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Beyond below-ground geological complexity: Developing adaptive expertise in exploration decision-making

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ABSTRACT

The declining discovery rate of world-class ore deposits represents a major challenge to the future of global metal supply. To counter this trend, there is a requirement for mineral exploration to be conducted in increasingly challenging search spaces. In meeting future production demands, the minerals industry must economically extract resources from lower quality and more complex ore bodies. Faced with such an increase in task complexity, a major challenge from both an exploration and mining perspective is the human behavioural aspect of information interpretation and decision making. This paper discusses how organisations and individuals can develop the capacity to become proficient at creative problem solving, making balanced judgements and effective decisions.

Expert knowledge, also referred to as tacit or implicit knowledge, is gained through experience and has capacity for holistic perspective. However, expert knowledge can be difficult to articulate and vulnerable to heuristic biases. Experimental knowledge is predominantly qualitative and used in professional decision making. Yet it remains difficult to make objective decisions, such as the choice of research questions, methodologies, and interpretation of results, without being influenced by our implicit knowledge and naturalistic decision making. In addition to individual constraints, the motivational environment influences learning and decision making. Learning environments that support autonomy improve creativity, confidence and the development of adaptive expertise.

This paper introduces a model of learning and decision making for developing adaptive expertise. The model takes into account behavioural and motivational aspects of the individual, as well as the wider context and complexity in which the individual and the decision making behaviour are embedded. This can be used as a diagnostic tool for situational analysis and a guiding model for designing working environments to promote learning and adaptive decision making, to improve success rates in minerals exploration and mining.