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REASONING IN ORGANIZATION SCIENCE

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Prescriptions regarding organization-scientific methodology are typically founded on the researcher's ability to approach perfect rationality. In a critical examination of the use of scientific reasoning (deduction, induction, abduction) in organization research, we seek to replace this unrealistic premise with an alternative that incorporates a more reasonable view of the cognitive capacity of the researcher. To this end, we construct a typology of descriptive, prescriptive, and normative criteria for the evaluation of organization-scientific reasoning practices. This typology addresses both cognitive limits and the diversity of research approaches in organization research. We make the general case for incorporating not only the computational but also the cognitive element into the formulation and evaluation of scientific reasoning and arguments.

The objective of scholarly reasoning is to justify new knowledge in a scientific field. The creation of organization-scientific knowledge, more generally, has been approached from many angles, ranging from epistemological concerns (Moldoveanu & Baum, 2002) and the role of theoretical paradigms (Pfeffer, 1993) to social construction of knowledge (Astley, 1985) and scientific rhetoric (Ketokivi & Mantere, 2010; McCloskey, 1998). Conspicuously missing from the extant literature is a methodological—as opposed to rhetorical, psychological, or social—account of scientific reasoning. The missing piece is crucial, because the general understanding of how scientists reason and formulate explanations is surprisingly limited (Lipton, 2004), and yet prescriptive norms are essential in defining criteria for methodological rigor. Further exacerbating the problem is that prescriptive accounts typically do not incorporate the cognitive limitations of the researcher, which renders the resultant prescription unavoidably nonoperational (Stanovich, 1999).

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The paucity of the methodological literature on reasoning in organization science in particular is striking, because questions regarding the nature of human reasoning have always been at the heart of organization scholarship. The literature on how managers reason and make decisions is as diverse as it is massive: volumes of research have been devoted to rationality and the implications of cognitive limits, such as bounded rationality and behavioral biases (e.g., Bazerman, 2002; Bell, Raiffa, & Tversky, 1989; Eisenhardt & Zbaracki, 1992; Kahneman, Slovic, & Tversky, 1982; March, 1994; Simon, 1997; Stanovich, 1999). We continually report on and are puzzled by the intricacies, idiosyncrasies, and downright irrationalities of managerial reasoning (e.g., Green, 2004; Green, Li, & Nohria, 2009), emphatically calling for more research.

In stark contrast, methodological texts implicitly assume that researchers are rational actors who are able to overcome cognitive limitations through rigorous application of scientific reasoning principles. While methodological texts candidly acknowledge that research is a complex endeavor beset with numerous challenges, the ability to reason rationally—from one's data to a theoretical conclusion, for instance—is typically assumed to be possible. At the same time, unless we have strong reasons to assert that researchers are fundamentally different from managers in how they cognitively function, we know that prescriptions to eliminate cognitive constraints and biases are generally unrealistic.

Our aim in this article is to inform the way organization scholars practice reasoning, individually and socially. We start with the premise that researchers are just as human as managers and that there is little evidence that researchers face different cognitive constraints. We reject the implicit assumption—found in many methodological texts—that the cognitive aspects of reasoning constitute a liability. Accordingly, we incorporate cognitive constraints to arrive at operational and reasonable methodological prescriptions. Drawing jointly from the literature on cognition and methodology, we formulate a framework of general reasoning criteria that can be used to evaluate and improve our reasoning practices. This framework considers the heterogeneity of research approaches by examining reasoning in the three main traditions of research within our field: theory testing, inductive case research, and interpretive scholarship. We conclude by discussing the implications of the context dependence of reasoning on coauthorship and the academic-practitioner dialogue.

WHAT IS SOUND REASONING?

Proceeding from premises to conclusions in a credible manner is the essence of an argument (Toulmin, 2003). One of the primary tasks of scholars, as scientists, is to use various reasoning principles to bridge premises with conclusions and to defend the claims made in these conclusions. Conversely, one of the primary tasks of the audience members, as scientists, is to evaluate whether the reasoning principles have been used in a sound manner. We start by a brief examination of the elementary forms of scientific reasoning.

Forms of Reasoning: Deduction, Induction, and Abduction

Both in everyday life and in scientific inquiry, we use three basic forms of reasoning to draw conclusions on matters of importance: we argue for a case, we make generalizations, and we construct explanations and interpretations. To introduce the elementary forms of scientific reasoning, consider this classic illustration from Peirce (1878):

1. All the beans in this bag are white (we call this the "rule").
2. These beans are from this bag (we call this the "explanation").
3. These beans are white (we call this the "observation").

Peirce's example can be read as a metaphor for the practice of reasoning in organization research. We can think of the beans as our data and the bags as our theories: we collect data (pick beans), make empirical generalizations (make inferences about beans not observed), and accept some theories while dismissing others (pick bags).

Deductive reasoning takes the rule (1) and the explanation (2) as premises and derives the observation (3). In deduction, one draws a conclusion about the particular based on the general. The observation necessarily follows as a logical consequence of the rule and the explanation, which makes deduction, in a sense, methodologically uncontestable: while one may question the credibility of the premises in a deductive argument—one might reject the general rule as empirically incorrect, for instance—the act of reasoning itself is logically sound.

Deduction allows us to predict the color of the next handful of beans drawn from the bag. But if our task were to make inferences about the entire bag of beans, we would engage in *inductive* reasoning. Inductive reasoning combines the observation (3) and the explanation (2) to infer the rule (1) and, thus, moves from the particular to the general. But an observation about the particular establishes a general rule in an incomplete sense; the rule does not logically follow from repeated observations. This is the well-known *problem of induction* (see Ketokivi & Mantere, 2010, for a discussion in the context of organization research).

Conventionally, deduction and induction have been considered the two basic forms of scientific reasoning. There is, however, a third form that merits attention: *abduction* (e.g., Peirce, 1878). Understanding the role of abduction becomes apparent once we acknowledge the possibility of multiple bags and uncertainty about which bag is the source of the observed beans. In abduction, one begins with the rule (1) and the observation (3); the explanation (2) is inferred if it accounts for the observation in light of the rule. Given the observation of white beans and the general rule that all the beans in the bag are white as well, one may reasonably infer that the beans came from that specific bag. This inference can be understood as a hypothesis that makes the observation of white beans a matter of course. Turning "surprising facts" into matters of course is the general logic of abductive reasoning (Hanson, 1958: 86). Just like in induction, we have no logical grounds to infer the conclusion: abduction is not only presumptive and conjectural, it is, strictly interpreted, a special case of the fallacy of affirming the consequent (Niiniluoto, 1999: 442). But from the point of view of reasoning practice, abductive reasoning is one of the primary reasoning tools we use, both in mundane decisions and in scientific inquiry (Hanson, 1958; Harman, 1965; Josephson & Josephson, 1996; Lipton, 2004). Indeed, abduction has been suggested as the logic by which new hypotheses are derived and, ultimately, how scientific discoveries are made (Hanson, 1958; Niiniluoto, 1999).

