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Team Reflexivity as an Antidote to Team Information Processing Failures

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Abstract

This paper proposes that *team reflexivity* – a deliberate process of discussing team goals, processes, or outcomes – can function as an antidote to team-level biases and errors in decision making. We built on prior work conceptualizing teams as information-processing systems and highlights reflexivity as a critical information processing activity. Prior research has identified consequential information-processing failures that occur in small groups, such as the failure to discuss privately held relevant information, biased processing of information, and failure to update conclusions when situations change. We propose that *team reflexivity* reduces the occurrence of information-processing failures by ensuring that teams discuss and assess the implications of team information for team goals, processes and outcomes. In this paper, we present a model of *information-processing failures* (TIPs) and of *remedies* involving team reflexivity. Next, we discuss the *conditions* under which team reflexivity is and is not likely to facilitate performance. In doing so, we integrate literature regarding team regulatory processes, emergent cognitive states, and team learning.

Keywords: Team reflexivity, team information processing failures, team regulatory processes, team learning

Team Reflexivity as an Antidote to Team Information Processing Failures

Recent conceptualizations of teams as *information-processing systems* focus scholarly attention on the centrality of activities such as sharing, analyzing, storing and using information in carrying out team work (De Dreu, Nijstad, & van Knippenberg, 2008; Hinsz, Tindale, & Vollrath, 1997; Nijstad & Stroebe, 2006; Salas, Rozell, Mullen, & Driskell, 1999). Since a growing number of teams in the workplace perform intellectual and cognitive tasks (Cooke, Salas, Cannon-Bowers, & Stout, 2000; Hinsz, et al., 1997; Salas, Dickinson, Converse, & Tannenbaum, 1992), processing information has become a central and essential aspect of most team work. Through members' cognitions and communications, teams process information of all kinds, resulting in team outputs in the form of decisions, plans, product designs, or services delivered. As teams work with information, possibilities for misplaced emphases, distortion, or critical omissions abound (cf. Flores, Zheng, Rau, & Thomas, 2012). Yet research on the role of team reflexivity as a possible remedy has been limited. The aim of this paper is to explore the role of team reflexivity in the effective processing of information, and to propose team reflexivity an antidote to what we refer to as team information processing (TIP) failures. We argue that team reflexivity can help counteract team information processing failures and thus aid the decision-making process in teams that operate in a demanding, knowledge-intensive context.

Consider, for example, a breast cancer care team charged with diagnosis and treatment of women with suspected carcinoma. The team faces challenges that range from long patient waiting times to the risk of misdiagnosis. The team's decisions may be overly influenced by a surgeon, due to professional status, and inadequately influenced by a nurse with unique information about the patient's symptoms, particularly if her input is not requested or valued. The team would thus fail to integrate and develop implications of the full set of information held by its members (Woolley, Gerbasi, Chabris, Kosslyn, &

Hackman, 2008). Similarly, team conclusions may not be updated in the presence of new information, if, for example, the surgeon's preference for an operation dominates, restricting discussion of alternative treatments. As we discuss in this paper, it is possible to avoid such information-processing failures through careful discussion of team members' information, assessments, concerns, or hunches.

As information-processing systems, teams are vulnerable to information-processing failures, including those known to characterize individual cognition (Tajfel & Turner, 1986; Taylor & Brown, 1988) and those that stem from confusion, misunderstanding or withholding information that occur in groups due to breakdowns in interpersonal interaction. Research on human cognitive shortcomings has identified numerous manifestations of "bounded rationality" (Kahneman, 2003; Simon, 1947, 1955, 1979) that make it difficult for individuals to process available information rationally and effectively. Instead, we process information in ways that produce systematic errors (see Heath, Larrick, & Klayman, 1998). Research on individual information processing failures has a long history in organization studies (for a recent review see Hilbert, 2012), while the area of TIP failures is receiving more research attention in the last decades. This was owed especially to a seminal review of teams as information processors arguing that individual cognitive shortcomings may be exaggerated rather than mitigated in teams (Hinsz, et al., 1997)[1], in part because of the potential for further information distortion created by poor communication. Although the possibility exists that team members can catch and correct each other's individual IP failures, research on group dynamics suggests that this is unlikely to be the norm (e.g., Janis, 1982a). Other group dynamics, including withholding of information also limit the effectiveness of team conversations and lead to poor outcomes (e.g., Argyris & Schön, 1978; Edmondson, Roberto, & Watkins, 2003; Janis, 1972; Janis, 1982a, 1982b; Janis & Mann, 1977; for a meta-analysis see Mesmer-Magnus & DeChurch, 2009).

Teams that face high task complexity are likely to be particularly vulnerable to specific information-processing failures. An *information-processing failure* is defined as a distortion in the exchange of, communication about, or elaboration on information, due to either an omission error in information sampling, or due to biased elaboration of the information. Drawing from research on team decision-making and team learning, we organize these process failures into three categories: (1) failure to share or discuss relevant information, (2) failure to elaborate and examine implications of shared information, and (3) failure to update or alter prior conclusions or current behaviors.

We use these categories to propose a theoretical model of *team reflexivity*, which involves deliberate discussion of team goals, processes, or outcomes, so as to adapt them as needed. Our model builds on an emerging conceptualization of teams as information-processing systems, and highlights reflexivity as a critical information-processing activity. Prior research has identified consequential information-processing failures that occur in small groups. Although a recent review has cast some doubt on team reflexivity as a panacea for team performance (Moreland & McMinn, 2010), we propose that a deliberate and targeted use of team reflexivity reduces the likelihood of these failures (cf. Lewis, Belliveau, Herndona, & Keller, 2007). Specifically, we propose that information processing failures can be mitigated in teams that employ a conscious process of reflection about what they are trying to achieve (their goals), how they are going about it (their processes) and how effective or successful they are (their outcomes). Teams that engage in high levels of reflection on goals, processes, and outcomes are likely better able to avoid information-processing failures. In short, we argue that reflexivity enhances team performance through more effective information processing, which in turn relates leads to reduced team errors and failures.

An important novel contribution of our paper is that we organize the literature around TIP failures with our taxonomy of these failures (i.e. biases and errors), and we propose that

reflexivity can counteract these failures. The main aim is to spur systematic research in this area, which is currently very much scattered and to propose an agenda that explores how depth of reflexivity impacts on team information processing (see West, 2000).

In the sections that follow, we define the construct of reflexivity and situate it in the team learning literature. We then elaborate the construct by reviewing dimensions of reflexivity, drawn from multiple literatures. We review evidence from the literature for three information-processing failures at the group level to explore how reflexivity may mitigate these problems. Finally, we discuss preliminary research on interventions to stimulate reflexivity in teams, point to avenues for future research and discuss implications for practice.

