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A Behavioral Model of Team Sensemaking

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Abstract

In the social domain of interoperability, *sensemaking* is a term used to describe how individuals and organizations process complex information in highly dynamic and uncertain situations. This paper builds on established theories and offers a new model of team sensemaking. The approach is to translate general principles (e.g., diligence, facileness, etc.) into observable behaviors—including eight behaviors that enable sensemaking as well as eight behaviors that inhibit sensemaking. The model has been applied to a team exercise that poses prototypical challenges of intelligence analysis, to illustrate that the behaviors can be measured and to identify how the behaviors vary with time. The results of this testing serve to highlight future research on models and measures needed to improve sensemaking.

Sensemaking Theories

Interoperability includes the willingness and ability of individuals and organizations to work together effectively. One measure of effectiveness is *reliability*, defined as the "capacity to produce collective outcomes of a certain minimum quality repeatedly" (Hannan and Freeman 1984).

The underlying notions of *quality* and *repeatability* are more difficult to define, as they depend on the objectives of an organization. For example, successes of operational missions aboard an aircraft carrier are clearly different from successes of analytical reports produced by an intelligence agency. Nevertheless, management theorists have proposed principles that they believe are common to the success of all *high reliability organizations* (HROs), which are typically taken to include nuclear power plants, naval aircraft carriers, air traffic control systems, and hospital emergency centers (Ericksen and Dyer 2004).

The basic principles of HROs (Ericksen and Dyer 2004) include: Diligence – the capacity to anticipate or detect surprises early and without compromising routine operations. Facileness – the capacity to quickly and easily switch from stable and routine activity to flexible and novel action and then back again. Fluidity – the capacity to operate effectively in chaotic situations where traditional order has collapsed. Generativeness – the capacity to function as a learning organization, gaining knowledge from successes and failures as well as the experiences of others.

Other theorists have suggested that similar principles are components of an activity called *sensemaking* (Klein et al. 2007), which is accomplished via *mindfulness*—defined as "the result of a never-ending effort to challenge expectations and to consider alternate possibilities" (Weick and Sutcliffe 2001). Sensemaking is said to exhibit the following properties (Weick 1995): grounded in identity construction; retrospective; enactive of sensible environments; social; ongoing; focused on and by extracted cues; driven by plausibility rather than accuracy.

One limitation of these theories is that they are purely descriptive. That is, they do not specify measurable behaviors that might predict the success of sensemaking—or prevent the failure of sensemaking. In fact most theories of sensemaking are not actually theories in the scientific sense of being testable, and this limits the extent to

which they are practically applicable. Ironically, HROs themselves are often focused on measuring performance as the key to improving performance, hence we find a gap between theoretical notions of sensemaking and the practical problems that these theories are intended to address.

The remainder of this paper proposes a behavioral model of team sensemaking in the spirit of HROs. To do so we build on theoretical principles but go further in specifying measurable behaviors. We also present the results of a team exercise in which these behaviors were observed and tallied, to demonstrate that the behaviors can in fact be measured, at least by instance (it happened) and number (how often) over time. These measurements provide some insight into which behaviors may be most important to sensemaking, and how their importance may change with time in scenarios. Finally, we discuss the limitations of our model, and the advancements that will be needed to understand and improve sensemaking in HROs.

Behavioral Model

Our model proposes *enabling* (E) behaviors that improve sensemaking as well as *inhibiting* (I) behaviors that degrade sensemaking, as follows:

- Enable Sensemaking (E)

  - E1: Challenges assumptions or takes opposite view
  - E2: Suggests alternatives
  - E3: Displays self-questioning or doubt
  - E4: Displays reliance on other team members
  - E5: Reveals thought process aloud
  - E6: Pays attention to others' views
  - E7: Openly shares info and opinions
  - E8: Tells stories of past events or future possibilities

- Inhibit Sensemaking (I)

  ◦ I1: Shows preference for formal process
  ◦ I2: Pushes for formal discussion
  ◦ I3: Rejects complex explanations
  ◦ I4: Affinity for like-minded thinkers
  ◦ I5: Attacks others' contributions
  ◦ I6: Pushes for conclusions
  ◦ I7: Shows frustration overtly
  ◦ I8: Shows occasional disinterest

This list was developed from sources noted above, especially Ericksen and Dyer (2004) and Weick and Sutcliffe (2001), by identifying specific behaviors that we believe are representative of the general principles. Often a single behavior is suggested by several principles, and a given principle may suggest several behaviors. Thus there is not a one-to-one mapping from principles to behaviors.

Indeed we make no claim that our list of behaviors is all-inclusive or optimal. Instead, we propose that these behaviors are representative of the principles, and we suggest that specific behaviors are more useful than general principles in modeling and measuring sensemaking.

One assumption of our model is that each behavior can be characterized as either enabling or inhibiting. Previously, authors have focused on identifying behaviors that enable the success of sensemaking (see Eriksen and Dyer 2004; Fishbein and Treverton 2004). Our thesis is that the existence or nonexistence of enabling behavior is not sufficient to model sensemaking, as the occurrence of inhibiting behavior may be more detrimental than the mere absence of enabling behavior. We also suspect that sometimes the same behavior may be enabling or inhibiting, depending on circumstances such

as the stage of sensemaking. For example, "pushes for conclusions" may inhibit sensemaking early in the process but enable sensemaking later in the process.

Therefore we classify each behavior a priori as primarily enabling or inhibiting, but acknowledge that empirical testing is needed to validate the impacts of these behaviors on sensemaking performance.

Empirical Testing

Each of the behaviors in our model can be considered an independent variable (IV) with influence on the dependent variable (DV), i.e., sensemaking. However, there are clearly dependencies between the IVs themselves, and it remains a challenge for future research to better understand these dependencies—as well as to understand how the IVs combine to affect the DV of sensemaking.

