned with creating something new, and thus it is not possible to simply repeat prior sequences of actions. By contrast, "[t]he innovation process is nonlinear, full of ups and downs, false-starts and dead-ends" (Garud et al., 2011: 738). Particularly in the front end of the innovation process, which ideas to select and how to move them forward is inherently unclear (Van den Ende et al., 2015). Moreover, innovating usually requires the collaboration of people from different socializations (Bruns, 2013; Carlile, 2002; Dougherty, 1992a). These people may have different understandings of what ought to be accomplished, which aspects are important, and how to best propel the innovation process forward. Even if initial ideas successfully take root, it is still unclear whether those ideas are legitimized and how they align with the strategies and goals of the organization (Dougherty and Heller, 1994; Kannan-Narasimhan, 2014; Van Dijk et al., 2011). I refer to this lack of fit among elements or qualities such as ideas, goals, and materials as ambiguity.

The practice perspective on innovation promises to take such ambiguity into account. Dougherty (1992b), for instance, highlights the "complex, murky day-to-day realities people face" (p. 77) in innovating and argues that "[p]roduct innovation is inherently uncertain, but ignoring the realities of its practice exacerbates the uncertainties and heightens the chances of failure" (p. 78). The practice perspective is valuable because it enables scholars and managers to understand why some innovation projects fail and helps them shape organizations to enable innovation (Dougherty, 2001; 2018). Additionally, this perspective moves away from abstract features of organizing, and examines how practices are embedded in certain contexts (Bellantuono et al., 2013; Lindell, 1991; Mahringer et al., 2019; Prieto et al., 2009).

Surprisingly, however, how actors experience and deal with ambiguity in innovating remains somewhat obscure from these accounts.

Early work has focused on the identification of barriers to innovation, and it has characterized practices that may help to overcome those barriers. Orlikowski (2002), for example, highlights the difficulties of innovating in a globally dispersed organization, and she shows which practices may be used to deal with those barriers. These practices include 'sharing an identity', 'interacting face to face', 'aligning effort', 'learning by doing' and 'supporting participation'. Similarly, Dougherty (1992a) argues that differences in 'thought worlds' are problematic, and she suggests that 'defining products based on customer knowledge' and 'connecting the definition of product norms (e.g., high product quality) with the requirements of specific markets' are practices that help to overcome those barriers. Other scholars detailed material practices which actors use to transform knowledge across boundaries in the context of innovation (Carlile, 2002; Carlile, 2004; Nicolini et al., 2012). Table 1 provides an overview of select empirical studies that characterized practices conducive to innovation.

More recently, the practice perspective on innovation has moved beyond the characterization of barriers and practices towards unpacking the underlying mechanisms through which practices facilitate innovation (e.g., Cohendet and Simon, 2016; Deken et al., 2016; Dunne and Dougherty, 2016; Mengis et al., 2018; Sarpong and Maclean, 2014; Sele and Grand, 2016; Stigliani and Ravasi, 2018). Deken et al. (2016), for instance, reveal that actors stretch, flex, and invent product development practices as they face novelty. This, however, creates consequences for subsequent situations, which requires further flexing, stretching and inventing. Sele and Grand (2016) show that the extent of innovation depends on how various practices connect with each other. In a similar vein, Cohendet and Simon (2016) describe how actors experience and cope with tensions in performing the software development practice at Ubisoft. Moreover, Mengis et al. (2018) show that when scientists face a

Table 1
Overview of select empirical studies.

Study	Context	Innovation practices
Bruns (2013)	Interaction between scientists from different disciplines in a systems biology research program in two U.S. universities.	Computational modelling; experimental practice; joint assessment; consultation; counterprojection; alignment.
Carlile (2002)	Development of a novel, complex valve, which required the interaction of multiple departments.	Product development practice, in which actors from multiple disciplines use boundary objects to interact successfully.
Dougherty (1990)	18 new product development projects in 5 large firms.	Market definition practice, which involves multiple departments and considers strategic issues.
Dougherty (1992a)	18 new product development projects in 5 large firms.	Interacting between thought worlds; defining products based on customer knowledge; defining product norms based on specific markets.
Dougherty and Heller (1994)	15 established, large firms.	Practice of product innovation, in which actors link market and technology, connect expertise from different functions, and link products to the firm's strategy and resources.
Dougherty (2001)	New product development in 12 mature firms.	Strategic practice; new product development practice; business management practice; competency management practice.
Hargadon and Bechky (2006)	6 Professional service firms.	Help seeking; help giving; reflective reframing; reinforcing.
Orlikowski (2002)	Globally dispersed software development in an organization.	Sharing identity; interacting face to face; aligning effort; learning by doing; supporting participation.

