

Proactive Systemic Contributors and Adaptations Diagramming (SCAD-P): A Lightweight Tool Delivering Heavyweight Systems-level Insights

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We would like to share our most recent work in refining a lightweight tool that enables ongoing organizational learning about work as done, despite the constraint of the law of fluency (Woods & Hollnagel, 2006). *Proactive Systemic Contributors and Adaptations Diagramming (SCAD-P)* continues our lab's work on SCAD. SCAD, and by extension SCAD-P, was developed to mitigate the shortcomings of Root Cause Analysis (RCA) and other linear, causal methods that fail to illuminate the "messy details" of how work is done in complex adaptive systems (Nemeth et al, 2004; Woods et al, 2010; Dekker, 2014). SCAD-P also embraces the central tenet of Safety-II, that organizations need to focus less on accidents and more on learning from daily successes and enhancing the adaptive capacity needed to respond to future surprises (Hollnagel, 2014).

SCAD-P addresses a number of issues with trying to collect information on how people adapt to make systems work everyday. It is designed to be administered by a wide range of people, including front-line operators themselves. The training time to be comfortable administering the tool is minimal, often taking less than an hour. This eliminates the need for highly trained and specialized personnel to administer the tool. It is centered around how operators adapt in different ways in everyday work, and is formatted as a structured story elicitation tool. It asks the practitioner to describe 1) the situation that triggered a response, 2) the response and how it compares to "textbook", 3) the goal conflicts or tradeoffs that had to be negotiated, 4) the expectations and pressures that required the tradeoffs to be made, and 5) any gaps that remain in the diagram. A single story can be elicited in less than 10 minutes, making it easy to fit into a busy operator's schedule. It is lightweight enough to be embedded into work practice, not started and stopped as a formal study. The interviews are structured with probes asking the operator to think about their adapted behavior from multiple perspectives, including how it was a result of system conflicts and multiple goals of the organization. This priming addresses the common issue of interviews that sharp end practitioners are fluent in their work, obscuring the constraints and pressures they are adapting to (Woods & Hollnagel, 2006). Shifting perspectives across practitioners, from the sharp end to the blunt end, and from now (proximal) to the past (distal) can illuminate the limits of and threats to fluency (Ibid).

In this presentation, we will provide participants with SCAD-P materials and method for analyzing how normal, recent, sharp end work reflects goal conflicts and tradeoffs influenced by blunt end pressures and expectations. We will discuss how this model can

be used to create a shared understanding of the system behavior, discover patterns in normal work, and highlight opportunities to enhance adaptive capacity before an accident.

We will share how this method is currently being used by actual organizations in two different sectors, highlighting the benefits and obstacles in its use as we refine the method. This could be delivered as a talk, or as part of a session on ways organizations can track the gap between WAI and WAD. We are capable of and would like to deliver the method in a 3 hour workshop more hands-on format, in which participants would then receive hands-on experience developing proactive SCADs and the materials needed to return to their organization with a new proactive tool for understanding adaptations so they can predict the future adaptive capacities of their organization.

Workshop timeline (4 hours total)

- 30 minutes - introducing SCAD-P and its roots in SCAD
- 30 minutes - sharing insights from current benefits and obstacles using SCAD-P
- 90 minutes - training and mentored hands-on practice using SCAD-P tools
- 30 minutes - sharing and debrief

References

Dekker, S. (2014). *The Field Guide to Understanding 'Human Error'*. London: CRC Press, <https://doi.org/10.1201/9781317031833>

Hollnagel, E. (2014). *Safety-I and Safety-II*. London: CRC Press, <https://doi.org/10.1201/9781315607511>

Nemeth, C.P., Cook, R. I. and Woods, D. D. (2004). The Messy Details: Insights From the Study of Technical Work in Healthcare in *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans*, 34(6), 689-692. doi: 10.1109/TSMCA.2004.836802

Woods, D., Dekker, S., Cook, R., Johannesen, L., Sarter, N. (2010). *Behind Human Error*. London: CRC Press, <https://doi.org/10.1201/9781315568935>

Woods, D., Hollnagel, E. (2006). *Joint Cognitive Systems*. Boca Raton: CRC Press. <https://doi.org/10.1201/9781420038194>