The three forms of reasoning constitute our primary tools of inference. In the general sense, deduction is an inference to a particular observation (or case), induction an inference to a generalization, and abduction an inference to an explanation. In summary, we predict, confirm, and disconfirm through deduction, generalize through induction, and theorize through abduction.

Reasoning-As-Computation and Reasoning-As-Cognition

Induction may be used to denote all "ampliative" forms of reasoning—that is, reasoning where the conclusion is not logically entailed in the premises (e.g., Hájek & Hall, 2002). If we accept this general definition, induction becomes an umbrella term for a variety of nondeductive forms of reasoning, including abduction (Lipton, 2004). There has been a tendency among organization scientists to define induction in a much narrower sense, however. In traditions such as inductive case research (Eisenhardt, 1989), induction is de facto equated with eliminative ("Baconian") induction (Ketokivi & Mantere, 2010). In eliminative induction, propositions of increasing generality are inferred through a process of observing similarities among and differences between observations (Barker, 1957). Through iteration the generality of observed properties and relations in the data are tested against more evidence, eliminating propositions that do not receive support and retaining those that do. One of the essential qualities of eliminative induction is researcher invariance: because the common properties and their relationships are assumed to be essentially embedded in the data, any researcher looking at the same data will, by assumption, reason similarly and discover the same generalization. Consequently, inductive generalizations can indeed be claimed "to emerge" from the data (Brown & Eisenhardt, 1997: 5).

The view of reasoning underlying eliminative induction is *computation*, a researcher-invariant activity that bridges the premises with the conclusions. Computation here is not limited to mathematical operations with quantitative data; it means, in a general sense, following explicit, logically coherent rules. While it can be performed by the cognitive mind, cognition per se has only a perfunctory role, and, consequently, reasoning can be "abstracted from the mind" and programmed into algorithms (e.g., Thagard, 1988).

The limits of the computational view become particularly evident as one examines theory development. Theories are, in a peculiar way, always partly *about* the people who create them. Mintzberg crystallizes the sentiment: "We don't discover theory; we create it" (2005: 357). Theory building is an activity conducted by cognitively idiosyncratic scholars (Lipton, 2004; Stanovich, 1999). When scientists engage in reasoning, they do not just compute; they also *cognize*. In contrast to reasoning-as-computation, reasoning-as-cognition has a crucial holistic component that cannot be implemented in algorithms (cf. Fodor, 2001).

Idiosyncrasy and cognition in scientific reasoning are not simply hypotheses; they have been empirically demonstrated: reasoning is not a researcher-invariant activity (Faust, 1984; Lipton, 2004; Piaget, 1971; Weimer, 1979). The cognitive view also receives unambiguous support from recent research in affective neuroscience: "human decision-making is not a purely verbal/mathematical process, but requires integration of cognitive and emotional processing" (Thagard, 2007: 371). Describing or prescribing reasoning exclusively as computation is based on the unrealistic assumption that "people can disconnect their reasoning apparatus from the emotional machinery" (Thagard, 2007: 377). Cognitive, even emotional, idiosyncrasies pervade our reasoning practices.

In light of all the empirical evidence, it is hardly surprising that objections to the notion that inductive reasoning can adequately be described (or prescribed) as computational are abundant (Alvesson & Kärreman, 2007; Ketokivi & Mantere, 2010; Locke, Golden-Biddle, & Feldman, 2008; Mintzberg, 2005; Suddaby, 2006; Van de Ven & Johnson, 2006; Wodak, 2004). Abduction provides a useful formulation for extending reasoning to incorporate the cognitive aspect. First described by Peirce (e.g., Hartshorne & Weiss, 1934), abduction involves an active researcher formulating—through at least partly idiosyncratic cognition—various generic statements as explanations or interpretations of the data. Another researcher looking at the very same data might well formulate a different set of statements. After weighing the merits of each explanation, the researcher then selects the "best" one (Harman, 1965; Peirce, 1878). There is, however, no single set of criteria for what constitutes "best" (Lipton, 2004; Lycan, 1988). This is particularly relevant to organization science, where theorists make extensive use of nonobservational concepts (Bagozzi & Phillips, 1982; Godfrey & Hill, 1995): "when the process of inference to the best explanation is extended to postulate non-empirical entities, there is no best explanation" (Boylan & O'Gorman, 1995: 213).

The implications of incorporating the cognitive view of reasoning cannot be overstated. The computational view is based on the idea of a singular scientific method, indeed *the* scientific method, which many notable philosophers of science have promoted as the bedrock of scientific inquiry (see Lakatos, 1970, for a review). The scientific method is based on the computational view, and, consequently, proponents of it regard many of the cognitive aspects of reasoning as liabilities. The cognitive view, in stark contrast, candidly acknowledges both the researcher as an active reasoner and the use of abductive reasoning in crucial phases of research (e.g., Hanson, 1958; Lipton, 2004). Its proponents thus question the positivist pursuit of a single scientific method that defines scientific practice (Feyerabend, 1993).

Descriptive, Prescriptive, and Normative Reasoning Criteria

If we were to formulate a view of reasoning where both computational and cognitive elements were acknowledged, how would we revise our methodological criteria? Recent developments in cognitive science offer a toolkit for addressing the issue. In what has become known as *the great rationality debate* (Stanovich, 2011), contradictory scientific accounts explaining the seeming irrationality of human reasoning stem from three different bases or "responses" (Stanovich, 1999). The "panglossian response" holds that human beings are inherently rational and that any observed irrationality is ephemeral. The "apologetic response," in contrast, posits that human beings are not inherently rational and, importantly, that improving rationality is an unattainable goal; in our ability to reason rationally, we simply are what we are. Finally, the "meliorist response" acknowledges that human beings are less than perfectly rational and that perfect computational rationality is unattainable, but at the same time it acknowledges individual differences: some human beings are more rational than others, and neither rationality nor irrationality is an essential human condition. Meliorists further believe that education and information can improve reasoning. The meliorist view is also empirically supported (Stanovich, 2011).

The meliorist response resonates with the goals of this article, because one can think of improving the soundness of our reasoning as a central objective of methodology. This suggests that sound reasoning involves three separate criteria that all warrant attention (Table 1). Much of the computational aspect of reasoning is captured by what Stanovich (1999) discusses under the label of *normative reasoning*. The normative criterion focuses on reasoning under conditions of perfect rationality. The second, *descriptive*, criterion pertains to how we de facto reason. The third, *prescriptive*, criterion pertains to reasonable and operational expectations for reasoning. Prescription can be thought of as setting criteria that can be required from a cognitively limited reasoner—that is, "specifying how processes of belief formation and decision making should be carried out, given the limitations of the human cognitive apparatus and situational constraints . . . with which the decision

TABLE 1
Normative, Descriptive, and Prescriptive Criteria for Reasoning

Evaluation Criterion	View of Human Rationality	Reasoning Emphasis	Role in the Evaluation of Reasoning
Normative	*Panglossian*: Reasoners are inherently rational	Following explicit, formal rules (computation)	Awareness of the philosophical boundaries of knowledge claims (epistemic rigor)
Descriptive	*Apologetic*: Reasoners are not inherently rational, and there is not much we can do to improve reasoning	Idiosyncratic reasoning practice	Transparency of reasoning practice
Prescriptive	*Meliorist*: Reasoners are inherently neither rational nor irrational, but better reasoning can be prescribed	Researcher cognition	Negotiated compliance with local rules (methodological rigor)

maker must deal" (Stanovich, 1999: 3). Importantly, the prescriptive criterion is not reducible to either of the other two criteria. To reduce it to the descriptive would mean abandoning methodological rigor in favor of whatever practices of reasoning the researcher reports, as long as the description is sufficiently transparent. To reduce it to the normative would lead to unduly severe evaluation.