Team Reflexivity

Team reflexivity, a group level construct, has been defined in prior work as "the extent to which group members overtly reflect upon, and communicate about the group's objectives, strategies (e.g., decision-making) and processes (e.g., communication), and adapt them to current or anticipated circumstances" (West, 2000; p. 296). Although the original construct comprised three parts, namely reflection, planning, and action/adaptation, recent work views team reflexivity as one construct, with information-processing as an essential element of team reflection (e.g., Carter & West, 1998; De Dreu, 2002; Nederveen Pieterse, van Knippenberg, & van Ginkel, 2011; Schippers, Den Hartog, & Koopman, 2007; Schippers, Homan, & van Knippenberg, 2013; Schippers, Den Hartog, Koopman, & van Knippenberg, 2008; Schippers, Den Hartog, Koopman, & Wienk, 2003; Schippers, West, & Dawson, in press; Tjosvold, Tang, & West, 2004; van Ginkel, Tindale, & van Knippenberg, 2009; for reviews see Moreland & McMinn, 2010; Widmer, Schippers, & West, 2009).

Using the taxonomy of team processes proposed by Marks, Mathieu and Zaccaro (2001), reflexivity can be seen as a transition process referring to actions that teams execute between performance episodes (Marks, et al., 2001; Schippers, et al., 2013; Schippers, et al.,

in press). Reflecting on work processes can help teams to innovate, by promoting the generation of new ideas about how to work together effectively (Schippers, et al., in press; Schippers, West, & Edmondson, forthcoming).

We conceptualize team reflexivity as an explicit information processing activity in a team that precedes adaptation and is an essential component of team learning. We propose that team reflexivity improves team decision-making and performance by reducing the potential for information-processing failures. Our conceptualization sets the construct of team reflexivity apart from communication, or frequency of communication in teams, in that the content of the communication is key, and thus systematic reflection (for a recent review see Ellis, Carette, Anseel, & Lievens, 2014), as is implied by team reflexivity. Team reflexivity thus entails a discussion-based process in which teams assess their current information and their past or planned actions, decisions or conclusions, with respect to goals, processes, or outcomes. The aim of team reflexivity is to evaluate past actions and performance, learn from failures and successes, and craft action intentions for improved future functioning (Ellis, et al., 2014). Although adaptation is not guaranteed to follow team reflection, we argue that the chances of making useful changes in the team are increased by this activity (e.g., Ellis, et al., 2014; Geletkanycz & Black, 2001; LePine, 2003; LePine, 2005; Marks, Zaccaro, & Mathieu, 2000). For example, the breast cancer team might reflect on whether a team goal of seeing all patient referrals within 14 days is too long, or too short. The team also may consider whether waiting-time is the right performance measure, and consider a new goal related to quality of care. Team reflexivity could involve considering process issues, such as whether information from the nurse or the oncologist is being heard and used and whether or not the surgeon dominates team decision-making. Reflection on outcomes might target levels of innovation or satisfaction in the team. In short, reflection is an evaluative team discussion process that targets goals, processes, or

outcomes. Team reflexivity means combining reflection and the outcome of reflection with adaptation.

By definition, team reflexivity can be distinguished from other concepts within basic and applied research, such as feedback-seeking behavior, transactive memory, extended problem-definition phase, and quality circles. These concepts tend to assume team reflexivity takes place, without specifying it. As such, the concept of team reflexivity has theoretical value over constructs in which the actual process of sharing and elaborating of information is assumed and remains a "black box" process. Moreover, team reflexivity can be distinguished from team learning. A growing literature contributes to our understanding of antecedents and outcomes of team learning (e.g., Edmondson, 1999; Edmondson, Dillon, & Roloff, 2007; Gibson & Vermeulen, 2003; Jehn & Rupert, 2008; Wilson, Goodman, & Cronin, 2007). However, as noted in a review of the literature (Edmondson, et al., 2007), team learning has remained a fairly undifferentiated, or encompassing, construct - comprised variously of engaging in learning behaviors that emphasize communication between team members and others and range from asking questions and admitting mistakes within the team, to boundary spanning activities that gather information or expertise from others outside the team. Most of the research in this area views team learning as a process (e.g., Edmondson, 1999; Gibson & Vermeulen, 2003) although some (e.g., Wilson, et al., 2007) use the variable to refer to an outcome. We join the former tradition and focus narrowly on reflexivity as one aspect of the learning process. This paper develops reflexivity as a specific and essential team learning activity in a dynamic or complex environment. This premise is consistent with prior work on learning at different levels of analysis (e.g., Dewey, 1910, 1933; Kolb, 1984). Finally, the concept of team reflexivity can help structure the information-processing problem space, such that we can derive a set of testable predictions.

Information Processing Failures and Reflexivity in Teams

Extensive research has shown that individuals, working alone or in groups, use information-processing strategies that are often suboptimal or dysfunctional (e.g., Hinsz, et al., 1997; Senge, 1990; Taylor & Brown, 1988; Van de Ven, 1986) and that these common errors and failures are amplified in teams (for a review see Hinsz, et al., 1997). Hinsz, et al. (1997; see also Sasou & Reason, 1999) mention two explanations for why common individual level failures are amplified at the team level: First, groups are more consistent in applying rules and strategies they use in processing information, amplification occurs when they use biasing rules, and, second, processes akin to *social loafing* and *diffusion of responsibility* can occur when groups perform cognitive tasks (i.e. *cognitive loafing*, e.g., Weldon & Gargano, 1988; Schippers, in press). Cognition and interpersonal interaction thus create areas of vulnerability that reduce the likelihood of optimal information processing strategies and outcomes in teams charged with knowledge work.

Therefore, both theoretical and practical motivations exist for understanding factors that could help teams avoid these information-processing pitfalls. Highhouse (2001) noted the paucity of research on de-biasing techniques in organizational decision-making processes, and a similar gap exists in team research.

The following sections elaborate our three categories of TIP failures as an organizing framework for reviewing team and small group research related to this topic: (1) failure to search for and share relevant information, (2) failure to elaborate on information, and (3) failure to alter shared conclusions, maintaining or even reinforcing existing team behaviors. We also identify ways that team reflexivity could help counteract each of these failures. A taxonomy of these failures and ways of encouraging reflexivity to overcome them can be found in Figure 1. This Figure will serve as an organizing framework for the remainder of the paper.

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Insert Figure 1 about here

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Failure to Search for and Share Relevant Information

A coherent research paradigm can be found on team failures to search for and share information within the information sharing literature. Teams that pool knowledge from multiple sources to generate ideas are likely to make better decisions than lone individuals. In practice, however, the benefits of team pooling are elusive. First, unique information (known by only one member) in decision-making groups tends not to be shared in discussions, independent of its relevance (Stasser, 1999). Experimental studies have demonstrated that groups discuss common information (held by all or most members) at great length, and unique information often fails to surface. When it does surface, its impact is often muted (e.g., Larson, Christensen, Abbott, & Franz, 1996; Stasser, 1999; Stasser & Titus, 1985). Unique information may remain unshared when individuals – deeply engaged in the discussion at hand – fail to recognize its salience for the issue under consideration. Members also may fail to share private information because they take it for granted and implicitly assume that others know what they know (cf. Woolley, et al., 2008), or because they are reluctant to interrupt the flow of an ongoing discussion.