breakdown as they perform an innovation practice, they draw distinctions (i.e., what is known versus unknown and what is relevant versus irrelevant). This way, they can jointly overcome the breakdown and proceed with their work.

Taken together, both, early and more recent research, tend to focus on the general characteristics of practices. I argue that this approach does not allow for a full consideration of the role that ambiguity plays in innovating, because ambiguity is less a characteristic of the practice but more of the situations in which practices are enacted. To better consider ambiguity, thus, I suggest examining situations in more detail. While prior research has rarely focused on situations to explain innovating, it has often emphasized that considering situations is important (e.g., Bechky, 2003; Dougherty, 2004; Dougherty, 2017; Dougherty and Dunne, 2012). Brown and Duguid (1991: 42), for instance, hint at the "tricky interpolations between abstract accounts and situated demand." Orlikowski (2002) argues that product development practices are grounded in organizational knowing, which emerges from situated actions. Similarly, Janssen et al. (2015) argue that a situated perspective on innovating allows for a deeper elaboration of the role of novelty. Surprisingly, situations are often absent from conceptual explanations of innovating. Mengis et al. (2018) is an exception from this, but they focus on a particular kind of situation (i.e., epistemic breakdowns). In this paper, I conceptualize innovating in a way that takes situations into account. Hence, we now turn to Suchman's (1985) work, and more particularly to the notion of situated actions, which helps to accomplish this.

2.2. Situated actions

Suchman (1985; 2007) developed a situated action perspective in the context of human-machine-communication. The author empirically explored how users interacted with an expert advisor tool, which was developed to assist the usage of an innovative photocopier. The expert advisor tool provided detailed instructions for the users. Even though the developers intended to design the tool in a user-friendly way, however, it turned out that the users experienced troubles in operating the photocopier. Analyzing videotaped interactions between the users and the photocopier, Suchman found "that the machine's complexity was tied less to its esoteric technical characteristics than to mundane difficulties of interpretation characteristic of any unfamiliar artifact" (Suchman, 2007: 9). Thus, she adopted an ethnomethodological approach (Garfinkel, 1967; Heritage, 2013; López-Cotarelo, 2021; Rawls, 2008) to better understand this puzzle. Ethnomethodology focuses on the "actual competent 'doing' of something" (Nicolini, 2012: 134), and therefore helped her to pay close attention to the actions that happened as the users tried to operate the photocopier. Her analysis resulted in a theoretical account of human-machine-interaction, which foregrounded the interactive, situated nature of human action.

The concept of situated actions became a cornerstone of Suchman's work. She argued that actions do not exist *de novo* but relate to specific situations. Hence, actions derive their significance and meaning from the situations in which they are enacted. For example, in many situations forgetting a petri dish in the lab leads to damaged samples, but in Alexander Fleming's case it led to the discovery of penicillin (Ligon, 2004). Hence, "every instance of meaningful action must be accounted for separately with respect to specific, local, contingent determinants of significance" (Suchman, 2007: 84). The emphasis on situated actions was clearly an important shift in research, as it enabled deep appreciation of the context in which actions take place (Dourish, 2004). Consequently, it inspired several scientific communities such as research on artificial intelligence and human-computer-interaction (Lave and Wenger, 1991; Norman and Draper, 1986), learning (Brown et al., 1989; Contu and Willmott, 2003), knowing (Cetina, 2009; Gherardi, 2008), technology use (Orlikowski, 2000), and routines (Feldman et al., 2021; Pentland et al., 2020). In organization theory, it primarily influenced scholars that adopt a practice perspective (Feldman and Orlikowski,

2011).

