From Static Models to Dynamic Solutions: The Future of Resource Modelling

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# From Static Models to Dynamic Solutions: The Future of Resource Modelling

As the mineral resource industry faces increasing complexity in deposits, the promises of automation and machine learning (ML) offer a way forward. They deliver more than just efficiency—they represent a paradigm shift in resource estimation. This paper explores how leveraging advanced technologies, cloud-based simulations, and integrations with desktop solutions can overcome the inherent limitations of traditional practices, providing unprecedented insights and precision.

Historically, the software tools for resource estimation have often functioned in isolation, creating data silos and inefficiencies. Introducing cloud-integrated simulations and fostering seamless platform interoperability and visualisation at end-user workstations can unlock dynamic solutions that better serve geologists, engineers, and decision-makers. In this narrative, we demonstrate how breaking down these silos can enable real-time collaboration, more accurate data reconciliation, and an overall increase in confidence for block model outputs.

A critical focus of this paper is the transformative potential of artificial intelligence (AI) and machine learning (ML). By feeding real-time data into dynamic models, these technologies can refine estimates and predict and adjust for uncertainties in a way that traditional methods, such as conditional simulation, struggle to achieve. The ability to run cloud-based simulations through dynamic cloud-predicted domain models offers a future where resource models become truly adaptive, responding dynamically to changes in input conditions.

The authors propose a framework centred on automation and software interoperability that supports integration across geological, geostatistical, and engineering tools. This approach preserves data integrity while optimising usability across systems, paving the way for a new era in resource estimation. The paper concludes with strategic recommendations for fostering a culture of innovation, ensuring that the industry's adoption of these emerging technologies keeps pace with evolving challenges.