A recent review emphasized *representational gaps* in teams, in which diverse team members have different encodings of a problem, which lead to different representations of the problem that cannot be integrated (Cronin & Weingart, 2007). Representational gaps are thus important process losses in teams, interfering with team information processing and hindering the development of a shared understanding. Similarly, cross-understanding, or the understanding of each other mental model within a team, is an important element for integrating information (Huber & Lewis, 2010). Brodbeck, Kerschreiter, Mojzisch, and

Schulz-Hardt (2007) present an information asymmetries model, in which pre-discussion distribution of information affects whether or not group discussion promotes decision quality.

In sum, the failure to share and discuss task relevant information in teams is well established in prior research. Because this work has been extensively reviewed elsewhere (Brodbeck, et al., 2007; Scott & Kameda, 2000), we do not provide a full review here. Nonetheless, this failure constitutes an important process loss (Steiner, 1972), that team reflexivity may help mitigate.

How Team Reflexivity Can Counteract the Failure to Search for and Share Relevant Information

Team reflexivity may mitigate the failure to search for and share information by increasing the chances that a team will identify and use *useful, relevant and correct information* (Brodbeck, et al., 2007; Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, & Frey, 2006). Also, team reflexivity may assure that teams recognize the need to create some degree of shared understanding in the case of representational gaps (Cronin & Weingart, 2007).

First, teams need to assess whether they have enough information to effectively complete their work, instead of assuming they have all the information they need. Prior research suggests a lack of information sharing (the common knowledge effect), can be attenuated by reflexivity. Most simply, increased information exchange increases the likelihood that relevant information will be taken into account (Schulz-Hardt, et al., 2006). Five procedural mechanisms have been shown to attenuate the common knowledge effect (Scott & Kameda, 2000): (1) giving the group more time to discuss (as opposed to time pressure), (2) allowing the group to have access to informational records during discussion, (3) instructing group members not to form a priori judgments, (4) framing the task as a problem to be solved, and (5) explicit assignment of roles based on information distribution (with roles known by all group members). These mechanisms

can be seen as strategies for promoting reflexivity, because they encourage teams to reflect carefully on members' diverse information.

Second, when teams are made aware of the pitfall of shared information being attended to disproportionately compared with unshared information (i.e. common knowledge effect; Gigone & Hastie, 1993), they are more likely to share information effectively, likely increasing decision quality. This request can be used to build a norm of reflecting. A lab study by Postmes, Spears, and Cihangir (2001) showed that groups with *critical norms* rather than consensus norms enhanced the quality of decision making, in part because those groups sought and valued unshared information more than groups with a consensus norm (cf. Eisenhardt, Kahwajy, & Bourgeois, 1997; Kellermanns, Floyd, Pearson, & Spencer, 2008).

However, teams may not reap the benefits of those critical norms, if the potential positive side of this mild form of conflict escalates into a negative form of conflict (Simons & Peterson, 2000), possibly as a result of initial negative performance feedback (Peterson & Behfar, 2003). Therefore, constructive confrontation norms are key in enabling team problem solving and discussion of information based on arguments rather than hierarchy or power (Burgelman, 1994; Kellermanns, et al., 2008). These norms of open expression, disagreement and avoidance of negative affect (Kellermanns, et al., 2008), combined with high levels of trust are important for reflexivity to be effective, especially when the team's prior performance has not been up to par (Peterson & Behfar, 2003; Schippers, et al., 2013) . Relatedly, *epistemic motivation* ("the willingness to expend effort to achieve a thorough, rich, and accurate understanding of the world, including the group task or decision problem at hand" (De Dreu, et al., 2008; p. 23) has been found to be positively related to deep, systematic information processing in teams (De Dreu, Koole, & Oldersma, 1999), and is an important prerequisite for the quality of reflexivity.

Research also shows that norms carry over from one situation to another. For instance, members of a dyad with prior experience in either cooperative or competitive interaction, maintained a consistent style, despite changes in task or interaction partner (Bettenhausen & Murnighan, 1991). Klein (1989) showed that when a new situation seemed familiar, preferred solutions and alternatives used previously were seen as appropriate in the new situation. This carry-over of norms and working methods makes it important to establish explicit team norms of critical thought and reflection, and to establish regular discussions about the appropriateness of using prior solutions for new problems.

In the breast cancer care team, explicit reflection on what information the team has and needs can help the team recognize that each member may hold unique information. This may spur team reflexivity, helping the team seek out and pay special attention to information held by individual specialists.

Proposition 1. Norms and strategies that favor critical thought and search for information, will promote team reflexivity and this in turn will counteract the failure to search for and share information

Failure to Elaborate and Derive Implications from Information

Even if unique information is shared, teams might still fail to elaborate on the information in a systematic and unbiased way. *Elaboration* refers to working out in detail, and revealing intricacy, through a careful and painstaking process in order to understand or explain in detail the information relevant to a team's decision-making process. *Deriving implications* refers to identifying or exploring relationships between propositions arising from the information. Specifically, teams could elaborate: (1) observations about prior team actions or performance, assessments of those actions, (2) implications of observations or assessments, and (3) suggestions for future actions.

Individual motives affecting information sharing can leave teams with incomplete and biased information for elaboration (Wittenbaum, Hollingshead, & Botero, 2004). If team members have individual goals that are not in line with team goals, they may pay little attention to information relevant for the team goal that threatens their own goals, even though the information is shared. Diverse teams may be particularly subject to this TIP failure (Chiu & Staples, in press; for reviews see van Knippenberg & Schippers, 2007; van Knippenberg, van Ginkel, & Homan, 2013). Furthermore, if teams fail to share information, they may miss out on important information and harm the decision-making process. The quality of information elaboration can also be influenced by team composition. Recent research shows that information/decision making and social categorization processes interact, such that intergroup biases flowing from social categorization disrupt the elaboration of task-relevant information (van Knippenberg, De Dreu, & Homan, 2004), referred to as the *Categorization-Elaboration Model* (CEM).

Recent research shows that elaboration of information is especially important in highly turbulent environments (Resick, Murase, Randall, & DeChurch, 2014), and when teams have a complex task (cf. Schippers, 2014; Vashdi, Bamberger, & Erez, 2013). A complex task, as opposed to a simple task, is characterized by high rather than low information processing requirements (Gist, Locke, & Taylor, 1987; West, 1996). The uncertainty inherent in a complex task will spur teams to broaden their knowledge base, for instance through reflexivity. Where the task is complex, the need to exchange information and collectively process information will be strong. In the case of a complex task in a turbulent environment, structural team reflexivity in the form of action team learning may be particularly important. Action team learning is a team-level property defined as "reflecting not simply whether team members are trained in reflexivity methods, but rather the degree to which team members have *consistently* engaged in a *greater* number of *guided, shared, and*

role-focused reflective experiences following team action" (Vashdi, et al., 2013, pp. 946, 947). This form of ongoing reflexivity was shown to increase coordination with respect to helping and workload sharing, and in turn team performance (Vashdi, et al., 2013). This research shows that team reflexivity also has a temporal dimension: it is an iterative process of reflection and adaptation, stressing the temporal aspect of this construct (Schippers, et al., 2007; West, 1996).