An important aspect of situated actions is that they are considered collective accomplishments. In this vein, Suchman draws on the concept of 'mutual intelligibility', which she derived from ethnomethodology. Mutual intelligibility helps to "recognize and demonstrate the isolatable, typical, uniform, potential repetition, connected appearance, consistency, equivalence, substitutability, directionality, anonymously describable, planful-in short, the rational properties of indexical expressions and indexical actions" (Garfinkel, 1967: 10). Here, 'indexical' means that doings and sayings relate to elements of real world situations to reveal their significance (Barwise and Perry, 1985; Heritage, 2013). For instance, the utterance "this does not work" of an engineer depends on the context of its use. When this sentence is uttered after a failed experiment it might relate to the machine, but when it happens in a conflict with a colleague it might relate to the working relationship. Hence, the utterance indexes or points toward specific circumstances. Mutual intelligibility, then, refers to how people share this indexical understanding, i.e., collectively signify what is meant by their actions. Mutual intelligibility is important for actors because "to move forward with a shared task, they need to be able to make sense of what others are saying and doing" (LeBaron et al., 2016: 514).

Mutual intelligibility and actions are connected in a double sense. First, actors create mutual intelligibility of actions. In other words, they create a coherent account of how specific actions matter in a certain time and place. This creating of mutual intelligibility, then, renders these actions as normatively objective, which means that they are experienced as appropriate or inappropriate in a specific situation. Second, mutual intelligibility is created *through* actions. People display mutual intelligibility to others. Hence, it is not merely a cognitive process. It "turns on the availability of communicative resources to detect, remedy, and at times even exploit the inevitable uncertainties of action's significance" (Suchman, 2007: 86).

3. A conceptual model of innovating as chains of interrelated situations

This section develops a conceptual model which considers innovating as chains of interrelated situations. To accomplish this, I draw on the insights of Suchman (1985; 2007), as well as published empirical studies to illustrate my arguments. Fig. 1 shows the model. It displays the innovation process as a chain of interrelated situations, which are illustrated as white-colored circles. The 'light bulb' on the right-hand side symbolizes the outcome of the innovation process (e.g., a new product or service). The figure zooms into a particular situation. Here, actors initially experience elements such as ideas, goals, and materials, which may be residues from prior situations, but how these elements fit together is (partially) unclear (signaled by the question mark). Multiple actors then jointly define the situation, which enables them to move to the next situation. I elaborate two mechanisms of how they accomplish this: focusing on matters of concern and drawing on formal procedures. Subsequently, I explain those dynamics in more detail.

3.1. Ambiguous situations in innovating

It is well known that innovating is an ambiguous activity (Brown, 1997; Schön, 1983). From a strong process ontology, ambiguity is the starting point of any situation (Fortwengel et al., 2017; Tsoukas and Chia, 2002). Hernes (2008: 110) notes that "the situation is forever changing, and that what we see as stability is exception rather than the rule." If anything is in flow, thus, the situations that actors experience are (partially) ambiguous at first. The challenge, then, is to figure out how the qualities or elements of the situation, such as ideas, goals, and materials, fit together. As Suchman (2007: 177) notes, coherence "is an emergent property of moment-by-moment interactions between actors and between actors and the environments of their action."

Barley (2015) provides a vivid example of how ideas need to be made

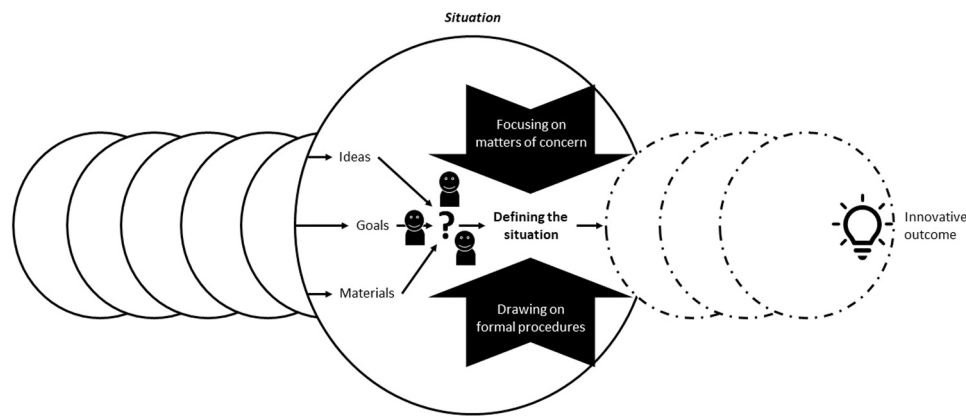


Fig. 1. Conceptual model of innovating as a chain of interrelated situations.

