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BUILDING HUMAN–MACHINE TRUST:

THE ORGANISATIONAL PSYCHOLOGY OF ACTING ON AI ALERTS

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EXECUTIVE SUMMARY

Mining operations are evolving rapidly with the integration of Artificial Intelligence (AI) and Internet of Things (IoT) systems. From real-time equipment monitoring to predictive alerts, these technologies offer enormous potential to reduce risk and improve safety outcomes.

But one critical factor determines whether that potential is realised: Human Response.

This white paper explores the organisational psychology behind how mine site personnel respond to AI-generated alerts. It introduces the concept of the "trust threshold" — the point at which workers are confident enough to act on automated insights. Drawing on SORBA.ai deployments, we examine how mining operations can build human–machine trust by aligning technology with human behaviour.

INTRODUCTION: THE RISE OF AI IN MINING SAFETY

The mining industry is no stranger to digital transformation. Remote sensors, automation, and AI are now standard across many sites — monitoring everything from structural fatigue and engine performance to gas levels and operator fatigue.

Yet as systems grow more intelligent, the human element grows more critical. AI can deliver timely alerts and predictive insights, but it cannot enforce action. That responsibility still lies with the people on the ground. If workers don't trust, understand, or prioritise the alerts, safety is compromised.

This paper explores how to bridge the trust gap between AI systems and frontline personnel — turning alerts into informed, proactive decisions that protect both people and productivity.

SORBA.AI AT A GLANCE: SMART ALERTS, SMARTER DECISIONS

SORBA.ai is an industrial AI platform purpose-built for real-time operational intelligence. In mining environments, it integrates seamlessly with existing SCADA, historians, and IoT systems to ingest high-frequency data from vehicles, infrastructure, and the environment.

Key features relevant to mining:

Real-Time Monitoring of equipment health, operator behaviour, and environmental conditions

Predictive Maintenance to forecast failures in pumps, engines, haul trucks, and ventilation systems

Anomaly Detection using machine learning to identify unusual behaviour before it escalates

Edge Compute for processing data close to source, even in remote mine sites.

Closed-Loop Optimisation, allowing AI to suggest or apply corrective actions automatically.

THE HUMAN–MACHINE TRUST GAP

Across multiple deployments, a consistent theme emerges: the biggest barrier to AI success isn't accuracy — it's adoption.

AI alerts can be ignored, overridden, or misunderstood. Common reasons include:

- False positives from past experiences
- Alarm fatigue due to excessive or unclear alerts
- Fear of surveillance or punitive monitoring
- Lack of training on how to interpret and respond to alerts

These reactions are not irrational — they're grounded in human psychology. When operators don't feel psychologically safe, they're less likely to engage with unfamiliar systems. When they don't understand how alerts are generated, they're less likely to trust them.

The key is designing systems that work with — not against — human cognition and culture.

BUILDING THE ORGANISATIONAL TRUST THRESHOLD

The "trust threshold" is the point at which a worker feels confident enough to act on a machine-generated recommendation. It's not a technical setting — it's a psychological one.

Raising this threshold means addressing:

- False positives from past experiences
- Alarm fatigue due to excessive or unclear alerts
- Fear of surveillance or punitive monitoring
- Lack of training on how to interpret and respond to alerts

Building trust is not a one-time event. It's a continuous process involving education, communication, and feedback.

LESSONS FROM THE FIELD WITH SORBA.AI

Predictive Maintenance

SORBA.ai has prevented gearbox and compressor failures by learning the unique vibration and temperature profiles of mining assets. Similar strategies can detect haul truck chassis stress, hydraulic leaks, and fatigue in rotating equipment — but only if alerts are heeded.

Data Quality

Poor-quality sensor data leads to poor-quality decisions. In mining, dust, heat, and vibration can degrade sensors quickly. Educating staff on the importance of data validation and automated cleansing improves system reliability — and trust.

Integration with Legacy Systems

SORBA.ai connects with older PLCs and SCADA systems without rewriting logic. This reduces the cognitive load on operators and avoids disruption — a key factor in adoption.

Real-Time Monitoring and Visualisation

Dashboards that highlight why an alert occurred (not just what happened) empower operators to take action. Visual clarity builds cognitive trust.