Framing, heuristics and positive illusions. Known failures to elaborate and develop the implications of available information include *framing* effects and the use of *heuristics* and *positive illusions* (e.g., illusion of control). *Framing* refers to the tendency for people to make very different decisions based on how the problem is presented (Kahneman, 2003; Tversky & Kahneman, 1981). For example, when problems are presented in a way that emphasizes the potential for gain, people tend to make conservative (risk-averse) decisions, whereas when the same problem is presented to emphasize the potential to avoid loss or suffering , people make riskier decisions (Kahneman & Tversky, 1979, 1984). How information is framed thus may affect how it's elaborated (Schippers, Rook, & Van de Velde, 2014).

Simple rules of thumb, known as *heuristics*, also may limit elaboration of information. For instance, the availability heuristic – a rule of thumb in which people base their prediction of the frequency of an event (or the proportion within a population) on how easily an example can be brought to mind – leads people to make irrational estimates, discrepant from actual statistical probability. Heuristics, by definition, limit information processing, and thus may reduce the quality of team judgments or decisions, especially for non-routine decisions (cf. Croskerry, 2003; Fischhoff, 1982).

Illusions are enduring systematic distortions of reality, in contrast to errors and biases, which refer to short-term mistakes and distortions (cf. Funder, 1987). Common positive illusions include unrealistic positive self-evaluations, the illusion of control, and unrealistic

optimism (Taylor & Brown, 1988). Although positive illusions have been shown to be associated with psychological health, they are nonetheless likely to bias team information processing (Taylor & Brown, 1988, 1994), especially if illusions become exaggerated in a team context. For instance, Heath and Jourden (1997) showed that both before and after task performance, groups maintain positive illusions about their performance, whereas individuals tended to become disillusioned during task-performance. Similar findings regarding group brain storming have been reported (Paulus, Dzindolet, Poletes, & Camacho, 1993; Paulus, Larey, & Dzindolet, 2000). This effect may lead teams to discard information about areas for improvement. For example, a breast cancer care team could adopt a policy, under a dominant surgeon, of favoring radical surgery over a medical approach to treatment.

How Team Reflexivity Can Counteract the Failure to Elaborate and Derive Implications from Team Information

Team reflexivity can help mitigate the failure to elaborate and derive implications from information through *explicit information processing* (cf. Lubatkin, Simsek, Ling, & Veiga, 2006; Wei & Wu, 2013). This entails weighing information in an unbiased way before coming to a final decision. Ideally, the elaboration process should (1) be grounded in data (concrete examples or any relatively concrete evidence to back up or clarify an observation or assessment), (2) involve disconfirmable statements (phrased such that the veracity of the statements can be assessed), and (3) balance advocacy and inquiry. These features of high quality elaboration will affect how information is interpreted (Argyris & Schön, 1978; Ellis, Mendel, & Nir, 2006; Sitkin, 1992; for a review see Ellis, et al., 2014).

Individual level research suggests that deliberation can counteract failures, such as the illusion of control – an inaccurate perception that an individual is in control in a particular situation. Notably, participants in an experiment with a deliberative mindset, compared to an implemental mindset, were less vulnerable to the positive illusion bias (Gollwitzer & Kinney,

1989). Once participants decided on a course of action, the positive sides of the favored choice became cognitively exaggerated, enhancing goal implementation (Taylor & Gollwitzer, 1995). We do not know of any research on this illusions of control or positive biases in teams, but we propose that the shortcomings observed for individuals might be even stronger in teams, in the absence of deliberate intervention (Hinsz, et al., 1997). Teams could, however, be helped to reflect on and weigh relevant information carefully, thereby enacting a deliberative mindset, before switching to an implemental mindset. Research on idea generation in groups using a "brainwriting" paradigm (i.e. team members writing down ideas on a slip of paper) has shown that two conditions enhance idea sharing in groups, namely *attention* – the extent to which groups carefully process the exchanged ideas – and *incubation* – the opportunity for group members to reflect on the exchanged ideas afterwards – (Paulus & Yang, 2000).

Team reflexivity can be used explicitly to counteract positive illusions that hinder the discovery of errors in problem solving, decision making, and detection of the need to make changes. Deliberate reflection also should help in mitigating failures caused by heuristics and framing, by allowing a team to produce a clear and realistic picture of the situation. Moreover, over time, knowledge of and attention to common fallacies should help teams become increasingly aware of framing effects and the use of heuristics in decision making. This might encourage them to try to look at the information they have from different angles. Reflecting on and questioning heuristics used in a team is helpful (for a review see Croskerry, 2003). Of course, it is essential that the use of such explicit information-processing strategies be related to the objectives, strategies, and processes of the team. Thus, for the breast cancer care team, reflexivity (at sufficient depth) would create circumstances in which a heuristic that biased radical surgery could be noticed and challenged. Moreover the positive illusion about its value could be exposed by discussions about the cosmetic and psychological disadvantages for patients of too rigorous an approach to surgery.

Proposition 2: Team reflexivity – explicit information processing regarding the team's objectives, strategies and processes – will counteract the failure to elaborate and develop the implications of team information.

Failure to Revise and Update Conclusions

After elaborating and reflecting on the information available to the team, it is important to proceed towards revising and updating conclusions. Several streams of research point to the challenge of effectively updating conclusions or behaviors in teams. Just as a frog fails to react to a slow change in temperature (Senge, 1990), teams may fail to recognize critical changes in their environment that occur gradually.[2] Several related theories suggest that revising shared views of reality in groups when the environment changes is challenging, notably: *habitual routines*, *social entrainment, escalation of commitment* and *confirmation bias*.

Habitual routines and social entrainment. The failure to revise conclusions in teams – especially the failure to question a current course of action – is suggested by research on *habitual routines*. A well-honed routine can crowd out consideration of alternative interpretations. An example, described by Gersick and Hackman (1990) is the 1982 crash of Air Florida flight 90, when the cockpit crew failed to use the anti-ice capability of the aircraft, despite the icy weather conditions. The usual routine for this crew, used to warm climates, was to answer "off" when "anti-ice" was read from the checklist; facing the atypical circumstance of ice and snow, the crew failed to update their usual routine.

Social entrainment – the persistence of social rhythms in a team – refers to the failure to update taken for granted conclusions.[3] According to McGrath and Kelly (1986, p. 100), "groups and individuals attune their rates of work to fit the temporal conditions of their work situations, and that such attunement, once established, persists to some degree even when surrounding temporal conditions have changed." Other research shows similar tendencies in teams (e.g., Geletkanycz & Black, 2001; Gersick & Hackman, 1990).

Gersick (1994) showed that teams go through cycles of inertia and change, and temporal milestones and specific events can initiate change in a team's level of reflexivity. Further, Gersick's (1988) elegant study of punctuated equilibrium found that project teams reflected on how to move forward at critical times such as a project midpoint. Habitual routines in some teams were changed as a result. However, many work teams do not have a finite life span, clear goals, or specific deadlines, as was the case in Gersick's study. Many teams lack natural breakpoints, and even mid-point reflection may not be prevent information-processing failures, if not done thoroughly. For most teams it may be useful to enhance the level of reflexivity so that team attention can be focused on the temporal rhythms and patterns of its work (cf. Zellmer-Bruhn, Waller, & Ancona, 2004; Zellmer-Bruhn, 2003). Highly reflexive teams will consider team processes and team environments, and will discuss and adapt temporal processes as needed (cf. Bartel & Milliken, 2004).