By making the distinction between the prescriptive and the normative, we avoid the assumption that researchers are able to approach perfect rationality. Furthermore, even if researchers were perfectly rational, reasoning norms might still be unattainable. It would be misleading, for instance, to presume that improving our inductive reasoning practices would bring us closer to solving the problem of induction (Ketokivi & Mantere, 2010). The problem of induction presents a fundamental dilemma, and dilemmas are, by definition, not solvable.

Normative, prescriptive, and descriptive modes of evaluation all contribute to the process of robust knowledge creation but have different roles. The role of normative evaluation is to ensure epistemological rigor, best described as resilience and restraint stemming from appreciating the unavoidable incompleteness of our knowledge claims. It helps us understand why hypotheses can, strictly speaking, never be verified, why hypothetico-deductivism offers a poor method for ruling out alternative explanations, and how all empirical research is haunted by epistemological dilemmas that arise from the problem of induction (Ketokivi & Mantere, 2010).

The normative aspects of scientific reasoning are rooted in the philosophy of science literature. The core of this enterprise is a primarily logical, analytical quest for universal principles that can characterize knowledge creation across fields of scientific inquiry. Using such literature as a basis for prescription is, however, problematic for two reasons. First, there is roughly as little agreement among philosophers of science on the exact nature of scientific reasoning as there is agreement among strategy scholars on the sources of competitive advantage. Second, even where philosophers do agree, their conclusions typically offer ambiguous and nonoperational guidelines to research practice. In research practice, therefore, there is not much the researcher can do *methodologically* about trying to solve epistemological dilemmas.

Methodological rigor, in turn, is achieved through prescriptive evaluation, which plays a crucial role in the process where the credibility of knowledge claims is assessed (Patton, 2002). In such social processes a scholarly community evaluates methodological rigor in light of local rules that stem from contextual methodological considerations and preferences (Patton, 2002). These rules are constantly negotiated and renegotiated through various processes of evaluation: coäuthorship, manuscript review processes, and various scholarly meetings. In contrast to normative evaluation, prescriptive evaluation does not afford a priori authority to any methodological principle. Symmetrically, prescriptive preferences have no immediate authority beyond the community that has granted them.

The role of descriptive evaluation is to provide transparency—to reveal the local aspects of reasoning. Transparency calls for the disclosure of cognition in all its idiosyncrasy: personal insights, serendipity, imperfections, and novel ways of interpreting data. After all, in appraising an argument, is it not in many ways more central to evaluate how exactly the author reached the specific conclusions—how they came to know—than what, exactly, the specific conclusions were—what they know (cf. Van de Ven & Johnson, 2006)?

REASONING IN ORGANIZATION RESEARCH: A TYPOLOGY

In this section we elaborate the descriptive, the prescriptive, and the normative criteria in the context of deductive, inductive, and abductive reasoning. The methodological basis for reasoning lies in the proper definition of these criteria. Since organization research is methodologically heterogeneous, we structure the discussion by first distinguishing three different research traditions, which in our view account for the majority of organization research.

In *theory-testing research* (Bagozzi & Phillips, 1982; Stinchcombe, 1968), hypotheses are developed from a priori theoretical considerations. Here, testing means confirming or disconfirming these hypotheses using statistical inference. This research design is adopted from the natural sciences (Hempel, 1965; Popper, 1959; Whewell, 1840), although, unlike in the natural sciences, the application of the approaches in organization research typically involves observational, not experimental, data.

In *inductive case research* (Eisenhardt, 1989; Yin, 2003), theory is developed in a data-driven manner; some variant of the grounded theory approach (Glaser & Strauss, 1967) is often used. This tradition is sometimes dubbed "postpositivist" qualitative research (Denzin & Lincoln, 2005) because it builds on the idea of a division of labor between qualitative scholars, who build new theory through their inductive case studies, and quantitative scholars, who test those theories in larger samples (Edmondson & McManus, 2007; Eisenhardt, 1989). In inductive case research, theory has roughly the same meaning as in theory-testing research: it is a set of propositional statements linking the key concepts in the theory to one another (e.g., Whetten, 1989). The characteristic outcomes of inductive case research are theoretical propositions to be examined further by theory-testing research. Such division of labor is facilitated by a common philosophical foundation: both theory-testing and inductive case researchers tend to adopt a *scientific realist* view of studying organizations (Eisenhardt, 1991).

Finally, *interpretive research designs* (Hatch & Yanow, 2003) are similar to inductive case studies in that they rely on qualitative data. Interpretive researchers, however, build theory in a manner very different from that used by inductive case or theory-testing researchers. Interpretive researchers carry out their research as a dialogical process between theory and the empirical phenomenon, where researcher judgment (cognition) plays a crucial role in the interpretation (Gadamer, 1975; Hatch & Yanow, 2003). This dialogical process should not be understood as an instrument for obtaining a "final explanation"; rather, it is an outcome in and of itself. As a result, interpretive scholarship produces reflexive narratives, not explanatory models or theoretical propositions. Interpretive researchers further tend to use methods different from those used in inductive case study; narrative and discourse analysis are good examples. The interpretive research design in organization research is founded on the premise that social scientific inquiry should not be modeled after the natural sciences but instead is an independent tradition (Hatch & Yanow, 2003; von Wright, 1971).

Methodological organization-scientific literature often links specific types of reasoning to specific research designs. Theory testing represents the "deductive style of research" (Rumelt, Schendel, & Teece, 1991: 8), theory building based on qualitative data is inductive (Eisenhardt & Graebner, 2007), and interpretive scholarship is abductive (Hatch & Yanow, 2003). These labels must be understood as deriving from the normative foundation. Describing theory testing as deductive links to Hempel's (1965) hypothetico-deductivism and Popper's (1959) deductive theory testing. Induction in case study, in turn, links to the idea of researcher-invariant eliminative (Baconian) induction. Interpretive scholarship is, in contrast, less unified in its normative methodology but is sometimes characterized as abductive (Boje, 2001; Wodak & Meyer, 2009).

Labels aside, a closer look at research practice reveals that researchers across research traditions use all three forms of reasoning. It is hardly surprising to observe that we all make inferences to a case (use deduction), inferences to generalizations (use induction), and inferences to explanations (use abduction). Thus, using reasoning types as labels to describe entire research designs is misleading. Instead, differences between research approaches, whatever they may be, are found not in the types of reasoning used but, rather, in how the three reasoning types are used in conjunction with one another. The descriptive and the prescriptive criteria in particular must consider this.