As a first step toward this end, the sensemaking model was applied to a team exercise that poses prototypical challenges of intelligence analysis. The exercise involved both red and blue teams, with eight analysts on each team. Team members had not previously collaborated with one another, and participants had from 5 to 20 years of experience, representing FBI, CIA, and local law enforcement agencies.

Details of the exercise are classified, but overall results for the blue team are reported here to illustrate that the proposed behaviors can be observed and counted. The results also provide some preliminary insight into how the behaviors vary with time. Two different observers tallied all behaviors on score sheets while watching video recordings of the exercise. Inter-observer consistency was approximately 80%, which suggests that the behaviors are relatively well-defined and relatively reliably observed.

Table 1. Number of instances of each behavior, by day

Behavior	Day 1	Day 2	Day 3	Day 4
E1	15	11	3	2
E2	9	7	9	4
E3	3	3	0	0
E4	12	11	6	1
E5	7	7	5	4
E6	10	6	6	3
E7	19	10	11	8
E8	13	10	4	6
I1	0	0	0	0
I2	0	0	0	0
I3	0	0	0	0
I4	0	0	3	0
I5	0	0	0	0
I6	0	0	0	0
I7	1	0	0	0
I8	8	7	2	0
Total Enabling	88	65	44	28
Total Inhibiting	9	7	5	0
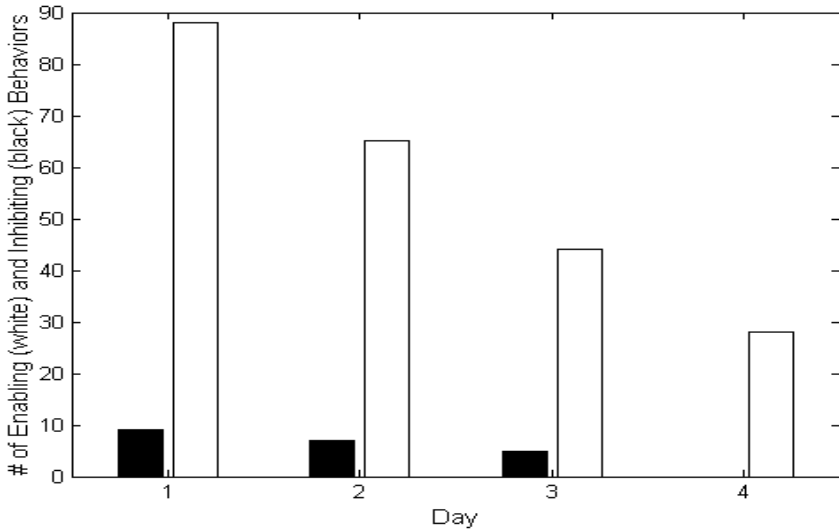
Figure 1. Total number of enabling (white) and inhibiting (black) behaviors by day

Table 1 provides the number of times (counted by one observer) that each behavior was observed on each day in the exercise. Figure 1 graphs the number of enabling (white) and inhibiting (black) behaviors. Figure 1 shows that enabling behaviors far outnumbered inhibiting behaviors on each day. Table 1 shows that all types of enabling behaviors were observed, whereas most types of inhibiting behaviors were not observed. These results suggest that all eight of the enabling behaviors are important, and also that this blue team was effective in sensemaking.

However, as discussed below under *Sensemaking Metrics*, it is important to acknowledge that we have only measured behaviors that contribute to sensemaking—not the effectiveness of sensemaking itself. For example, referring to Table 1, the enabling behavior observed least frequently was E3: "Displays self-questioning or doubt." According to the theories, this would be one of the most critical behaviors needed for effective sensemaking, so the high number of

other enabling behaviors may in fact be a misleading indication of the blue team's sensemaking performance. Conversely, the inhibiting behavior observed most often was I8: "Shows occasional disinterest." This behavior may have much less impact on sensemaking than negatively aggressive behaviors like "rejecting" or "attacking" other teammates' contributions.

The results in Figure 1 also show that enabling and inhibiting behaviors both decreased with time. This suggests that the sensemaking challenge itself decreased with time as the team converged on an interpretation of their situation and consensus course of action. The steady decrease with time is most likely an artifact of the exercise, where a sensemaking challenge was presented at the start. If instead the challenge were injected into a routine operation then sensemaking behaviors would be expected to increase and then decrease with time.

Sensemaking Metrics

As noted above, our model specifies observable behaviors that presumably enable or inhibit sensemaking—but does not measure the overall effectiveness of sensemaking itself. As such, we have proposed a set of independent variables without a formal specification of how they combine to affect the dependent variable—i.e., sensemaking.

We believe that our behavioral model is useful, and that practical insights can be gained merely by using the model to count the number and timing of instances for each behavior. However, we acknowledge that the ultimate utility of our behavioral model is seriously limited without formal measures of the dependent variable—i.e., sensemaking.

Thus we suggest that the central problem for future research is go beyond our behavioral model to better define exactly what cognitive and social processes and achievements would constitute

"sensemaking," in specific domains like intelligence analysis and military operations. Only then can formal measures of sensemaking be developed, and only with these formal measures of the dependent variable (sensemaking) can measures of independent variables (behaviors) be used to explain, predict, and improve sensemaking.

For example, if we had a formal measure of sensemaking success in our exercise, then we could determine which behaviors were *most* enabling or inhibiting, and *how* the behaviors evolved and combined to affect sensemaking. As noted earlier, formal models and measures of performance are the hallmarks of HROs—indeed they are the very mechanisms by which HROs typically achieve high reliability performance. Therefore our suggestion is that the same practice, typical of HROs, be applied to understanding and improving sensemaking itself.

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