coherent. In this study, scientists developed a system that analyzed weather data over several years to identify suitable places for establishing solar and wind farms. One of the scientists was familiar with a novel kind of algorithm (i.e., ‘self-organizing maps’) that could be used to develop that system, while his colleagues were not familiar with this algorithm. The scientists collectively scrutinized the potential of this algorithm for developing the new system by understanding the differences of the novel algorithm compared to other algorithms. Hence, they connected various ideas (e.g., multiple algorithms and the project goals) to make the situation more coherent. Finally, a colleague uttered, “I’m sold on self-organizing maps at this point. This is a great idea” (p. 1623), which reveals that the team collectively understood the potential of self-organizing maps for the problem they faced. Hence, they realized that further elaborating on self-organizing maps was a suitable way forward.

While ambiguity is not exclusive to innovating, the problem in this context seems to be that it is more difficult to recognize the situation as something that has been experienced in the past, as information is inconclusive, and trials may not contribute to more clarity. Mengis et al. (2018), for example, show how scientists ran into a major problem when they developed a novel bioreactor. Because they had never experienced such a situation before, they needed to invest considerable work to solve the problem and resume their work.

What is more, innovating often involves the collaboration of people with different socializations (Deken and Sele, 2021). These people need to align on a joint definition of the situation, despite their varying backgrounds. There is a rich body of work that has stressed that innovating requires collaboration between research and development as well as marketing departments (Griffin and Hauser, 1996; Song and Parry, 2003), or, phrased differently, from different ‘thought worlds’ (Beverland et al., 2016; Dougherty, 1992a; Weeth et al., 2020). Such collaboration may also involve actors from different firms, as highlighted by research on open innovation (Bogers et al., 2017; West and Lakhani, 2008). In all these cases, people with different socializations need to innovate together. The relevance of such collaboration is also stressed by Dougherty (1990) who argues that successful innovations include many linkages between people from different departments.

Empirical evidence shows the challenges that occur when people with different socializations work together. Carlile (2002), for instance, shows how a manufacturing engineer made his concerns about the design of a new, complex valve intelligible to his design colleagues. Initially, design engineers wanted to focus on improving the functionality of the valve, but they did not understand how complex it was to manufacture such a valve. Only when they came up with an assembly drawing that represented both specializations, they were able to collectively proceed. Similarly, Ben-Menahem et al. (2016) show how a molecular biologist presented the results of his experiment to a structural biologist and a biochemist in an early-drug development project.

As the interaction unfolded, they started to understand what their colleague required. The biochemist, for instance, mentioned that he needed to know about differences between animal species. However, they collectively had to work out why species’ differences were relevant for this situation (i.e., because they had to select a species for performing toxicity studies). After several minutes of interaction, the molecular biologist uttered “now I’m starting to understand what you really want” (p. 1323), which shows that the situation had become mutually intelligible. In another example, a chemist and a structural biologist discussed how to use a ‘hit list’. The chemist wanted to use a specific criterion to assess the hit list, but this criterion was not intelligible to the structural biologist. Hence, they decided to use another concept that was intelligible to both.

In sum, innovating is characterized by situations that are (partially) ambiguous at first. This ambiguity can be described as a lack of coherence or fit between the elements that characterize the situation, such as ideas, goals, and materials. To temporarily reduce ambiguity, actors need to make these elements coherent, i.e., they need to define the situation. In the following, I discuss two possibilities that may be used to achieve this: (a) focusing on matters of concern and (b) drawing on formal procedures. In practice, these mechanisms may occur simultaneously and are not mutually exclusive, but here I discuss them separately for analytical reasons.

3.2. Defining the situation by focusing on matters of concern

One way that actors can define the situation is by focusing on matters of concern that they want to focus on. As they focus on these matters of concern, they signal what is part of the situation and what is not part of the situation. Dougherty (2017: 146) calls this process ‘problem-setting’ (see also Dougherty, 2004). She argues that “innovators select what they will treat as ‘things’ of the situation, set the boundaries of their attention to it, and impose upon it a coherence which allows them to say what is wrong and in which directions the situation needs to be changed.”