Escalation of commitment and confirmation bias. Research on escalation of commitment and the confirmation bias also points to failures to revise conclusions in the presence of new information. Escalation of commitment refers to a tendency (by groups and organizations) to continue a chosen course of action, even when changing to a new course would be preferable (Staw, 1981). Confirmation bias refers to a tendency by decision makers to notice, assign more weight to, and actively seek out evidence that confirms their hypotheses or preferred ideas, while ignoring or failing to seek evidence that might disconfirm them (Jonas, Schulz-Hardt, Frey, & Thelen, 2001; for a review see Nickerson, 1998).

In teams, the failure to consider disconfirming information, has been related to decision making fiascoes involving *groupthink* (Janis, 1972; Janis, 1982a). Escalation of commitment has been documented in teams in several studies. For instance, a study that asked MBA student teams to play a management game showed that, despite negative performance feedback regarding the introduction of a brand, teams would increase their resource allocation to this

brand when prior resource commitments (in this case, the proportion of advertising expenses) were high (Lant & Hurley, 1999). Whyte (1993) argued that the escalation of commitment bias can be explained by loss aversion in individuals (Kahneman & Tversky, 1979), and that escalation of commitment is generally exaggerated in groups.

These four biases and errors (habitual routines, social entrainment, escalation of commitment, and confirmation bias) all represent failures to update beliefs about the best course of action in the face of new information. For example, the breast cancer care team may regularly have a session where members discuss new research findings published in leading journals yet still fail to implement changes in practice. As described next, reflexivity may enable the team to pay explicit attention to these processes.

How Team Reflexivity Can Counteract the Failure to Revise and Update

Team reflexivity can help mitigate the failure to revise and update conclusions by paying *explicit attention to the team's decision-making process*. Reflexivity involves reflecting on the way decisions are made in the team and considering whether the team is on track to reach its goals. Prior research shows that attention to team decision-making processes occurs when teams are urged to interrupt the workflow and reflect, for instance, in a "time-out." Zellmer-Bruhn (2003) suggested that the "pause" created by interruptions in teamwork can be enough to notice and acquire new knowledge, even without a deliberate search effort. These results are consistent with theory on interruptions triggering active cognitive processing, and, in turn, stimulating changes such as new routines. Okhuysen (2001) suggested that reflexivity can be brought about by a simple intervention that instructed teams to "stop and think" in a laboratory study. Teams with an ambiguous task (diagnosis of the causes of a salmonella outbreak in a restaurant) were given formal instructions to perform a "cause and effect analysis," leading to interruption by team members to evaluate how well they were following instructions. Once the work was interrupted, they also evaluated their

progress on the ambiguous task. A qualitative study of research and development (R&D) teams showed that routine change can come about through the process of vicarious learning (learning from the experiences of others). Vicarious learning included learning from experiences of other teams by first translating it to the team's own work and then making an informed decision of whether or not to change the routine (Bresman, 2013). In sum, when teams consciously reflect on their decision-making process, the quality of decision outcomes may be enhanced (Sitkin, 1992).

Research on de-escalation strategies for making decision-makers responsive to available information and evidence shows that holding individuals accountable for the decision-making *process* were less likely to escalate commitment than individuals who were held accountable for the *outcomes* of their initial course of action (Simonson & Staw, 1992). Similar research – in the motivated information-processing paradigm – showed that under conditions of high process accountability (compared to outcome accountability) decision makers incorporate information more fully and reflect to a greater extent on the information (Lerner & Tetlock, 1999; Scholten, van Knippenberg, Nijstad, & De Dreu, 2006; Tetlock, 1992).

Wittenbaum, Hollingshead, and Botero (2004) presented a model in which team members' motives and goals determine what information is mentioned, how information is mentioned, as well as to whom information is mentioned, in turn influencing group decision quality, member influence and member relations. Research on cognitive processing and attitudes showed that an accuracy motivation resulted in active and objective cognitive processing, whereas a defensive motivation resulted in biased processing, and cognitive processing mediated the effect of motivation on attitudes (Lundgren & Prislin, 1998). Thus, explicit attention to and reflexivity on the decision-making process, brought about by interruptions, process accountability, and/or an accuracy motivation, has a de-biasing effect and improves the decision-making process.

Proposition 3. Teams high on reflexivity will show more explicit attention to, and accountability with respect to the decision-making process. This, combined with an accuracy motivation, will counteract the failure to revise and update conclusions.

Interventions to Improve Team Reflexivity

Guided reflexivity (sometimes referred to as briefing/debriefing or after event reviews; DeRue, Nahrgang, Hollenbeck, & Workman, 2012; for a review see Ellis, et al., 2014) may help teams avoid TIP failures. Indeed, guided reflexivity has been associated in prior research with improved team processes and outcomes (Vashdi, Bamberger, Erez, & Weiss-Meilik, 2007). Team feedback may help make teams aware of information gaps and thus alter team processes (Johnson, Hollenbeck, DeRue, Barnes, & Jundt, 2013). Prior research shows that even simple interventions (a formal instruction to "stop and think") can improve team processes and performance (Okhuysen, 2001) and that reflexivity may occur naturally at a team's midpoint (Gersick, 1989). Okhuysen and Waller (2002) found that semi-structures such as time pacing and familiarity increase the chances that teams will interrupt their work to "stop and think." Subsequently, those teams do evaluate their work and develop alternatives.

Counterfactual thinking may also help teams avoid information processing failures through reflecting on "what might have been" – imagining another and better outcome of certain events, and the structured evaluation of past events resembles reflexivity. In this way, counterfactual reconstructions of the past can pave the way for future improvement (Markman, Gavanski, Sherman, & McMullen, 1993; Roese, 1994; 1997; Taylor & Schneider, 1989; for a review see Ellis, et al., 2014).

Although learning from one's own mistakes may be useful, recent research suggests that learning from the TIP failures of other teams may be even more helpful (Staats, & Gino, 2013). Data from 71 surgeons who completed over 6,500 procedures using new technology

over 10 years showed that individuals learn more from their successes than from their failures, and yet learn more from others' failures than others' successes. (Bresman, 2013) found a similar pattern at the team level. Thus information sharing about each other's failures, and reflecting on other teams' failures may be a viable option to counter TIP's.

Proposition 4. Team reflexivity – in terms of guided reflexivity, team feedback, and learning from other teams' TIP failures and reflecting on them – will enable teams to counteract TIP failures.

