



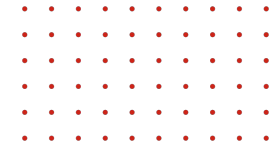
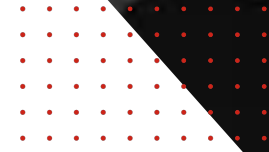
ABE
RISK SOLUTIONS

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Title

***“ Bridging Gaps in Mining Safety Understanding:
Leveraging Visual Animations to Overcome
Language and Literacy Barriers ”***

ABSTRACT

The mining industry continues to experience persistent safety and communication challenges, particularly across multilingual and low-literacy workforces. Visual animation-based training can overcome these barriers by improving comprehension, engagement, and retention of critical safety information. The *Visual Safety Systems Framework (VSSF)* is a framework that integrates human-factor theory, indigenous philosophy, and technological innovation to enable inclusive, high-impact safety learning. Empirical evidence from case studies across Zimbabwe, South Africa, Botswana, and Australia demonstrates measurable improvements in hazard recognition, compliance, and safety culture.



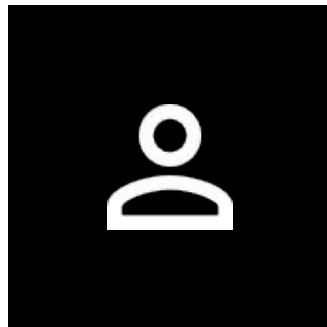
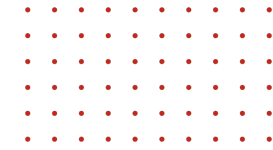
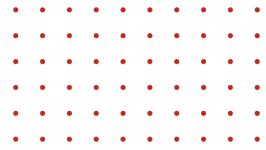
The Core Problem: A Persistent Safety

Deficit

Communication failure remains a key contributor to industrial accidents in mining, where workforces are often multilingual, transient, and exposed to high-risk environments. Studies by the International Labour Organization (2022) and the Minerals Council South Africa (2023) reveal that misunderstandings of procedures, rather than deliberate non-compliance, drive most incidents.

- Workforces are high-risk, multilingual, and often transient.
- **The "Comprehension Gap":** Most incidents are driven by *misunderstanding* procedures, not deliberate non-compliance (Minerals Council SA, 2023).
- **The Literacy Barrier:** In Southern Africa, only ~60% of the mine workforce possesses functional workplace literacy (UNESCO, 2023).
- **Result:** Traditional, text-heavy training is failing those most at risk.

The Solution: High-Impact Visual Learning



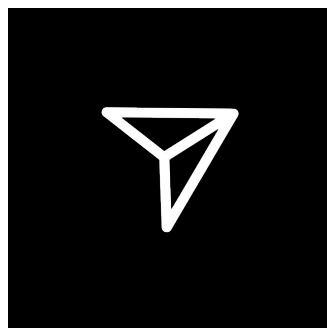
Inclusivity

It provides a universal, clear, and engaging medium for critical safety information.



Cognitive Science

Visual learning enhances comprehension and long-term retention. Workers recall up to **60% more** procedural content from animated simulations (Wu et al., 2019).

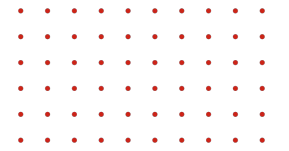


Global Precedent:

Industry leaders (BHP, Rio Tinto) have already adopted animation, correlating with shorter induction times and lower incident rates.



The Visual Safety Systems Framework (VSSF)



Visual Content Design:

Translating complex procedures into universally interpretable animations.

Cultural Encoding

Embedding local idioms and symbols to build relevance and trust.