Embracing this crucial premise, below we analyze the roles and evaluative criteria for deduction, induction, and abduction. The discussion within each type of reasoning begins at the normative criterion: in discussing deductive reasoning, we thus first discuss its use in theory testing; in discussing inductive reasoning, we first examine inductive case study; and in discussing abductive reasoning, we begin with interpretive research.

Evaluating Deductive Reasoning

The normative criterion for assessing deductive reasoning is logical coherence within a system of statements (Table 2). The principle of logical coherence is straightforward, but complications arise from the fact that organization theories are expressed in a natural (e.g., English) as opposed to a formal (e.g., first-order logic) language (e.g., Peli, Bruggeman, Masuch, & Ó Nualláin, 1994). While formal logic may be applied to uncover logically invalid inferences, logical coherence must be understood as a normative criterion. The normative criterion of formal explicitness may have appeal in some contexts, but prescription must be approached with caution: "natural language is unparalleled in important respects—no formal language approximates its flexibility and expressive power" (Peli et al., 1994: 586). It is impossible to explicate exhaustively and in a logically flawless manner all the premises and conclusions of a theory expressed in a natural language.

No theory about organizations is logically coherent in the normative sense, yet we consider many theories methodologically acceptable. As a case in point, a logical analysis of the formal structure of organizational ecology (Hannan & Freeman, 1984)—logically perhaps the most rigorous organization theory to date—revealed both unnecessary assumptions and theorems unsupported by assumptions (Peli et al., 1994). While this has led to a number of further developments and revisions of the theory (Hannan, Pólos, & Carroll, 2003), the normative criterion of complete logical coherence may never be met.

TABLE 2
Criteria for Evaluating Deductive Reasoning

Type of Reasoning	Normative	Descriptive	Prescriptive
Deduction	Universal logical coherence within a complete system of arguments	Transparency of premises and conclusions	Coherence between premises and conclusions, negotiated within a scholarly community
Theory testing	Deductive derivation of hypotheses from theory (hypothetico-deductive); testing theories through falsification (Popper's deductive theory testing)	Tractability of the link between theory and hypotheses	Explanatory coherence in linking theory, hypotheses, and evidence
Inductive case	*Not applicable*: Deduction is outside the normative scope of case research	Tractability in motivating the research problem	Coherence in motivating the research problem
Interpretive	*Not applicable*: Deduction is outside the normative scope of interpretive research	Transparency of deductive chains in interpretive inferences	Narrative coherence of deductive chains in interpretive inferences

Furthermore, we will demonstrate that logical coherence cannot be promoted as a universal criterion. This calls for the formulation of descriptive and prescriptive criteria.

Evaluation of deduction in theory-testing research. Deduction is an indispensable tool for the theory-testing researcher, both in the theoretical and the empirical realm. In the theoretical realm, the idea that theoretical propositions (theorems) follow from the underlying theoretical premises (assumptions) in a deductively valid manner is often considered one of the hallmarks of good theorizing. Indeed, the notion of *formal theory* connotes precisely such logical tractability (Hannan et al., 2003; Peli et al., 1994). In order for a formal theory to be worth empirical scrutiny, its propositions must be consistent and coherent. In the empirical realm, in turn, all the operations where the raw data are transformed into estimates of model parameters are mathematical calculations and, thus, deductions.

The normative criterion in assessing deduction in theory-testing studies is the notion that empirical operationalizations and hypotheses must be logically derived from theory—hence the label hypothetico-deductive. If the normative criterion is met, the premises unambiguously imply the conclusion. If the underlying theory is logically coherent and unambiguously implies the hypothesis, then the hypothesis is also logically coherent and, consequently, worthy of empirical scrutiny. If reasoning can be made logically coherent, it automatically becomes transparent as well.

While the philosophy of science literature has provided us with the normative criterion of the hypothetico-deductive method (Hempel, 1965; Whewell, 1840), it has also unequivocally demonstrated that theoretical terms used in scientific theories are not formally reducible to observational statements (e.g., Quine, 1951). This effectively makes the normative criterion an unattainable ideal and, consequently, inappropriate as a general prescriptive criterion. In research practice we must therefore both describe and prescribe our deductive reasoning in other than formal terms—for instance, to establish the correspondence between a theoretical concept and its empirical counterpart (Bagozzi & Phillips, 1982; Costner, 1969; Keat & Urry, 1975). This begs the question, "If the link between theory and empirical analysis is not deductive in the formal sense, in what sense is the link deductive, or is it deductive at all?" What exactly are "the interpretive strings" (Bagozzi & Phillips, 1982: 461) by which *theoretical concepts* are translated into *derived concepts* and, subsequently, into *empirical concepts*? In order to answer these questions in a transparent manner, the researcher must illuminate the underlying logic instead of relying on a rhetorical appeal to deductive reasoning. Illumination must start with the realization that deductive logic is not limited to formal logic such as first-order predicate logic. Instead, a variety of deductive (and other) logics are used in theoretical arguments that are expressed in a natural language (Mankletow & Over, 1990). This obviously applies to all organization research, but in the case of the theory-testing tradition, it pertains in particular to the correspondence between theoretical propositions and empirical hypotheses.

The details of various alternative logics are beyond the scope of this article; we refer the reader to Mankletow and Over (1990) for a concise summary. What is relevant here is the implication for the descriptive and the prescriptive criteria. The central prescriptive criterion is that as long as natural language is used to express theory, formal validity constitutes a sufficient but not a necessary condition for methodological validity of deductive reasoning. Therefore, the fact that a theory is incoherent in the first-order-logic sense may serve as a normative criterion that illuminates potential formal logical inconsistencies, but applying this normative criterion as prescriptive requires the dubious assumption that organization theories should adopt formal logic as a general criterion. Our position is that because such a criterion simply cannot be met, it provides a nonoperational basis for prescription. Prescription must instead be based on examining how the rules of the *selected* logic are followed. Different logics rely on different kinds of semantic rules, and prescriptive criteria must be based on such local rules. To the extent that these rules are followed, deductive reasoning becomes tractable. Importantly, reasoning is only locally tractable: deductive reasoning does not follow universal but, in contrast, highly contextualized forms and norms. Unlike the normative criterion, the prescriptive criterion builds on the notion of *local epistemology*, as discussed by Longino (2002).

Evaluation of deduction in inductive case research. While deduction does not feature in the normative texts on inductive case research, it has a role within the practice of all qualitative research, which makes it relevant from the descriptive and prescriptive points of view. Much like theory-testing scholars, inductive case scholars need deductive reasoning to locate and motivate their research problems among targeted bodies of literature. Research problems can be established by arguing that the existing literature is incomplete and that there is a gap in the body of knowledge (Alvesson & Sandberg, 2011); arguing for mixed evidence is common as well (Locke & Golden-Biddle, 1997; Mohr, 1982). One may even argue that all the literature has been inappropriate in how the research question has been approached (Alvesson & Sandberg, 2011; Locke & Golden-Biddle, 1997). Establishing such positions relies on deductive reasoning; arguing for a gap in the literature is an inference to a case, not to a generalization, let alone to an explanation. For this inference to a case to be effective, its premises and the bridge to the conclusion must be elaborated (the descriptive criterion) and established as valid and coherent (the prescriptive criterion).