Reflexivity Training. It seems important to time an intervention well, because in certain instances, teams will be more open to change than in others (Silberstang & Diamante, 2008; Zellmer-Bruhn, 2003; cf. Ford & Sullivan, 2004) – for instance, when a team reaches a milestone (Gersick & Hackman, 1990; Okhuysen & Eisenhardt, 2002) or a new technology is implemented (Edmondson, Bohmer, & Pisano, 2001). Also, according to Gersick and Hackman (1990), the amenability of routines to change varies with the depth of the routine and the centrality of the routine to the teams' task. Zellmer-Bruhn (2003) suggested that the "pause" created by interruptions in teamwork can be enough to trigger teams in noticing and acquiring new knowledge, even without deliberate search. These results are in line with prior theory suggesting that interruptions trigger active cognitive processing, which, in turn, stimulates changes such as acquiring new routines. Okhuysen & Waller (2002) indicated that midpoint transitions are most common when teams were instructed to use time management as part of their team process. However, reflexivity at natural milestones may be insufficient for preventing TIP failures in work teams with complex tasks, and it may be useful to enhance the general level of reflexivity in those teams. Lewis and her colleagues (2007) showed that knowledge-sharing inefficiencies could be avoided when "oldtimers" were instructed to reflect on the team's collective knowledge prior to task execution. These results suggest that familiarity among group members reduces

their ability to adopt a prescribed, formal intervention and that a targeted reflexivity intervention can overcome this problem.

While the interventions described above were not designed to enhance team reflexivity, recent research suggests that reflexivity can be enhanced by means of a simple, structured intervention (Konradt, Schippers, Garbers, & Steenfatt, 2014; see also Ellis, et al., 2014). In the study by Konradt and his colleagues, 98 student teams communicated either face-to-face or virtual via chat while completing a collective decision making task. The information distribution among team members constituted "a hidden profile." The reflexivity intervention instruction, handed to randomly-assigned teams after they finished the first part of the task, described three steps: (1) reflect about expert knowledge, (2) review performance and reflect on alternative task strategies using expert knowledge, and (3) plan a detailed implementation strategy for the new strategy during the next phase of the assignment. Results of this study showed that teams in the team reflexivity condition, showed higher levels of reflection than teams in the control group. Moreover, these teams were more likely to have shared mental models, greater team adaptation, and greater improvement in team performance. This research suggests that a small, structured intervention may enhance team reflexivity. We propose that a small, formal intervention will also be useful for ongoing groups in organizational settings.

Proposition 5. Small, structured interventions will enhance reflexivity in teams.

More generally, team training should go beyond natural milestones or interruptions in the work to make reflexivity an ongoing process in teams. This may occur through creating artificial milestones, or scheduling regular time-outs, or by creating a meta-norm of reflexivity to help members feel free to ask for a time-out or call attention to doubts they have with respect to the group's work, or if there are differences in (cross)-understanding (cf. Edmondson, 1999, 2003; Huber & Lewis, 2010; Zellmer-Bruhn, 2003). The role of the team leader in bringing this about is discussed in the work of Hackman and Wageman (2005) and Wageman (2001) on team

coaching. Team leader coaching is defined as "direct interaction with a team intended to help members make coordinated and task-appropriate use of their collective resources in accomplishing the team's work" (Hackman & Wageman, 2005, p. 269) . For instance, team leaders can actively intervene and lead the discussion as to enhance reflexivity (Hackman & Wageman, 2005). For example, the team leader who typically asks, "What can we learn from this?" following errors is directly encouraging reflexivity. Gersick and Hackman (1990) suggested that a team leader can help the team develop meta-routines, which prompt members to initiate re-evaluation of first-level routines regularly and in a timely fashion. A team leadership style high in reflexivity will therefore stimulate reflexivity among team members. Team leaders who themselves reflect are also likely to encourage each member to share and discuss their information, scan for new information, challenge framing, reveal and discuss heuristics, draw attention to potential biases, and generally encourage the team to discuss their decision making processes (Hackman & Wageman, 2005).

Since teams are inclined to quickly create comfort-enhancing routines, often at their first encounter or meeting (Gersick & Hackman, 1990), it is important to develop a norm encouraging reflexivity very early in a team's life. Teams whose leaders pay close attention to such "team design factors" may set in motion a self-reinforcing spiral of motivated team information processing and enhanced team performance (Wageman, 2001). Also, regular interventions aimed at enhancing team reflexivity will be needed as a team may be inclined to move to a comfort zone of relying on habitual routines . Regular interventions in the form of team training may prevent teams from choosing and sticking to routines and help teams stay reflexive instead.

Proposition 6. Creating artificial milestones, taking time-outs as well as creating a meta-norm of reflexivity, will enhance reflexivity in teams.

Effect of Organizational Practices. Heath, et al. (1998) describe interventions in the form of organizational practices that could repair individuals' cognitive shortcomings in an organization. They called these practices "*cognitive repairs.*" An example is a technique known as the "five whys", which involves simply asking "why" in succession, to go beyond superficial causes, before stopping generating hypotheses about avoiding a future failure. For ongoing team learning and team reflexivity, teams must develop an ongoing way of being reflexive during, not just after, task execution, to enable a process of "execution-as-learning" (Edmondson, 2008). Organizational protocols such as the medical protocols for trauma situations that allow doctors to quickly collect all relevant information, not just salient information (Heath, et al., 1998), can also trigger reflexivity. Flores, et al. (2012) found that organizational practices such as participative decision making, openness, and a learning orientation promote organizational learning. Although it seems intuitively clear that such organizational practices will reduce the chances of TIP failures, research on this is still rare.

Proposition 7. Organizational (and team) practices, such as cognitive repairs and protocols, will be related to more reflexivity and less TIP failures.

Boundary Conditions Limiting the Effect of Team Reflexivity

This paper has implied, thus far, that reflexivity is always helpful as an "antidote" to TIP failures. However, we should also consider possible boundaries and contingencies. Recent research highlighted some of these (e.g., Moreland & McMinn, 2010; Schippers et al, 2013; Schippers et al in press). Reflection uses up time and energy of team members and should ideally only be employed if the benefits outweigh the costs (Schippers, et al., 2013). However, there is evidence that the benefits of reflexivity can be gained rapidly. For instance, experimental research by Hackman, Brousseau, and Weiss (1976) showed groups that were instructed to spend five minutes of a 35-minute performance period explicitly reflecting on goals and strategy outperformed teams in that were instructed to start right

away or received no special instructions.

Early conceptualizations of team reflexivity included the idea that there are different levels, ranging from deep to surface reflexivity (Schippers, et al., 2007; West, 2000). Surface reflexivity might manifest in seeking clarification about the purpose of a team meeting whereas deep reflexivity might involve challenging assumptions about shared underlying objectives in a joint venture team. Surface reflexivity might be unhelpful in complex information processing situations or threatening environments when (as we suggest above), it is used as a strategy for seeking comfort. Deep reflexivity might be unhelpful and potentially paralyzing for teams undertaking relatively simple and well-learned information processing tasks (think of the protracted and unproductive examination of customer relationships in a situation where customers are seeking routine information quickly that then deflect the team from its work of delivering these services to customers). There would be considerable value in understanding how to conceptualize depth of reflexivity and determining the situations in which surface to deep level reflexivity enabled more effective team information processing.