Technology Integration

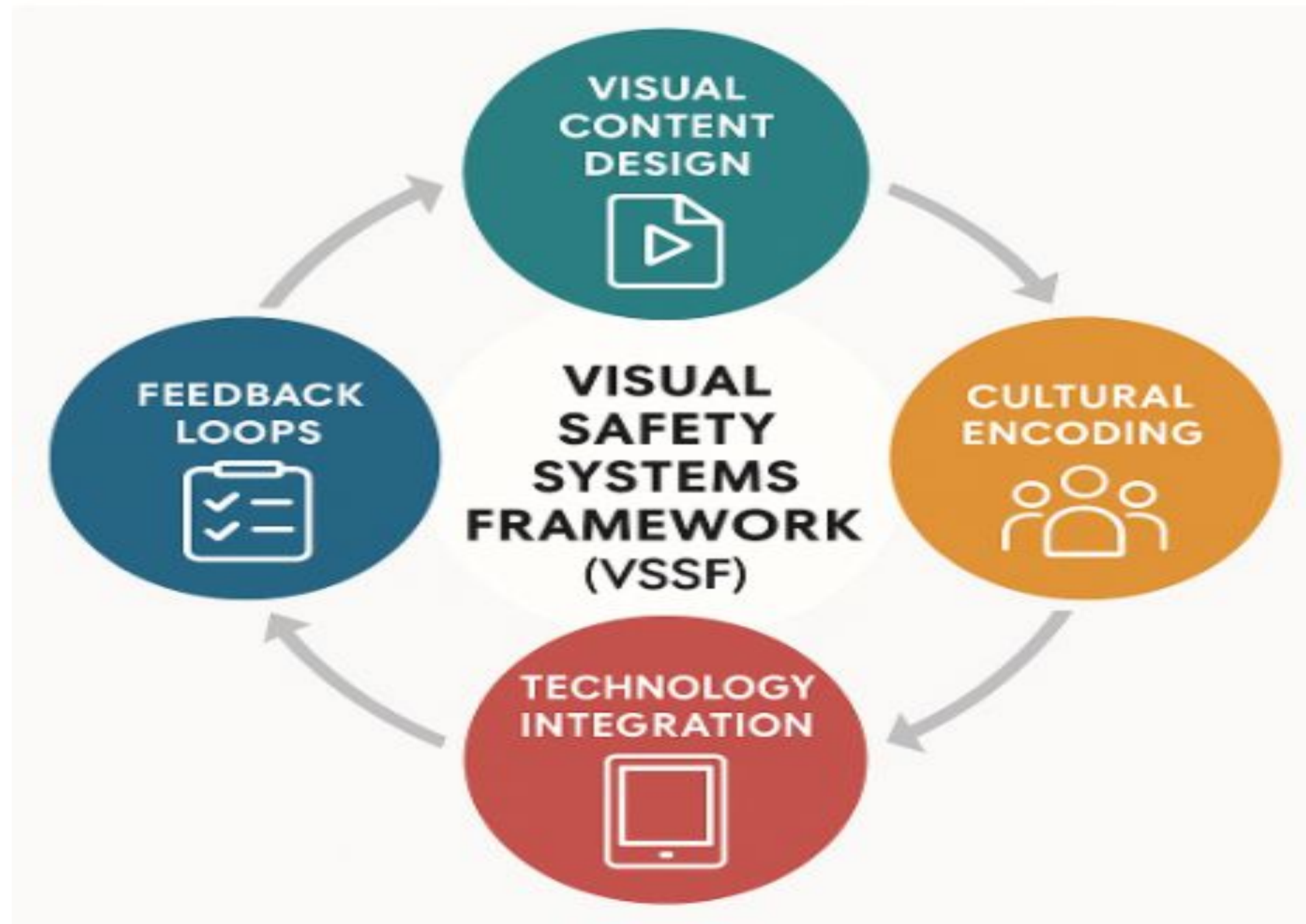
Deploying content via tablets, Learning Management Systems (LMS), and digital screens for toolbox talks.

Feedback Loops

Continuously evaluating comprehension and observing behavioral changes.