Furthermore, inductive case researchers may well use not only qualitative but also quantitative data and may thus use mathematical computations in the process of summarizing and drawing conclusions from data. Content-analytical techniques, in turn, form large textual masses and may involve the quantification of the data, followed by deductive operations that range from simple computation of frequencies (e.g., Mantere, 2005) to more complicated multivariate statistical analyses (e.g., Gibson & Zellmer-Bruhn, 2001). Here, descriptive and prescriptive criteria converge with those applicable to mathematical computations within the domain of theory-testing research.

Evaluation of deduction in interpretive research. Methodological literature on the interpretive research design is silent on deduction. Yet while the cognitive act of interpretation is largely abductive, since multiple interpretations are explored in parallel (Alvesson & Kärreman, 2007), deduction plays a key role in structuring and presenting interpretive findings. Interpretations of data are, indeed, effectively presented as *deductive chains*, starting at a general principle, which is then illustrated with examples from the source text. For instance, scholars using deconstruction (e.g., Boje, 1991; Kilduff, 1993; Martin, 1990) begin the presentation of their interpretation with a provocative general claim, followed by an example from the source text, shown to be logically implied by the generic statement.

Descriptive evaluation of deduction centers on the transparency of the deductive chains. An overall prescriptive principle for evaluating interpretive scholarship is *narrative coherence*—that is, the credibility and plausibility of the theoretical interpretation presented (Czarniawska, 1993; Fisher, 1985). Prescriptive evaluation is focused on whether the interpretation "hangs together" in terms of the logical aspects of the plot (Fisher, 1987: 15). In particular, deduction is used to achieve *structural coherence* (Fisher, 1987: 13), which constitutes a crucial aspect of narrative coherence.

Evaluating Inductive Reasoning

Conventionally, the normative criterion for inductive reasoning is researcher invariance: the outcome of an inductive generalization should not depend on the researcher performing it (Eisenhardt, 1989). This criterion arises from the normative premise that induction is ultimately rule following—computation, not cognition. The normative view is straightforward in principle, but complications arise from two sources. First, theory building in practice is simply not researcher invariant. The prescription that researchers should somehow "abstract themselves out" of the reasoning process, while normatively appealing, is unattainable (Ketokivi & Mantere, 2010). The second problem is epistemological: in the philosophy of science literature on the link between empirical data and theoretical explanation, researchers have consistently argued that theoretical explanations do not and *cannot* emerge from empirical data in a computational, objective manner (e.g., Carnap, 1952). Table 3 summarizes inductive reasoning.

Evaluation of induction in inductive case research. Inductive case study derives from the tradition of grounded-theory research, which is succinctly characterized as systematic discovery of theory from data, with less emphasis on a priori theoretical considerations (Glaser & Strauss, 1967). Eisenhardt's (1989) formulation of

TABLE 3
Criteria for Evaluating Inductive Reasoning

Type of Reasoning	Normative	Descriptive	Prescriptive
Induction	Generalizability and predictive power of arguments	Transparency of the link between data and empirical generalizations	Robustness of the empirical evidence for generalizations
Inductive case	Theoretical propositions emerge from empirical data, unbiased by researcher interpretation	Transparency of coding process (generalizing from data)	Impartiality of the empirical generalization
Interpretive	*Not applicable*: Computational induction not addressed by methodological literature	Transparency in analogical reasoning	Credibility of analogical reasoning and appropriateness of metaphors
Theory testing	Induction is not to be used; theories are to be tested deductively (seeking falsifying evidence)	Transparency of the empirical generalization	Rigor in the articulation of the empirical generalization

inductive multiple case study research has been widely adopted in our field as the model of case research. As the label suggests, the normative basis is in inductive reasoning. This normative criterion suggests that the task of the researcher is to derive the generalizations in a computational manner; cognition is ancillary. One of the central premises in inductive case research is the idea that the researcher can gain theoretical insight from data by using inductive reasoning in research phases such as iterative tabulation, cross-case pattern search, and replication (Eisenhardt, 1989: 533). Such tendencies embedded in the data—not the interpretations of the researcher—are seen as the drivers of reasoning.

The caveat of the normative criterion is that one cannot, in practice, reach a theoretical conclusion from empirical observation by inductive generalization (Carnap, 1952; Peirce, 1877; Popper, 1959). Instead, theorizing always involves inferences to explanations, not just to generalizations (Suddaby, 2006; Sutton & Staw, 1995); explanation thus involves abduction. While the normative ideal can provide an inspiration for seeking rigor and transparency in one's approach to the data (Eisenhardt & Graebner, 2007), much like with deduction, the prescriptive criterion cannot be collapsed into the normative.

The prescriptive criterion is founded on impartiality in interpretation. Impartiality is particularly crucial when seeking empirical generalizations. Specifically, computational induction is central in the early coding of textual data, which involves the classification of specific segments of text into more general categories (Strauss & Corbin, 1990). Identifying a segment of text as a member of a particular category is inductive since it leads, by supporting generic categories with particular instances, to the affirmation of a more general empirical tendency. The drawing of empirical generalizations tends to occur in the early stages in the process of coding. In their impactful treatise on grounded coding, Strauss and Corbin (1990) proposed that a grounded analysis begins with *microanalysis*, where the text is read with an open mind, identifying passages that appear particularly noteworthy and relevant to the research problem at hand. Microanalysis is followed by *open coding*; where a large set of empirical categories is created. In both microanalysis and open coding, researchers identify empirical tendencies in the data, and the reasoning used is best described as enumerative induction.

The descriptive criterion for induction is the transparency of empirical generalizations. Illustrations from data through quotations and extracts are effective tools to this end. Prescriptive evaluation is founded on unbiased generalization by the researcher. While this is often achieved by a careful explication of coding principles, researchers sometimes use external audits of various kinds to further reinforce a sense of unbiased generalization (cf. Corley & Gioia, 2004). Interrater reliability tests are sometimes used to check whether several coders identify the same instances in the empirical texts (microanalysis) as relevant and whether they use the same codes to categorize these instances (open coding; e.g., Gibson & Zellmer-Bruhn, 2001).

Evaluation of induction in interpretive research. To an interpretive scholar, induction does not have the same computational role as it does to an inductive case researcher. Rather than general empirical tendencies, interpretive scholars focus on striking and idiosyncratic examples in order to use them to evaluate and ultimately untangle theoretical problems (Alvesson & Kärreman, 2007). Interpretive scholars rarely use elaborate coding frameworks. Instead of starting their data analysis with extensive open coding, they begin with a "preunderstanding," which serves as the starting point for their "dialogue with the data" (Gadamer, 1975).