Possible boundary conditions include a lack of motivated information processing, the strategic orientation of a team, a ceiling effect for the usefulness of team reflexivity, and the (limited) ability of teams to detect TIP failures. Indeed, as Wittenbaum and her colleagues (2004) noted, *motivated information sharing* in real work teams is a factor usually overlooked in information-sharing research—typically conducted in laboratory settings (see also De Dreu, et al., 2008). De Dreu (2007) suggested that team information sharing, learning and effectiveness was greater under condition of perceived cooperative outcome interdependence, but especially when task reflexivity was high. The mixed-motive structure of many group tasks is extensively discussed in a review of De Dreu and his colleagues (2008), which presents a motivated information processing in groups (MIP-G) model. We

concur that social motivation (i.e. prosocial versus proself) is related to the type of information processed, and can this be related to biased information processing. In general, there is a need to integrate social psychological perspectives on reflexivity and information processing in teams. Recent work on intelligence teams suggest that the strategic orientation of a team influences team information gathering and processing. Work reviewed by Hackman in his book Collaborative intelligence: Using teams to solve hard problems (Hackman, 2011) indicated that team information processing is also influenced by the team strategic orientation: offensive versus defensive (i.e. promotion versus prevention focus). Teams with a defensive orientation tend to focus more on details and external information gathering, while teams with an offensive orientation tend to focus more on information held by team members and higher-level outcomes (Woolley, 2011; Woolley, Bear, Chang, & DeCostanza, 2013). Furthermore, shifting between strategic orientations seemed to have an asymmetric adaptation effect: Teams shifting from offense to defense were better able to alter their information search behavior than teams shifting from defense to offense (Woolley, et al., 2013). This suggests that the team strategic orientation strongly determines how the team searches for information and thus influences team information processing.

At the same time, there is a question of how effective extensive reflection is for teams that already perform well. The possibility of a "ceiling effect" for team reflexivity is explored in research by Schippers and colleagues (2013) suggesting that groups high on reflexivity with relatively poor prior performance improve more than reflexive high performing groups. This may be due to simply having more room for improvement. These findings may also apply to TIP failures, in that relatively low performing groups may profit more from team reflexivity, because their learning may translate more readily into higher team performance.

Our final question is how effective are teams in recognizing the quality of their decision making processes? Research by Nemeth and Ormiston (2007) indicated that teams with stable membership (as opposed to changing memberships) showed increased comfort and perception of creativity in idea generation, but not actual creative behavior. This suggests that team members do not always perceive their quality of idea generation accurately, and may conclude that they are doing well. Another boundary condition may then be the extent to which teams change membership, or are diverse, preventing them from reaching this "comfort zone". Research by Schippers et al. (2003) indicated indeed that diverse teams profited more from reflexivity, at least in the beginning of their life-cycle, while homogeneous teams high on team tenure seemed to profit more from team reflexivity. . Homogeneity and tenure stability may lead to teams to reflect only at a surface level (West, 2000) and seek comfort through reflexivity rather than solve problems.

Implicit in our arguments is the assumption that teams will be reasonably accurate in recognizing effective and ineffective information processing processes. However, as was suggested by an anonymous reviewer, it is possible that reflexivity could in some cases result in more biased information processing. Indeed, key to our argumentation is that teams should also be aware of existing biases and errors and learn to recognize them. Awareness of possible TIP failures (i.e. biases and errors) precedes effective reflection and adaptation (cf. Schippers & Hogenes, 2011). Even if teams have knowledge about common biases and errors, this would of course not mean that they will always be or become aware of team information processing failures, and even if they are, that the resulting decision is of high quality. However, throughout this review our main message has been that team reflexivity increases the chances of detecting these TIP failures and also increases the chance of a higher quality decision making process and outcome.

Discussion

We propose that reflexivity enhances team process and performance through conscious reflection, resulting in more thorough and systematic information processing, which in turn leads to reduced team errors and failures and an enhanced ability to adapt to change. Drawing on theories of information processing and decision making, we presented a model that presents team reflexivity as an aid in reducing three kinds of team failures and thereby enhancing the quality of team decision-making and team performance. Our framework outlines three information-processing failures: (1) failure to share and integrate relevant information, (2) failure to elaborate and derive implications from information, and (3) failure to revise and update conclusions (see Figure 1). We argued that team reflexivity will reduce the chances of these failures occurring.

Implications for Research

Our review suggests many avenues for future research. For instance, research has not yet established whether teams that have high rather than low levels of reflexivity are indeed less susceptible to information processing failures, and better able to perform than teams with low levels of reflexivity. One way to study this is by videotaping team processes to open the 'black box' of process (Weingart, 1997). Lehmann-Willenbrock, Allen, and Kauffeld (2013), for example, videotaped team meetings and showed that verbal behaviors used to structure group discussions enhanced meeting effectiveness by promoting proactive communication and inhibiting dysfunctional behaviors such as complaining. Enhanced meeting effectiveness in turn predicted organizational effectiveness (Kauffeld & Lehmann-Willenbrock, 2012). We argue that the content of the information, as well as the process of information handling, should be taken into account in future studies of team processes.

Prior research has not established the best ways to stimulate reflexivity, nor what interventions are most effective. More research is needed before we can specify conditions and

methods for optimal reflexivity interventions; this research should include longitudinal intervention studies in field settings. Research is also needed to determine the stages of a team's life cycle best suited for a reflexivity intervention (Zellmer-Bruhn, et al., 2004). For instance, if teams receive training before their work begins, this may help build team norms of reflection. Furthermore, project team midpoints have been shown to be a natural time for reflection (Gersick, 1989; Okhuysen & Waller, 2002), and research may test the effects of formal intervention to promote reflexivity at this time.

Finally, research is needed to assess the optimal level of reflexivity for groups in different settings – including how much reflexivity is too much (distracting and slowing a team down, rather than improving performance). Given the importance of information processing in knowledge-work teams, we hope that understanding information-processing failures and ways to overcome them, as outlined here, will help guide future research endeavors.

Implications for Practice

Practitioners who wish to structure and lead groups in ways that foster team reflexivity may wish to train both team leaders and team members to engage in focused, evaluative discussion of goals, processes, and outcomes. Both should regularly assess whether or not they need new information to ensure decision-making effectiveness. They should also reflect on the suitability of current procedures – especially to ensure that sufficient attention is paid to uniquely-held information. Reflection about common team information-processing failures and their manifestations is also important. Team members should be encouraged to reflect on their objectives – their appropriateness, clarity, specificity and their commitment to them (DeShon, Kozlowski, Schmidt, Milner, & Wiechmann, 2004; Widmeyer & Ducharme, 1997). They should also regularly review decision processes and changes in their environment that have implications for the team's work (West, 2000).

Reflexivity, we propose, is the most important intervention a team can routinely employ to improve its performance. Of course, reflexivity is not an end in itself; it must translate into action or change. West (1996, 2000) emphasized that team innovation and effectiveness improve when reflexivity leads to planning and action by team members. Planning is a crucial step between reflection and adaptation (Gollwitzer, 1996); the more effective the planning, the more subsequent adaptation can lead to improved team performance or innovation. Adaptation means changing the team's objectives, strategies, team processes or environment. Because teams are inclined to quickly create comfort-enhancing routines, often at a first encounter (Gersick & Hackman, 1990), it is important to develop a meta-norm encouraging reflexivity early in a team's life. For virtual teams, meeting face-to-face prior to working at a distance can be very helpful (Hertel, Geister, & Konradt, 2005). Also, regular interventions to enhance team reflexivity can prevent teams from relying excessively on habitual routines. Regular interventions (e.g., training) may prevent teams from sticking to routines and help them stay reflexive.

