Automation & Decarbonization Increases Cognitive Load

Increased Complexity - if not managed properly, impacts Risk & Efficiency

TASK COMPLEXITY ↑


| COGNITIVE | AFFECTIVE | PSYCHOMOTOR |

- Autonomous, Electrified & Decarbonized mines will be dependent on a range of new roles, skills, and procedures.

- With the poor levels of skills retention in the mining industry, and the risks of working with autonomous vehicles, electrical / LH2 power systems present to mining operations – this is of particular concern.

- McKinsey's **Organizational Health Index** (OHI) measures an organization's ability to align to strategic goals:[1]

    - Low OHI is indicative of **low safety & efficiency.**[2]

    - Mining has invested heavily in technology but not people,[2] **increasing task complexity**.

- Effective risk management of high task complexity requires addressing Knowledge (**Cognitive**), Values (**Affective**), and Skills (**Psychomotor**) domains.

[1] Organizational Health Index McKinsey. (N.D)
[2] The missing link in mining-company productivity: People. McKinsey (2018)

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# Amplification of Skills Decay and Performance Variability in Autonomous and Decarbonized Mines

Skills Decay & Insufficient Training

- In autonomous & decarbonized operations, skills decay[1] & insufficient training impacts retention of procedural knowledge, impacting safety and productivity response.

- Assessment of supervisory skills reveals poor ability of supervisors to be able to identify risk in the workforce.

- These findings have direct implications on the required frequency of AHS training and emphasises the need for a disciplined approach to training.
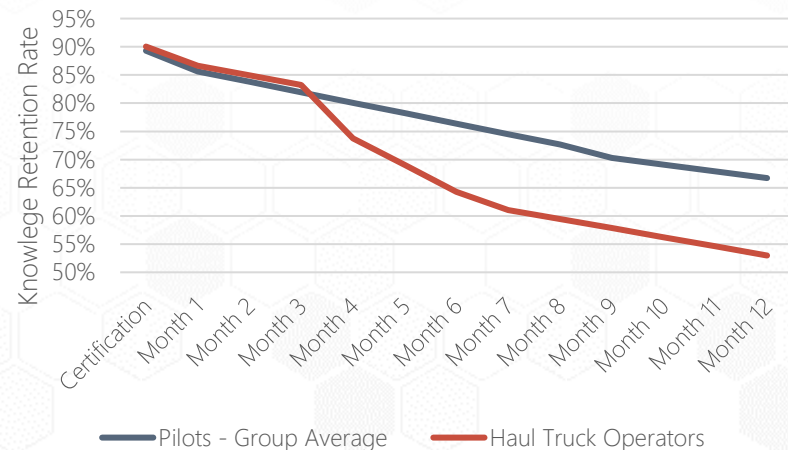
Performance Variability

- Unfortunately, human performance is highly variable.

- This is a result of inefficient behavior, and avoidable.[2]

- If left unmanaged, variability will cause significant losses to mines.

- Either expensive contingency must be factored at significant cost, or new strategies must be employed for variability reduction.
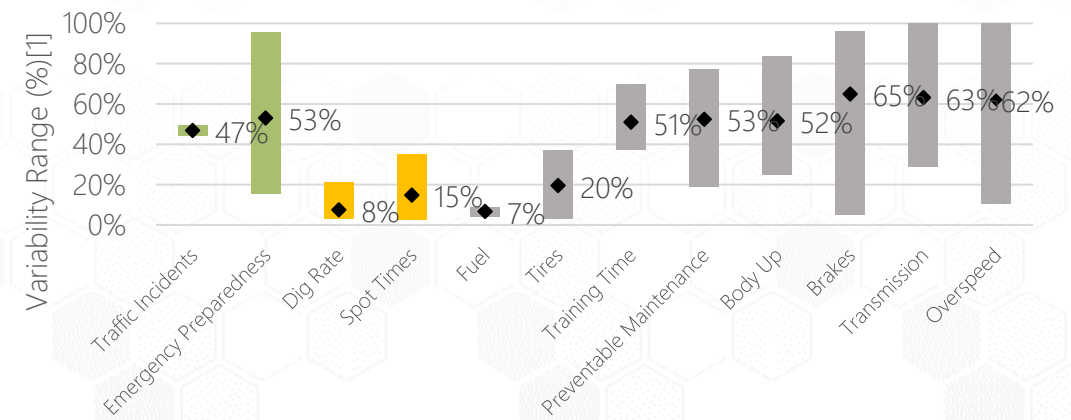
[1] Skills Decay In Surface Mining Haul Truck Operators. Immersive Technologies (2022).
[2] Operator Fuel Efficiency Project Summaries. Immersive Technologies (2023).

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