Even though more implicitly, Suchman (2007) also considers this issue. A central theme in her work revolves around the concept of ‘communication’. She argues that communication is not merely a process of symbolic representation, but it is a process “in which we make use of language to delineate the collective relevance of our shared environment” (p. 178). She further explains that communication is essential to make situations and actions mutually intelligible, and to identify the “direction of subject matter” (p. 89). Hence, focusing on matters of concern is one way that situations can be defined communicatively.

Empirical evidence reveals how actors identify such matters of concern. Nicolini et al. (2012), for example, examine the development of an innovative bioreactor. In their study, a junior bioengineer showed a slide that revealed the results of a failed experiment to her colleagues. The situation was ambiguous because the results were not expected, and

they could not make immediate sense of them. As the interaction unfolded, the scientists identified a matter of concern, that is, explaining a 'weird trend' in the visualized curves that resulted from the experiment. The junior bioengineer made this matter of concern intelligible by foregrounding it ("You see this weird trend", p. 618) and framing it as unresolved (it happened for "whatever reason", p. 618). Identifying this matter of concern helped the team to define the situation as a situation in which they needed to find explanations for this weird trend.

Dunbar (1997) also shows how scientists identified matters of concern as they elaborated how B-cells matter for an autoimmune disease. Here, a postdoc found B-cells in parts of the body that he did not expect. Subsequently, the team focused on explaining this matter of concern. In a similar vein, Mengis et al. (2018) find that when scientists faced a situation in which it was not clear how to proceed (what they call an 'epistemic breakdown'), they started to define matters of concern, by identifying aspects that were relevant or irrelevant to proceed with their practice, and aspects that were known and unknown to define the situation more clearly.

3.3. Defining the situation by drawing on formal procedures

In innovation management, formal procedures, how to use them to promote innovation, and which procedures are most conducive to innovation are important topics (Do Vale et al., 2021). Several scholars suggested formal procedures that can be used to promote innovation, such as stage-gating (Cooper, 1990), waterfall models (Petersen et al., 2009), and agile approaches (Highsmith and Cockburn, 2001) such as Scrum (Schwaber and Beedle, 2002), or combinations of these approaches (Cooper and Sommer, 2016). Others suggested that formal procedures can promote (Orlikowski, 2002) or inhibit (Brown and Duguid, 1991) innovation. These formal procedures can be used to define situations as well.

To better understand how formal procedures can be used to define the situation, we first examine the role of formal procedures in Suchman's work. The example of canoeing is useful to understand how Suchman sees the role of formal procedures (or 'plans' in her language) for situated actions:

"[I]n planning to run a series of rapids in a canoe, one is very likely to sit for a while above the falls and plan one's descent. The plan might go something like 'I'll get as far over to the left as possible, try to make it between those two large rocks, then backferry hard to the right to make it around that next bunch.' A great deal of deliberation, discussion, simulation, and reconstruction may go into such a plan. But however detailed, the plan stops short of the actual business of getting your canoe through the falls. [...] The purpose of the plan in this case is not to get your canoe through the rapids, but rather to orient you in such a way that you can obtain the best possible position from which to use those embodied skills on which, in the final analysis, your success depends." (Suchman, 2007: 72)

The canoeing example reveals several aspects about formal procedures.¹ First, procedures are unable to specify situated actions, and hence they "neither determine the actual course of situated action nor adequately reconstruct it" (Suchman, 2007: 31) (see also Suchman, 1993; 2003). A formal procedure and the actual doing of a practice are two different things (Geiger, 2022). Rather, "people produce and find evidence for plans [or formal procedures] in the course of situated action" (Suchman, 2007: 70). Second, formal procedures and situations are entangled. Consequently, they "do not precede the work of their enactment but rather that their sense is found in and through, and only in and

through, that work" (Suchman, 2007: 22). This entanglement foregrounds how formal procedures matter for defining the situation (Brown and Duguid, 1991; Dourish, 2004). Third, procedures are "resources for people's practical deliberations about action" (Suchman, 2007: 69). Procedures can be used as resources for action while canoeing through the rapids, because they provide guidance (Carroll, 2003) for the canoeist.