Recent research highlights the role of the team leader in setting the stage for a shared team vision (i.e. social sharedness), enhanced reflexivity and ultimately enhanced team performance (Schippers, et al., 2008). Gersick & Hackman (1990) suggested that a team leader might also help the team to develop meta-routines, which prompt members to initiate re-evaluation of first-level routines regularly.

Finally, laboratory research giving student teams facing complex problem-solving tasks suggests that reflexivity in the form of "stop and think") can be enhanced by formal instructions (Okhuysen, 2001). Field research (Schippers, 2003), suggested that reflexivity could be enhanced through a relatively modest intervention. Teams that received a four-hour training session showed improved reflexivity six months later. It is likely that more extensive training combined with regular follow-up might be even more effective.

Conclusion

We have emphasized that team reflexivity can help counteract team information processing failures and thereby aid the decision-making process in teams operating in a demanding, knowledge-intensive environment. We also proposed a model of information-processing failures and remedies that foster team reflexivity. Our aim is to aid researchers and practitioners who wish to further explore and apply team reflexivity. Teamwork is important in many areas of human endeavour, and mistakes can be costly or even fatal. Reflexivity can be a powerful way of overcoming the problems inherent in team-based knowledge work. The human capacity to reflect is a valuable and often under-utilized resource (Ellis, et al., 2014). Using this capacity to overcome group information processing failures can enable team productivity, innovation and effectiveness. We hope this paper serves as a call to study the conscious use of reflexivity in settings in which people are working to achieving shared goals. The arguments and propositions presented here are intended to spur new research and new understanding of the mechanisms that underlie team reflexivity and its role in mitigating team information processing failures.

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Footnotes

[1] Besides of this tendency to amplifiy, (Hinsz, et al., 1997), also note a *group accentuation pattern*, that is, if a bias or error in information processing is unlikely among individuals (e.g., in less than half of the sample), groups are even less likely to process information in such a way. The tendency to amplify only holds for *common* biases and errors.

[2] To summarize the story that Senge (1990) popularized, a frog placed in a pan filled with boiling water jumps out immediately, a natural life-saving reflex. If, in contrast, the frog sits in a pan filled with cool water that is heated gradually, apparently the frog will cook, never recognizing the need for escape.

[3] The term entrainment, borrowed from the biological sciences, refers to the phenomenon in which one cyclic process becomes captured by, and set to oscillate in rhythm with, another, initially independent, process (McGrath & Kelly, 1986). Examples are physiological processes such as body temperature and activity cycles, which become coupled to each other and the 24-hour clock.

[4] The authors thank an anonymous reviewer of Small Group Research for suggesting this line of reasoning.

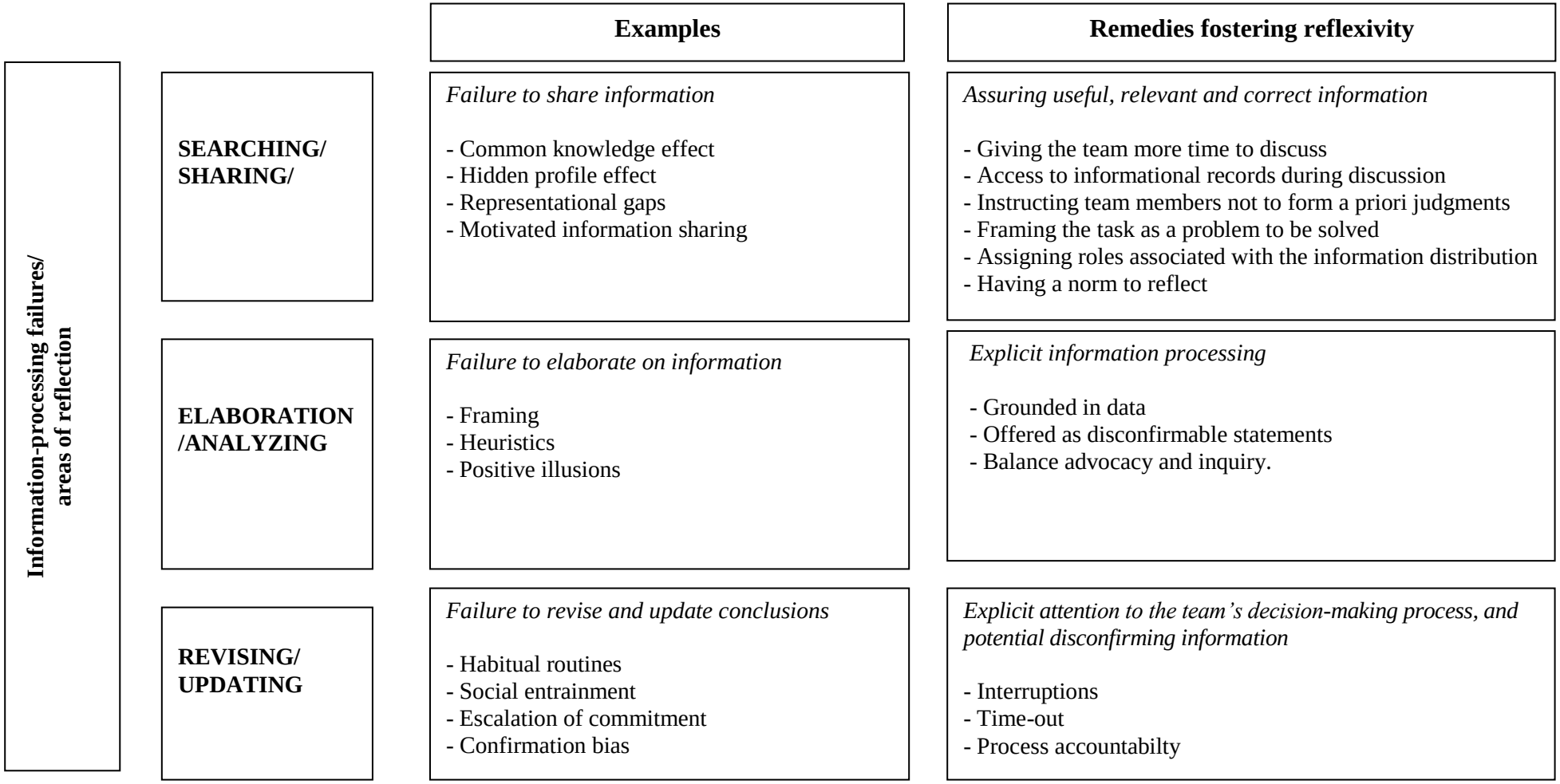

Figure 1. A taxonomy of information-processing failures and remedies fostering team reflexivity