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Abstract Title: From Human Observation to Automated Assessment: A BPMN-Based Approach to Analyst Performance Assessment

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Assessing analyst proficiency in complex information operation (IO) environments is challenging, particularly when assessment relies on human observations, such as behaviorally anchored rating scales (BARS). While human observers provide rich, contextual insight into analyst behavior, these approaches are resource-intensive, cognitively demanding, difficult to scale, and constrained by the availability of trained observers. Conversely, automated computer-collected data (e.g., mouse movements, application use, screen captures) offers scalable and granular assessments but lacks the contextual expertise to interpret performance. This research introduces a novel application of Business Process Model and Notation (BPMN), a standardized tool for visualizing workflows and streamlining operations, to provide structured workflow context that links human-rated observations and automated computer-collected data. This unifying approach supports scalable, data-driven performance assessment while preserving human expertise for validation, refinement, and interpretation.

As part of a research effort focused on assessing analyst performance in dynamic information environments, we modeled IO analyst workflows using BPMN diagrams to structure and document human-observable tasks into workflows that align detailed computer interaction data (e.g., menu selections, button clicks, and mouse movements) with human-rated behaviors (e.g., team communication). Together these data sources support a more comprehensive and scalable approach to analyst performance assessment that reduces reliance on human observations while improving visibility into analyst behaviors that are difficult for human observers to consistently capture in real time.

To accomplish this, we extended the traditional use of BPMNs, beyond workflow documentation, to guide our data capture of observable behaviors, decision points, and tool interactions across three proficiency levels: novice, competent, and expert. These BPMNs are designed to document IO analyst task processes, associated technologies, decisions, and interaction patterns across proficiency levels within the same task while translating them into machine-usable workflows aligned with automated data capture. By translating expert judgment into these workflows, this approach links human observable behaviors with computer interaction patterns. In this way, BPMNs provide structured context that supports the interpretation of passive interaction data in relation to analyst performance. This supports a transition from a manual, observer-dependent

assessment towards a scalable, data-driven capability that preserves human expertise for contextual interpretation, narrative construction, and evaluation of decision-making.

Bridging the gap between the traditionally disconnected sources of data, actively collected human observational assessments and passively collected computer-interactions, enables near-real time assessment and feedback of analyst performance. The use of BPMNs to support the integration of these data collection methods enables automated or semi-automated systems to assess proficiency and supports creation of a standardized integrated assessment process capable of producing scalable, consistent, and fine-grained assessments. Rather than replacing human expertise, the modified BPMN framework uses expert-defined workflows to provide context for interpreting passive computer interaction data at scale; expertise defines the meaning and structure of analyst workflows while automated systems detect and assess workflow execution. The result is an approach to automated or semi-automated assessment that leverages human-machine teaming to reduce observer burden while enabling near-real-time, fine-grained assessment and feedback at a scale unattainable by humans or computers alone.

Track for Submission:

Mission Readiness