These insights can be applied to innovating. They help to see how people use formal procedures to define the situation at hand and make their understanding intelligible to others. Dougherty (1992b) also hints at this when she suggests that successful innovators craft detailed plans, which helps them to continuously assess their actions. Additionally, formal procedures and situated actions coevolve, as actors may change formal procedures to account for the needs of the situations they face (D'Adderio, 2001; Deken & Sele, 2021).

Empirical evidence reveals how actors draw on formal procedures as they innovate. Bruns (2013: 69), for example, shows how scientists collectively dealt with the results of a failed laboratory experiment. The scientists pointed to different procedures that were familiar to them (e.g., 'sonicate', 'prime', 'flush', 'vortex'). Pointing to these procedures in their interaction helped them to define the situation, either by making sure that they had already performed certain possibilities or by identifying them as suitable ways forward. Moreover, Deken et al. (2016) unpack how actors in an automotive company innovated an information-based service. Developing this service did not fit with the stage-gate procedure that the company typically used to develop new products. For instance, the company had to include external partners early in the process because it did not have the capability to develop such an information system on its own, but partner selection was typically done after the first stage-gate had been passed. Hence, actors referred to these actions as 'gate 1.5'. This move connected actions to the familiar stage-gating procedure, but at the same time signaled a mutually intelligible deviation.

3.4. Chains of interrelated situations

While the prior sub-sections elaborated on the dynamics of particular situations, we now zoom out (Nicolini, 2009) to consider the innovation process as a chain of interrelated situations. Suchman (2007) argues that situated actions are influenced by history—"human activity invariably occurs in circumstances that include more and less long-standing, obdurate, and compelling layers of culturally and historically constituted, social and material conditions" (p. 52). In other words, people define situations in the context of prior situations. Suchman (2007: 74) further argues that "the environment of our actions is made up of a succession of situations that we walk into and to which we respond." This aligns with the idea to conceptualize the innovation process as a chain of interrelated situations.

However, conceptualizing the innovation process as a chain of interrelated situations does not mean that prior situations influence the here-and-now in a deterministic way. Rather, elements from prior situations are 'reenacted'. Suchman (2007: 52) argues that "the significance of [...] historical] conditions, and their relevance for what is happening here and now, must be actively reenacted by participants in ways not fully specified in advance or in any strongly determinate way." This argument echoes 'phenomenology', where situations are not properties of an external social world, but a product of collective interpretation (Dourish, 2004; Heritage, 2013). Therefore, historicity does not imply that actions are predetermined, as some scholars have interpreted Suchman's work (e.g., Vera, 2003), because this is a "a sense antithetical to the orientation toward the flexible, ongoing (re-)production of intelligible action" (Suchman, 2007: 15) that Suchman envisioned.

It would also be misleading to assume that defining a situation sustainably reduces ambiguity. Hence, people must iteratively engage in defining situations. Any action that is taken changes the situation at hand and potentially influences the significance of further actions taken.

¹ There seems to be a subtle difference between plans and formal procedures. While a plan describes a specific future course of action, a formal procedure is a more abstract representations of multiple courses of action. However, for the purpose of the article, this distinction is irrelevant.

The following example from Suchman's observations of the users of a high-end copy machine helps to illustrate this argument. Making two-sided copies from a bound document required users to, first, create an unbound master copy and, second, create copies from the unbound master copy. However, in one situation the users realized that the page order in the master copy was wrong after they had created the unbound master copy. Consequently, they tried to execute the program again, which did not work because the copier wanted them to again unbind the already unbound document. For the users, hence, the actions of making the unbound master copy and sorting pages became part of the situation and connected to the action of making copies, while the machine did not take this action into account.

To say it in the words of Suchman (2007: 133), "[t]o appreciate what they are doing now requires that the relation between this attempt and the last is recognized, and the machine state does not capture that relation. So although both users and system are, in some sense, doing the job again, there are two different senses of what, at this particular point, it means to do so." This example shows that, for humans, prior actions shape (or become part of) the situation. Because the machine did not take account of this aspect, it failed to successfully interact with the users. Thus, "situated actions are always, and irremediably, contingent on specific, unfolding circumstances that are themselves substantially constituted through those same actions" (Suchman, 2007: 27).