Figure 1: Visual Safety Systems Framework (VSSF)

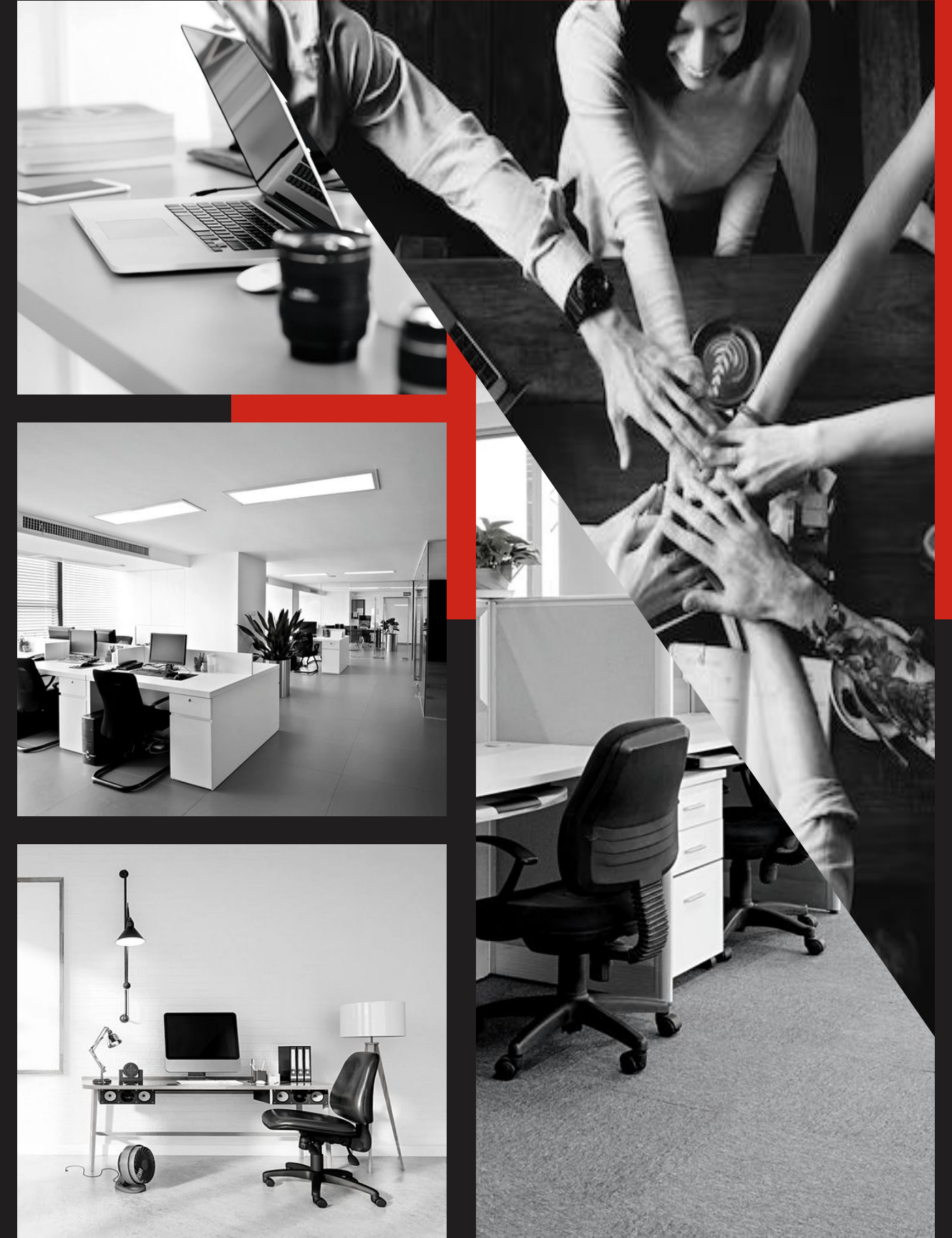


Visual Content Design, Cultural Encoding, Technology Integration, and Feedback Loops – surrounding a central core labelled "Inclusive Safety Learning".)

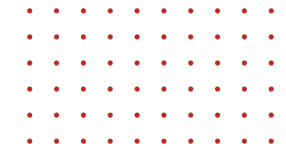
Theoretical Foundations

Our approach is grounded in proven theory, tailored for the mining context.

- 01. Human Factors (HFE):** Reduces "cognitive load" by making safety procedures intuitive and easy to process.
- 02. Social Constructivism:** Animation creates a shared, visual reference point, reinforcing learning as a team-based process.
- 03. Ubuntu Philosophy:** We integrate the concept of collective responsibility and inclusion— "I am safe because we are safe" —as the foundation of a visual safety culture.