Interpretive scholars do, however, use analogical reasoning. A special case of induction, analogical reasoning is used to interpret one entity based on similarity with another (Cornelissen & Clarke, 2010; Oswick, Keenoy, & Grant, 2002). Rather than inferring general principles from particulars, through analogical reasoning scholars use particular similarities in two cases to infer further similarities (Hesse, 2000). The widespread use of analogical reasoning likely links with the common use of metaphors in interpretive theorizing (Boje, 2008; Czarniawska, 1993; Morgan, 2006). With analogical reasoning researchers draw on the power of the metaphor to use a simple, more contained case to illuminate an aspect of the focal case (Lakoff & Johnson, 1980). For instance, in his deconstruction of the Disney Corporation, Boje (1995) used the Hollywood play *Tamara* as a basis of theorizing. Boje first argued for the similarity between the play and an organization and, subsequently, used *Tamara's* properties to illuminate various aspects of organization: "The beauty of *Tamara* is that the choices surrendered by single-story interpretations of organization are returned in this discursive metaphor for organizational life" (Boje, 1995: 1001). The analogical case may also be used to recontextualize the focal case. In their deconstruction of leadership, Calás and Smircich (1991) contrasted passages of classical leadership texts with various texts on the subject of seduction with the goal of revealing the surprising, even shocking, resemblance between the two textual domains. The descriptive and the prescriptive criteria for analogical reasoning involve the transparency and credibility in arguing for similarities between two domains.

Evaluation of induction in theory-testing research. In theory-testing research the normative criterion is unambiguous: inductive reasoning is not acceptable. Popper (1959) forcefully argued this point, formulating his method of *deductive theory testing* as an express attempt to banish inductive reasoning from theory testing. Popper's aim was noble, but at the same time his view constitutes perhaps the best example of the unattainability of the normative criterion. Indeed, we cannot think of a single organization theory that has been falsified in a deductively valid manner; in fact, we are not even aware of any genuine attempts at falsification. Hájek and Hall's candid description of the utility of Popper's method for describing or prescribing research practice is as accurate as it is unflattering: "As a descriptive claim about what scientists, *qua* scientists, actually *do*—let alone about what they *believe* about what they do—Popper's view strikes us as absurd. But even as a [prescriptive] claim it fares little better" (2002: 154). All claims to falsification in organization-scientific texts must be understood and evaluated as rhetorical, not methodological (Ketokivi & Mantere, 2010).

Salmon (1966: 19), among others, has reminded us that inferences made from empirical data are either inductive (in the case of inferences to empirical generalizations) or abductive (in the case of inferences to theoretical explanations). Indeed, induction unavoidably underlies all empirical generalizations made in theory-testing research. But if Popper's normative criterion is nonoperational, what are the proper descriptive and prescriptive criteria? Workable descriptive criteria for inductive *statistical* generalizations can be found in many statistical texts that discuss statistical hypothesis testing, effect sizes, statistical power, and articulation of results (Abelson, 1995; Harlow, Mulaik, & Steiger, 1997); it is hardly necessary to reproduce these well-established criteria here. We instead focus on discussing theory appraisal more generally.

In organization science, researchers typically examine empirical hypotheses through probabilities and tendencies instead of "if/then"-type certainties. This is another central reason why the prescriptive criterion for inductive reasoning is impossible to link to Popper's normative idea of falsification: what kind of evidence could falsify—in a deductively valid manner—the proposition "if X increases then Y likely increases as well"? Prescriptive criteria can, however, be formulated on the basis of *empirical adequacy* (van Fraassen, 1980) and *positive relevance* (Salmon, 1966). Both address the extent to which the theory provides an account of the observed data. Indeed, most applications of multivariate statistical modeling examine not whether the data are consistent with the theory but, rather, *the extent* to which this is the case; the greater the extent, the greater the degree of empirical adequacy. As empirical adequacy accumulates through multiple empirical studies, the focal theory accumulates *positive (inductive) relevance*. The prescriptive criterion thus links to the rigor with which empirical adequacy and positive relevance are established.

Evaluating Abductive Reasoning

The normative ideal of abduction in philosophical discourse (Harman, 1965; Lipton, 2004; Niiniluoto, 1999; van Fraassen, 1980) is the selection of "the best explanation" from a set of competing explanations. This selection process is always fundamentally cognitive, not computational. In the multiparadigmatic field of organization research, criteria for what constitutes "the best" often conflict with one another and are also subject to negotiation between the authors and their audiences (Ketokivi & Mantere, 2010). Consequently, much like in the case of deductive and inductive reasoning, the normative ideal is nonoperational and insufficient; hence, descriptive and prescriptive criteria must be formulated. Descriptive evaluation of abduction is founded on the transparency of the explanations considered, whereas prescriptive evaluation places an expectation of compliance to local epistemic values in selecting one explanation over the others. Table 4 summarizes abductive reasoning.

Evaluation of abduction in interpretive research. Interpretive scholars (Alvesson & Kärreman, 2007; Locke et al., 2008; Wodak, 2004) openly acknowledge cognitive reasoning as legitimate methodology. They regard the *hermeneutical circle* as their methodological foundation, which depicts understanding as continuous dialogue between the data (usually text) and the interpreter's preunderstanding. Consequently, methodological authorities portray interpretation as a characteristically abductive exercise (Eco, 1984; Wodak & Meyer, 2009). Interpretive scholars further openly admit that preunderstanding is always informed by existing theories (Gadamer, 1975), and, thus, abduction is a process driven by an interplay of doubt and belief, which, in turn, fuels the imaginative act of creating new knowledge (Peirce, 1878). In her account of critical discourse analysis, Wodak sug-

TABLE 4
Criteria for Evaluating Abductive Reasoning

Type of Reasoning	Normative	Descriptive	Prescriptive
Abduction	Selecting "the best explanation"	Transparency of selection between alternatives	Compliance to local principles in selecting between alternatives
Interpretive	Credibility in theoretical interpretation	Reflexivity in theoretical interpretation	Credibility in theoretical interpretation
Theory testing	Abduction is not to be used; theories are to be tested deductively (seeking falsifying evidence)	Transparency of the selection between alternatives (operationalizations, theoretical interpretations)	Credibility of the selection between alternatives (operationalizations, theoretical interpretations)
Inductive case	Abductive reasoning must not be used; "the best explanation" must be sought through elimination of alternatives using computational inductive reasoning	Visibility of researcher interpretation in entertaining and selecting from alternative explanations in theoretical interpretation	Credibility of the selected explanation

gests that critical discourse analysis is an "abductive approach, [which requires] a constant movement back and forth between theory and empirical data" (2004: 188). She further argues that the abductive approach is an antidote against "fitting the data to illustrate theory" (Wodak, 2004:). Similarly, Boje suggests that abduction represents to the narrative analyst "an ongoing inquiry where scientists have a more spontaneous creative insight they speculate may be tied to their data, or they select one among several plausible hypotheses" (2001: 51–52).

The process of interpretive research can be described as "reflexive narrative," where researchers seek—through a dialogue between their own preunderstanding and the empirical data—a new understanding of theory through an evolution of their own understanding. Interpretive researchers' encounters with data involve, on the one hand, interpreting data in light of theory and, on the other hand, remaining open to being challenged by the data by continually calling into question their preunderstanding (Alvesson & Kärreman, 2007). Maintaining this reciprocity is a central concern: if the researcher does not remain open to being "surprised" by the data, reasoning deteriorates from disciplined abduction to methodologically void rhetoric, where the conclusion merely reflects the researcher's preunderstanding (Alvesson & Kärreman, 2007; Wodak, 2004).