4. Discussion

Even though the practice perspective on innovation has tremendously advanced our understanding of this process, the notion of ambiguity has rarely been conceptualized explicitly in innovating. I argue that a reason for this is that prior research has tended to examine the characteristics of practices that are conducive to innovation, but we need to deep dive into the situations in which those practices are enacted to fully consider ambiguity. Building on the work of Lucy Suchman (1985; 2007), and more specifically the concept of 'situated actions', I conceptualize the innovation process as a chain of interrelated situations. Situations are (partially) ambiguous at first because it is not clear how the elements that constitute those situations, such as ideas, goals, and materials, fit together. Thus, situations need to be defined to temporarily reduce ambiguity. I elaborated on two mechanisms that can be used to define situations: focusing on matters of concern and drawing on formal procedures.

In the following, I discuss how these arguments contribute to practice-theoretical research on innovation. More specifically, they (a) shed new light on the barriers to innovation, (b) reframe the meaning of 'context' in innovation research, and (c) emphasize the role of 'the mundane' in innovating.

4.1. Shedding new light on the barriers to innovation

The practice perspective has identified several barriers to innovation (e.g., Dougherty, 1992a; Dougherty, 1999; Dougherty and Heller, 1994). This paper advances the discussion on the barriers to innovation in two significant ways. First, viewing the innovation process as a chain of interrelated situations may generate a deeper understanding of the barriers that prior research has identified. From the perspective developed in this paper, for example, 'thought worlds' do not exist outside of actual situations, but they are tied to ideas that individuals bring into a situation. For instance, some of these ideas may make sense from a customer point of view, but not from an engineering point of view, and vice versa. Ambiguity arises from the misfit of those ideas. Put differently, the lack of fit among elements is equivalent to the barrier to innovation. This perspective then draws our attention to how actors define the situation and generate coherence among the elements that arise from different thought worlds. For instance, actors could define a matter of concern—how a certain product idea may be beneficial for customers—which may align these thought worlds in situ. Focusing on

this matter of concern defines the situation and clarifies what actors need to collectively elaborate.

Second, considering actual situations may reveal other barriers, which are more subtle but still relevant for innovating. Mengis et al. (2018), for instance, show how scientists face an 'epistemic breakdown,' which leads them to dialogically draw distinctions to proceed with innovating. In this vein, focusing on situations may uncover how innovators stall in ambiguous situations (Schön, 1983), how they succeed or fail to communicate ideas to their colleagues (Stigliani and Ravasi, 2018), how aesthetic properties of the physical setting enable or prevent ideas from gaining traction (Baldessarelli, Stigliani, & Elsbach, 2022), or how people face conflicts and breakdowns of their practice (Cohendet and Simon, 2016; Mengis et al., 2018). Hence, the perspective developed in this paper offers the opportunity to consider other barriers to innovation that become salient in actual situations.

4.2. Reframing the meaning of context in innovation research

Viewing the innovation process as a chain of interrelated situations echoes scholars who have stressed the relevance of context in innovating (Bellantuono et al., 2013; Lindell, 1991; Mahringer et al., 2019; Prieto et al., 2009), but at the same time suggests a different view on the notion of context. Through such a perspective, context is not a static entity but a dynamically evolving characteristic of the unfolding situation. Suchman (2007: 19) suggests that "behavior can only be understood in its relations with real-world situations. [...] Thus, the structuring of behavior is done not a priori, but in reflexive relation to circumstances that are themselves in the process of being generated, through the same actions that they in turn work to make comprehensible." This statement shows that context does not exist a priori, but it is enacted and continuously evolves (D'Adderio, 2014). The elements of the situation, such as ideas, goals, and materials, form the context against which action is performed.

Seen this way, it is more appropriate to focus on how actors contextualize (Howard-Grenville and Lodge, 2021) their actions as they innovate. This implies considering how actors reproduce context (e.g., bringing in an idea), how they relate their actions to this context, and how they lend significance to it. For instance, innovations often arise from transferring an established idea from its familiar context to a novel context (Dunbar, 1997; Hargadon and Bechky, 2006). When we focus on actual situations, we can observe how actors bring familiar ideas into a new situation, and how they relate the idea with other elements of the situation. Vice versa, actors may also decontextualize certain elements, thus shaping the innovation process.