Discussion



01.

Visual safety systems transcend literacy barriers and promote inclusivity in safety communication. Animated content provides a dynamic, culturally grounded method for embedding procedural understanding and behavioral reinforcement. Challenges to adoption include limited digital infrastructure, budget constraints, and managerial perceptions that animation trivializes safety.

02.

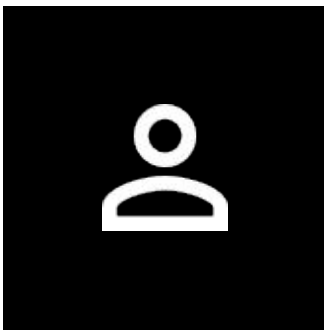
However, when aligned with ISO 45001 principles and co-designed with employees, animation-based modules can serve as auditable training evidence and promote psychological safety by normalising



Conclusion and Recommendations

Visual animation training is a scalable, evidence-based intervention for closing the safety comprehension gap. To institutionalise adoption:

Regulators



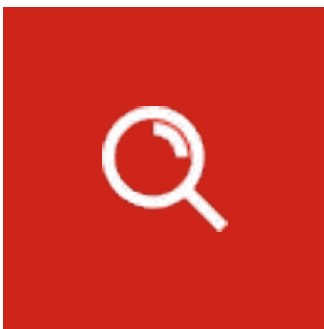
should recognise digital visual modules as approved safety-training media.



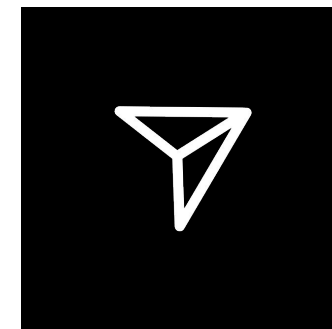
Mining companies

should co-create scalable animation libraries with employees and local artists.

Researchers



They should link visual learning metrics to safety indicators such as LTIFR and near-miss frequency.



Unions and training institutes

should integrate visual literacy within skills frameworks.

Future Research and Policy Implications



Future research should explore long-term behavioural retention and integration with emerging technologies such as VR and AR. Policymakers and academic institutions could collaborate through an *African Visual Safety Consortium* to develop shared, multilingual training resources, aligning with SDG 8 (Decent Work) and SDG 9 (Innovation and Infrastructure).



OUR CLIENTS

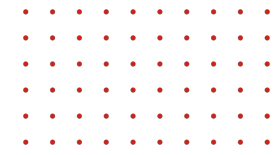


Author Profile



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Dr Abednego Kholwani Bayne Chigwada is an Environmental, Health, Safety and Risk Executive with over 25 years' experience across mining, manufacturing, government, and essential services in Southern Africa and Australia. He holds a PhD in Management of Technology and Innovation and is a Fellow of the Australasian Institute of Mining and Metallurgy (AusIMM) and a Certified Risk Management Professional (IRMSA). His research interests include human-centred safety design, visual communication in risk management, ESG integration, and indigenous knowledge systems in industrial safety.



Global Presence



South Africa Office

Situated in the economic heart of South Africa, our Johannesburg office serves as a critical node in our operations across the African continent. Johannesburg is a major financial and industrial center, known for its dynamic business landscape and rich history. This location allows us to effectively manage and mitigate risks in a region characterized by rapid growth and diverse market opportunities.



Head Office Australia

Located in the bustling city of Melbourne, Australia, our Head office is the central hub of ABE Risk Solutions. Melbourne is renowned for its vibrant cultural scene, diverse population, and strong economic foundation. Our head office is strategically positioned to leverage the city's robust infrastructure and business-friendly environment, ensuring we deliver top-notch risk management solutions to our clients.



Zimbabwe Office

Our Harare office is located in the capital city of Zimbabwe, a key location for our activities in Southern Africa. Harare is known for its vibrant markets, political significance, and emerging economic potential. By establishing a presence in Harare, we are well-positioned to provide tailored risk solutions that address the unique challenges and opportunities within this evolving market.



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