A Grounded Theory Approach to Individual and Team Performance Using Quantitative Analysis of Qualitative Metrics.

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Abstract:

Individual and team behavioral health affect performance in any domain that requires collaboration, from international business teams to high criticality emergency response units. For NASA's future exploration beyond lower Earth orbit, astronaut behavioral health are of utmost importance for mission success. An expected 20 minute communication latency between astronauts on Mars and mission control on Earth, coupled with the constant psychological stressors of isolation, sensory monotony, and confined environments can negatively impact the crew's ability to live and work together for long durations. There exist a number of theoretical frameworks for maintaining and enhancing individual and team psychological health and performance. However, proving them with empirical evidence is extremely difficult due to the qualitative nature of the measures. Easy access to psychosocial state data is the essential roadblock to performing the psychology research needed to understand the underlying factors that affect performance. Qualitative psycho-social dimensions such as social distance, power dynamics, affect, an individual's sense of meaningfulness, and a team's perceived efficiency in working together are typically highly subjective, not readily computationally tractable, and are collected using self-reports such as think-aloud protocols or surveys. These methods are prone to subject bias, memory, and can confound the behaviors being studied. Under funding by NASA, the authors developed a method to collect and automatically analyze data requiring zero or low participant effort. The results dramatically reduced the burdens of hand-coding raw data and enable researchers to make empirically based discoveries more rapidly. We describe a tool for automatic analysis of transcripts and narrative text to derive psycho-social states. Through a series of human subject experiments at flight analog facilities at the Johnson Space Center and other sites, we empirically derived emotional state data that correlated with standardized surveys. We also apply the grounded theory approach to the data collected to derive theoretical concepts related to high individual and team performance such as "anomalous team activities" and "meaningful work".