4.3. Emphasizing the role of 'the mundane' in innovating

The practice perspective on innovating argues that it is important to zoom in on the actual work that people carry out as they innovate (Dougherty, 2017). This paper aligns with this argument but suggests focusing on the actual situations through which innovating happens. Compared to prior research on innovation from a practice perspective, thus, this paper suggests to zoom in even more (Nicolini, 2009).

Focusing on situations in innovating foregrounds the role of mundaneness (Deken and Sele, 2021). Mainstream innovation research and innovation management tend to focus on describing abstract features that may be conducive to innovation, such as strategy or culture (e.g., Adams et al., 2006). This article, however, argues that innovating happens in mundane situations, and thus these situations should be center stage if we want to fully understand how innovating happens. Hargadon and Bechky (2006) echo this argument when they suggest that creativity does not reside within individuals, but that it is the result of fleeting moments which can easily be missed. To fully appreciate those moments, we need to focus on actual situations.

Moreover, actors may not be fully aware of those aspects. For instance, actors most likely are unable to narrate how they make their use of formal procedures mutually intelligible through their doings and

sayings. Stigliani and Ravasi (2018), for instance, show that designers regularly express visceral responses to others. While this is crucial to make their aesthetic knowledge available to others, it could easily go unnoticed when studying this setting. Hence, if we do not consider mundane situations, we may miss the essence of innovation.

Focusing on mundaneness further has implications for empirical research on innovating. The ethnographic studies that have already been conducted differ substantially in terms of their findings from other kinds of studies, for instance, because they show that performing a practice can involve breakdowns which need to be overcome (Mengis et al., 2018), that practices may be subject to variation (Deken et al., 2016), and that the innovative potential lies in mostly serendipitous connections between practices (Sele and Grand, 2016). To fully appreciate actual situations in innovating, we might additionally need (micro-) ethnographic studies (Dittrich, 2021), including video and audio recordings (LeBaron and Christianson, 2021; Nicolai and Thompson, 2023), to generate a deeper understanding of innovating.

Moreover, innovating is not the only phenomenon that is shaped by substantial novelty, where outcomes are unclear a priori, and where actors from multiple specializations need to collaborate. Other examples are forecasting (Martino, 2003), strategizing (Jarzabkowski et al., 2007), work in extreme contexts (Danner-Schröder & Geiger, 2016), or organizing with artificial intelligence (Anthony et al., 2023). Hence, the theoretical elaboration of this paper may be transferable to other phenomena with similar characteristics as well. Future research could examine whether and how these insights can be transferred, leading to a more situated perspective on the dynamics of contemporary organizing.

5. Conclusion

This paper suggests that to fully consider ambiguity in innovating we need to focus on real-world situations. It has developed a conceptual model that shows how innovating can be seen as a chain of interrelated situations. Each situation is (partially) ambiguous at first and needs to be defined by actors. In this vein, this work complements prior research in the practice perspective on innovation and may provide a possible path for its future development. This suggested development would be in line with a broader movement in organization studies that has emphasized the relevance of unpacking microprocesses to understand organizational phenomena (Aroles and McLean, 2016; D'Adderio, 2014; Reay et al., 2006). Even though this paper has integrated empirical studies that take such details into consideration, such studies in the context of innovating seem to be exception rather than the rule. This paper, thus, calls for a shift to generate a more complete understanding of innovating.

Declaration of Competing Interest

There are no competing interests to declare.

Data Availability

No data was used for the research described in the article.

Acknowledgements

I am thankful to Associate Editor Barbara Müller-Christensen and the two anonymous reviewers for their invaluable feedback and guidance during the revision of this paper. Additionally, I would like to express my gratitude to the participants of the 'WK ORG Paper Development Workshop 2021,' as well as to Daniel Gäckle and Anja Danner-Schröder for their insightful comments on earlier versions of the manuscript. This publication is part of the 'WIN-Kolleg' of the 'Heidelberg Academy of Sciences and Humanities,' financed by the 'Ministry of Science, Research and the Arts of the State of Baden-Wuerttemberg,' Germany.

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