CPS Unintended Consequences Project

Multidisciplinary Meeting

22 June 2023

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SOUTH AFRICA

Project Objectives

To ensure Member Firms are suitably equipped to drive the implementation of **Collision Prevention Systems (CPS)** across their TMM fleet, the MCSA has embarked on a **human factors engineering study** to identify the **unintended consequences** (positive and negative), on the **physical and mental state** of **Mine Personnel** including TMM Operators, during the implementation, onboarding and use of CPS within the Member Firms operations.

The above will be achieved through a combination of:

- Desk research across the topic of automation adoption
- interviews. focus groups and questionnaires with stakeholders to understand the implications within the context of the South African mining sector

The overall aim of this project is to prepare adequate **change management plans** to **mitigate** against any detrimental effects as well as **leverage** any positive effects that may be introduced by CPS. The study may also necessitate the need to generate **training material** that contains some of the key lessons learnt to create awareness and enable effective system adoption and usage.

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Stakeholder Participation to Date

Organisation Type	Type of engagements	% response
Mining House	Interviews	57%
Mining House	Online Questionnaire	0%
OTM	Interviews	38%
OEM	Interviews	0%
OTM	Online Questionnaire	10%
OEMs	Online Questionnaire	0%
Other (e.g., Academic institutions, consultants, etc.)	Online Questionnaire	86%

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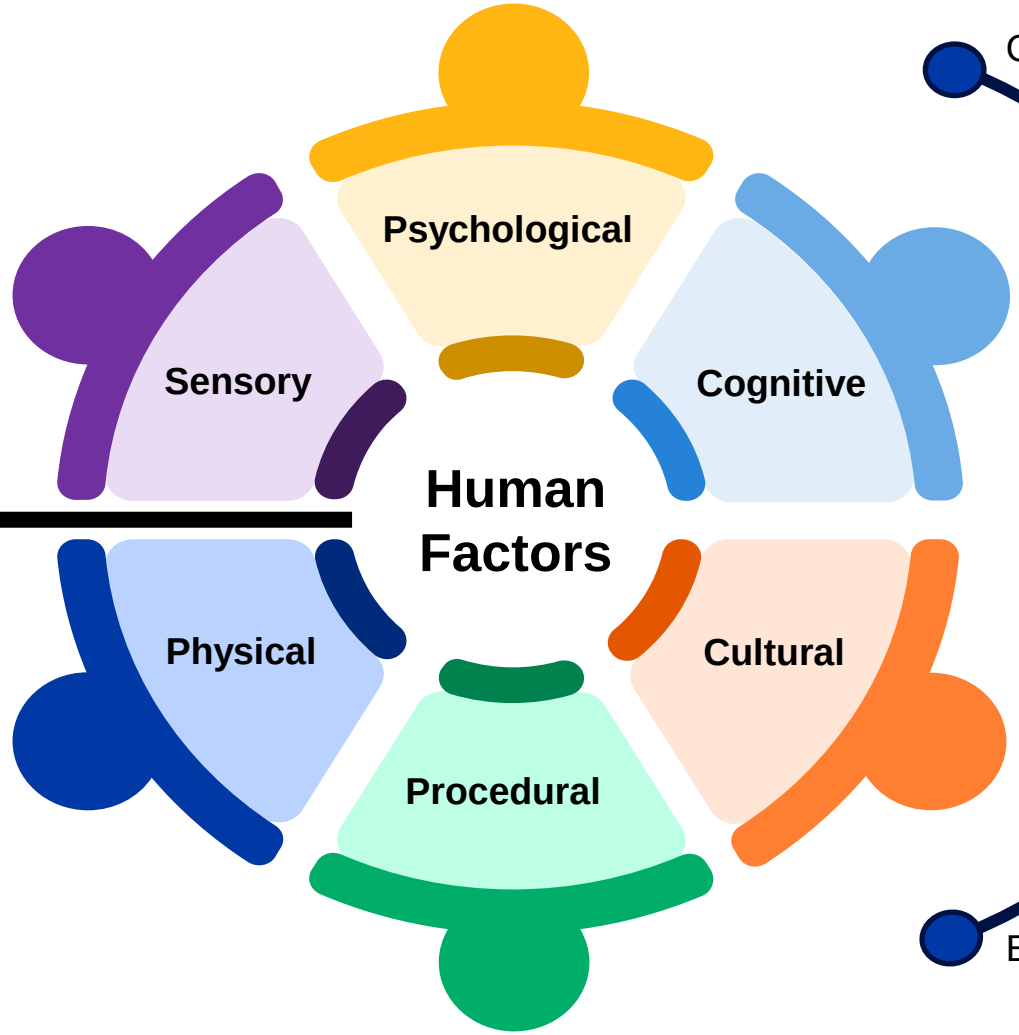
Human Factors Model

Internal Human Factors

External Human Factors



Contextual Influences

- Culture and Leadership
- Change and Comms
- Reward and Remuneration
- Behavioural Characteristics
- Skills and Training
- Organisational Design
- Financial Health
- Technological Quality
- Environment

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Human Factor	Unintended Consequence of CPS on an Operator or Pedestrian
Psychological	• Increased risky behaviours (Risk Homeostasis) • Loss of control / technology represents a sense of distrust (Reduces thinking ability) • Feelings of threat
Cognitive	• Cognitive / information overload – sometimes information is inadequate, unnecessary or serves to distract rather than aide • Errors due to perception error / memory lapses/slip/ tech misunderstanding
Sensory	• Loss of situational awareness • Operator alarm fatigue / nuisance alarms • Non-compliance due to false alarms – could lead to sabotage • Poor design of equipment interfaces leading to inadequate absorption of information
Physical	• Loss of visibility – Mine dependent i.e., underground mines vs open pit mines etc. • Accident migration / task transition • Technological issues - Sensing technology inaccuracies / Technology stalemate
Procedural	✓ Increase safety related behaviours ✓ Holding others accountable to ensure they meet targets aligned to bonuses / incentives • Increased adherence to traffic rules • Over-reliance – Could lead to accident migration and loss of control of the vehicle • Poor identification and understanding of issues • Deskilling – perhaps this is a misconception?? New skills are required with the implementation of CPS • Procedural violations / procedural non-compliance (e.g., mine personnel removing their hardhats) • Lack of standardization in tech
Socio-Cultural	✓ Increase in the overall safety culture • Sabotage – nefarious and non-nefarious (creative ways established to deactivate the system) • Abuse • Perceptions of being a safety “silver bullet” • Job losses due to mine closures (cannot afford to install CPS) • Language and cultural barriers – this could be unique to each mine

QUESTIONS

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