



Predictors of Human Errors in Procedural Work

An Executive Summary

Key insights

There are a large number of well-conducted empirical studies available on predictors of human error in procedural work: a search via PsycINFO, Business Source Elite, and Consensus identified more than 100 papers drawn from an initial pool of more than 2,000 studies. Most of these studies were conducted in safety-critical domains, such as healthcare, aviation, nuclear power, and manufacturing. Findings consistently demonstrate that the following factors are the most robust predictors.

1. Interruptions and distractions

Task interruptions and distractions are one of the most consistently identified predictors of human error — and their real-world consequences can be severe. Several airline crashes have been attributed in part to interruptions during pre-flight checklist procedures, and research suggests that even fairly minor distractions can increase major medical mistakes eightfold.

The reason lies in how interruptions affect memory. When someone is pulled away mid-task, they are more likely to lose track of where they were in a procedure. On resuming the task, they become prone to skipping a step, repeating one, or executing the sequence out of order. This phenomenon occurs not because their concentration was impaired, but because the interruption disrupted their memory for what they had already completed.

A related phenomenon concerns what happens immediately after an error occurs: attention tends to orient toward the error itself — assessing it, processing what went wrong. This reallocation of attention is itself costly: attention directed toward the error is attention withdrawn from other ongoing tasks, which increases the likelihood of a second error occurring.

2. Task complexity

A second robust predictor is task complexity. In simulation studies, error counts rise in direct proportion to task complexity — a pattern holding for both expert and non-expert operators. In

manufacturing, medical and administrative transaction processing, more complexity and procedural rules are associated with more errors and incidents. Although the neurological mechanism differs from interruptions — this isn't about disrupted memory, but complexity itself overwhelming cognitive capacity — the practical implication is similar: simpler procedures produce fewer errors.

3. Workload, stress and time pressure

Workload, stress, and time pressure are among the most consistently cited factors across domains. Several systematic reviews found that in 95% of studies, mental-condition factors — including task overload, mental fatigue, stress, and pressure to complete tasks — were reported to negatively affect performance. In particular, perceived workload is repeatedly found to have a large, negative impact on the occurrence of human errors.

4. Safety Climate

'Safety climate' refers to the shared perceptions of organizational members regarding workplace safety and whether it is prioritized. High-risk industries such as aviation, nuclear energy, the offshore oil industry, and hospitals pay considerable attention to assessing safety concerns. Driven by the awareness that organizational, managerial, and human factors rather than technical failures are prime causes of accidents, these industries frequently evaluate the organization's safety climate.

The evidence here is considerably stronger than for the other predictors discussed so far: meta-analyses and controlled, longitudinal studies consistently show that safety climate, particularly measured at the group level, strongly predicts human errors, accidents, injuries, and safety compliance. In addition, it was found that management commitment, supervisory support, job demands, job autonomy, reporting/speaking up and psychological safety are the essential antecedents of a strong safety climate and offer a robust prediction of safety outcomes across industries and countries. There are many scales available that measure safety climate at the individual and/or group level, most of them have good psychometric properties.

5. References

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