Interpretive scholarship is methodologically founded on the cognitive view; the normative and the prescriptive criteria thus converge. The concept of reflexivity (Alvesson & Sköldberg, 2000) provides the foundation for the evaluation of abduction in interpretive research. Reflexivity entails revealing and assessing the subjective criteria for choices made in the process of interpreting. It sets the foundation for descriptive evaluation, where interpretive choices are exposed to scrutiny, as well as for prescriptive evaluation, where the credibility of interpretations is assessed. The practice of interpretive research differs from other forms in that it openly reveals the subjective and imaginative element of abduction. For example, in his deconstruction of Disney, Boje (1995: 1006–1007) reflected on the various strategies of deconstruction, as well as on his own choice. In their study of the Big Five accounting firms, Suddaby and Greenwood (2005: 46) recounted how they discovered a key theoretical category during an informal discussion with a colleague from religious studies.

Evaluation of abduction in theory-testing research. Much as in the case of inductive reasoning, normative methodology rejects abductive reasoning: as a special case of the fallacy of affirming the consequent, its use cannot be methodologically justified. At a more general level, Popper argued that the discovery of hypotheses does not belong to the domain of methodology: "The question how it happens that a new idea occurs to a man . . . is irrelevant to the logical analysis of scientific knowledge" (1959: 31). But, again, limiting the appraisal of scientific reasoning to logical analysis can be justified only in the normative sense. Other criteria must be developed for the descriptive and the prescriptive aspects.

How does one justify the R&D-to-sales ratio (R&D intensity) as a measure of innovativeness, return on assets as a measure of financial performance, or the natural logarithm of the number of employees as a measure of size? The derivation of the R&D intensity measure from the theoretical definition of innovativeness is an argument neither to a case nor to a generalization; it is an interpretation (Bagozzi & Phillips, 1982). This interpretation is best understood as an inference to an explanation—that is, an abduction (Willer & Webster, 1970: 754). This makes abduction an indispensable form of reasoning in theory-testing research as well.

Consider a firm with a high R&D intensity. This surprising observation is made matter of course by abducing the explanation that the firm is innovative. Obviously, there can be many reasons for observing a high R&D intensity, but the abduction of an innovative firm is not only plausible but is treated in the literature as methodologically acceptable to boot. Conversely, while a zero R&D intensity does not universally indicate absence of innovation (Berger, 2005: 152–153), such abduction has again proven to be generally plausible and acceptable.

The second principal use of abduction involves drawing theoretical conclusions from empirical data. Even in the case of a priori theory, the interpretation of evidence is always an inference to an explanation—that is, an abduction. That the link is abductive (not deductive or inductive) helps us understand why observing a hypothesis to be consistent with data does not rule out alternative hypotheses; it only signals empirical adequacy of the focal theory. The empirical observation "finds a home" in the structure of the focal theory. But the very same observation can find a home in other theoretical structures as well. Carter and Hodgson (2006) pointed out that many empirical studies pegged as evidence for transaction cost economics (e.g., Williamson, 1985) are consistent with predictions from other, even competing, theories. The problem is further exacerbated by the fact that the requirements for empirical adequacy are quite lenient in the social sciences: theories are typically not expected to predict the magnitude of an effect, only whether the effect is positive or negative (Meehl, 1990).

Current theory-testing methods are poor tools for ruling out alternative explanations (Salmon, 1971); their primary use is in testing the predictions of a single focal theory against empirical data. The focus, thus, is not on whether one theory explains the data better than another. Some organization scholars have promoted *strong inference*, where the focal theory is explicitly tested against another candidate theory using "the crucial experiment" (Platt, 1964: 347). But, again, we are not aware of a single rigorous organization-scientific application of strong inference, which leads us to conclude that strong inference can at best be incorporated as a normative criterion.

The descriptive criterion again pertains to transparency. Here we have an abundance of examples of theory-testing research where researchers have made explicit their choice of operationalizations of theoretical concepts. Consider the choice of the dependent performance variable in Hitt, Hoskisson, and Kim's (1997: 778) study of corporate diversification. These scholars considered three alternatives but chose return on assets (ROA) on both conceptual and empirical grounds. At the more general level, explicitly discussing alternatives and elucidating and justifying one's choice make abductions transparent.

The idea of elucidating one's choices also has prescriptive implications. While many contemporary prescriptions emphasize universality and generalizability, we derive the prescription from the importance of considering local conditions and idiosyncrasy. Using a specific measure of a theoretical construct simply because it is widely used in the literature is a rhetorical appeal to popularity and, as such, not acceptable methodology. Instead, the researcher must present the contextual considerations—by way of abductions, for instance—that make the selection transparent.

Evaluation of abduction in inductive case research. The normative literature on inductive case research does not address abduction but, instead, promotes the use of inductive reasoning (Eisenhardt, 1989). In research practice, however, identification of empirical tendencies by induction, while crucial, constitutes only one part of the research process. In seeking theoretical interpretations for the observed empirical tendencies and in choosing between possible theoretical interpretations, scholars always engage in abductive reasoning. In Strauss and Corbin's (1990) framework the two predominantly inductive stages—microanalysis and open coding—are followed by two theoretical stages—*axial coding* and *selective coding*. In axial coding the researcher creates a hierarchy of categories, which consists of a large number of empirical, first-order codes that are mapped onto a more limited set of theoretical dimensions (cf. Corley & Gioia, 2004). Selective coding, in turn, involves a further focusing of the set of categories through the identification of relationships between key theoretical entities.

Reflexivity is clearly a key consideration not only in interpretive research but also in inductive case research. Descriptive evaluation pertains to disclosing the abductive nature of the axial and selective coding stages. Instead of suggesting that theoretical constructs and propositions existed in the data a priori, the role of researcher cognition in the *creation* of these entities must be acknowledged. Glaser and Strauss note that

> the root source of all significant theorizing is *the sensitive insights of the observer himself*. . . . [insights] can come in the morning or at night, suddenly or with slow dawning, while at work or at play (even when asleep) . . . they can strike the observer while he is watching himself react as well as when he is observing others in action (1967: 251; emphasis added).

Prescriptive evaluation is focused on the credibility of the selected theoretical explanation, negotiated within the scholarly community.

REFLECTIONS

In their critical review of how the results of scholarly efforts become "implemented" by managers, Churchman and Schainblatt wrote:

> Some scientists believe that because they think clearly and rationally in their own disciplines they are particularly adept at thinking clearly and rationally about almost any important decision problem. Many managers are shocked by the claim that scientists can penetrate the extreme subtleties of managerial decision-making in sufficient depth to accomplish anything but the superficial (1965: 70).

This crystallizes the absurdity of the premise that while managers reason with limited and biased cognitions, the scholarly community should promote methodological principles based on a researcher-invariant, objective rationality. Below we reflect on the implications of our reasoning framework for two pertinent dialogues in our profession: the dialogue between the scholar and the practitioner and the dialogue among coauthors.

How Should the Scholar Interact with the Practitioner?