DESIGNING FOR TRUST: HUMAN-CENTRED ALERT SYSTEMS

To improve response rates, AI systems must align with human expectations. Practical interventions include:

- **Transparent AI Logic:**
  Show operators how alerts are calculated — e.g. “This vibration exceeded the normal envelope by 30%.”
- **Collaborative Alert Reviews:** Include recent alerts in toolbox talks. Discuss which ones were acted on, and why.
- **Feedback Loops:** Let operators flag false positives and influence system updates.
- **Visual and Audio Cues:** Use intuitive, colour-coded signals instead of complex readouts.
- **Tiered Escalation:** Provide low, medium, and high urgency levels with clear next steps.

Figure 1: Data received for Suspension Monitoring of Mining Truck

FROM ALERTS TO ACTION: RAISING SAFETY CULTURE THROUGH DIGITAL LITERACY

AI literacy is becoming a core safety competency. Workers don't need to be data scientists, but they should:

- Understand how AI fits into their job
- Be confident in interpreting alerts
- Know how to question and escalate concerns
- Build their own AI algorithms

Learning should be scenario-based, not theoretical. It should position AI as a safety partner — not a policing tool. And it must emphasise the value of personal agency: the worker's ability to make safe, informed decisions with AI support.

THE ROAD AHEAD: AI AS A SAFETY PARTNER, NOT A WATCHDOG

Mining leaders must rethink how they introduce and champion AI systems. Building trust means:

- Investing in change management, not just technology
- Involving operators early in deployment planning
- Rewarding proactive action on alerts, even when they turn out to be false alarms
- Framing AI as collaborative, not controlling

CONCLUSION

Mining operations are increasingly reliant on data to make safe, efficient decisions. But data alone doesn't drive action — trust does.

By aligning AI systems like SORBA.ai with human behaviour, operations can raise their organisational trust threshold and unlock the full safety potential of digital technology.

Investing in that trust is not just good practice — it's a matter of health, wellbeing, and long-term resilience.

APPENDIX

A. Key Terms at a Glance

AI Alert: A system-generated notification based on rules or predictive models.

False Positive: An alert that incorrectly signals a problem when none exists.

Trust Threshold: The psychological tipping point where a worker feels confident to act on AI.

Edge Computing: Processing data at or near the source rather than sending it to the cloud.

Digital Twin: A real-time digital representation of a physical asset or process.

Anomaly Detection: Identifying patterns or behaviours that deviate from the system's normal range.

Psychological safety: Refers to a shared belief within a team or group that it is safe to take interpersonal risks, such as speaking up with ideas, concerns, or mistakes, without fear of negative consequences like punishment, humiliation, or rejection.

B. Checklist: Designing AI Alerts That Build Trust

Use this checklist to review your current AI alerting system:

- ■ Are alerts based on high-quality, validated data?
- ■ Are false positives tracked, and is their rate being reduced over time?
- ■ Can operators easily understand why an alert occurred?
- ■ Is alert urgency clearly defined (e.g. low, medium, high)?
- ■ Are visual dashboards intuitive and easy to navigate on the job?
- ■ Do toolbox talks include recent alerts and team feedback?
- ■ Are operators involved in reviewing and improving alert logic?
- ■ Are escalation paths and response actions documented and trained?

If you answered "No" to more than 3 of the above, your system may require redesign or training improvements to raise trust levels.

C. Integration Guide: Making AI Systems Operator-Friendly

What to Integrate	Why It Matters	How to Improve It
Alert Explanation	Reduces confusion, increases action rates	Add "why it triggered" info to every alert
Feedback from Operators	Prevents alert fatigue, improves precision	Add operator rating after alerts (e.g., Useful? Y/N)
Escalation Workflows (eg. TARP – Trigger, action and response plan)	Clarifies responsibility and builds confidence	Map who is notified, and what they should do
Visual Clarity	Supports fast, intuitive decisions in high-stress moments	Use colour-coded, plain-language dashboards
Historical Alert Logs	Builds trust through review and reflection	Display resolved alerts and outcomes in team meetings

D. Additional Learning Resources

SORBA.ai University (White Papers, Webinars)
https://university.sorba.ai/

SORBA.ai Website (Case Studies)
https://www.sorba.ai/

ABOUT THE AUTHOR

Peter Horsburgh is a renowned expert in Reliability Engineering with over two decades of experience in manufacturing. He is the author of the popular book '5 Habits of an Extraordinary Reliability Engineer' and has worked with leading global manufacturers to integrate AI and machine learning into quality control, driving improvements in predictive maintenance and process optimization.

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