The premise of an ability to reason objectively easily translates into a false sense of confidence that the scholar is able to enter any decision situation with an a priori understanding of what is relevant about the decision-making process. As an antidote to such an elitist attitude, the framework developed in this article highlights both the multidimensionality and the context dependence of the scholar's reasoning. Indeed, reasoning in organization scholarship shares many features with managerial reasoning. Sensemaking *about* organizations is not a class apart from sensemaking *in* organizations: not only is it always possible to construct several plausible accounts of a phenomenon, but the rules for formulating these accounts differ across contexts (cf. Weick, 2001).

Understanding how scholars reason has implications for how the scholar's role in dialogues with practitioners should be construed. We propose that instead of producing the evidence on which managers should act, the scholar's task is to help the practitioner in the process of producing and interpreting such evidence. We contest the idea of "translating" academic research results ex post into practitioner language because it unduly places the burden of relevance on the scholar and builds on the questionable premise that research stemming from academic knowledge interest translates to nonacademic contexts (Van de Ven & Johnson, 2006). Instead, we suggest that our value-adding role is to become coarchitects not of the evidential content (to be translated) but of the process in which practitioners obtain evidence. The scholar's task is to ensure genuine understanding of the processes through which evidence is gathered and interpreted. While we as scholars are just as human as managers are, we have been trained to be methodologically rigorous: our profession's primary evaluation system—the peer review—promotes the continual development of this rigor. This is the scholar's competence.

Scholars are often not only exposed to but also interested in reasoning in multiple contexts, and they may therefore be able to offer an important vantage point for understanding the context dependence of reasoning more generally. Our framework elaborates this context dependence and, consequently, may help scholars avoid the omnipotence fallacy that Churchman and Schainblatt (1965) described. To this end, it is important to acknowledge that prescription is local, that cognition cannot be abstracted from reasoning, that many central methodological puzzles constitute insolvable dilemmas, and that compliance with a set of methodological *guidelines* must not be confused with being methodologically rigorous (Ketokivi & Mantere, 2010). Whatever methodological prescriptions we promote must pay heed to Mintzberg's (1977: 91) counsel: avoid giving prescription about how something should be done until you have demonstrated an understanding of how it is currently done and why.

Avoiding the Illusion of Unanimity in Scholarly Reasoning

The literature on how arguments become accepted and how scientific contributions are made typically focuses on the social negotiation process that takes place between those who present arguments, the authors, and those who evaluate them, the reviewers (e.g., Astley, 1985). Similarly, the literature on argumentation and rhetoric explicitly distinguishes between the authors ("the orators") and the audiences they are seeking to convince (e.g., Toulmin, 2003). This further implies the assumption that authoring and evaluating are distinct activities. Yet while the credibility of an argument is ultimately tested in peer review, the foundation for genuine understanding and methodological rigor is laid in the coauthoring process. This raises the question of what implications the inquiry in this article has on how the process of coauthorship should be understood. We are not aware of any methodological texts that address the coauthoring process, yet coauthoring of arguments is ubiquitous in organization science.

One crucial issue for collective reasoning is the coauthors' ability to entertain a range of interpretations before cohering on the one to be pursued (Lipton, 2004). Again, if reasoning among coauthors bears resemblance to coauthoring decisions in organizations, we might gain insight from the voluminous research on collective decision making. Janis, for instance, noted that group decisions are susceptible to what he labeled *the illusion of unanimity*:

> When a group of people who respect each other's opinions arrive at a unanimous view, each member is likely to feel that the belief must be true. . . . the members support each other, playing up the areas of convergence in their thinking, at the expense of fully exploring divergences that might disrupt the apparent unity of the group (1972: 38–39).

In the context of executive decision making during the Cuban missile crisis, for example, one participant—Arthur Schlesinger of the White House staff—observed that "meetings took place in a *curious atmosphere of assumed consensus*" (Janis, 1972: 39). Janis further argued that the consequences of the illusion of unanimity can be devastating.

In the context of scholarly reasoning, focusing on the computational aspects can be read as an instance of "playing up the areas of convergence," which can bring coauthors to agreement. But is the resultant agreement an illusion of unanimity? We argue that this may well be the case, because the assumption that computation warrants knowledge claims trivializes the role of collective sensemaking. It urges scholars to portray the conclusion as a result of an unbiased, objective reasoning process. Normative criteria can effectively be summoned to support the belief that the conclusion indeed unavoidably emerged from the data.

A litmus test for the illusion of unanimity is asking, "*Why*, exactly, do we agree on this?" This may lead to the realization that focusing purely on the computational aspect has bred agreement but not understanding. Illusive agreement can also be construed as an instance of *uncertainty absorption* (March & Simon, 1993), with the familiar consequence: when "inferences are drawn from a body of evidence and the inferences, instead of the evidence itself, are then communicated . . . the recipient of a communication is severely limited in [the] ability to judge its correctness" (March & Simon, 1993: 186). From this another test question can be derived: What are the specific criteria by which we have collectively judged the correctness of our claim?

Avoiding excessive uncertainty absorption and the illusion of unanimity requires acknowledgment of the cognitive elements of collective reasoning. This means that coauthors have to develop a mutual understanding of not only the interpretation to be pursued but also the reasoning principles that lead to this interpretation: asking not just "What do we know?" but also "How do we come to know?" (Van de Ven & Johnson, 2006). The reasoning framework developed in this article is admittedly complex, but this complexity suggests that reaching mutual understanding is not a trivial feat. Agreement without genuine understanding is possible (and tempting), but, clearly, a mutual understanding of the local reasoning principles is a necessary condition for a mutual understanding of the resultant interpretation. This is a further prerequisite to the possibility that the audience will genuinely understand the process that produced the interpretation. In the terminology of our reasoning framework, acknowledging that methodological evaluation lies primarily within the realm of the prescriptive rather than the normative can help coauthors avoid the illusion of unanimity and its adverse consequences.

In summary, evaluation is just as much the authors' task as it is the audience's. To the extent that coauthors seek methodological rigor, they must critically evaluate their own reasoning, both individual and collective, in light of the descriptive, the prescriptive, and the normative criteria. The negotiation over the prescriptive criteria in particular is not limited to negotiations between authors and their audiences but, indeed, must take place among coauthors as well. Similarly, with respect to the descriptive criteria, coauthors must make their own cognitions transparent to one another. Finally, coauthors must agree on the role of normative criteria: if, for instance, they choose to invoke Popper's method of falsification, they must exhibit mutual understanding of what exactly they seek to accomplish by so doing.

In Conclusion

Moving toward sound reasoning requires the interplay of normative, descriptive, and prescriptive criteria. Only by considering all three can we develop a set of criteria that are comprehensive, reasonable, and operational at the grass roots of organization scholarship. While we may turn to authorities in other fields of inquiry for insight and reflection, the construction of the criteria—the descriptive and the prescriptive in particular—is a local task. This is not to be interpreted as dismissal of logical coherence and methodological rigor; our aim is simply to place all criteria in their proper context. Indeed, by considering the cognitive aspects of reasoning, we may not only discover novel, actionable forms of rigor but also realize that there is indeed much we can agree on about the prescriptive foundation (Habermas, 1985).

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