Vision

**UQ:** Knowledge leadership for a better world

**SMI:** To create the capability for the minerals industry to effectively transition to sustainability

**Production cluster:**

Global leaders in research and innovation for environmentally, economically and socially sustainable production for the minerals industry

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Disruptive technologies

• Internet of Rocks
• Next Gen
  – cave-to-mill
  – tailings (resource to reserve)
  – mine to concentration
• Economic wrap
• REGI rapid estimation of geoscientific information
• Double the resource halve the process impact (bulk sorting)
• Deep mining – ‘economic search space’
• Adaptive process design and operation
• Integrated mineral project planning
Integration of Deep Knowledge

![Diagram of integration process]

- Geostats
- Copula-based simulation
- Design
- Flexi-circuit

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Adaptive process design and operation

Measurement Domain

Simulation & Design Domain

Process Control Domain

Inform

Update

Blasting Rock Mass

Load/Haul Rock Mass

Comminution Rock Mass

Separation Rock Mass

Inform

Update

Inform

Update

Inform

Update

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Future Mining

*Increased productivity, significantly reduced mining costs, safe, continuous and automated and long life operations*

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REGI – RAPID ESTIMATION GEOSCIENTIFIC INFO

JK Texture Analysis

Cluster & Train

Textural Parameters Interpolated in Block Model

Mineral map

Alternative method(s) to populate block model?

Interpolating Underlying Primary Variables Into blocks > Process Parameters

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NextGen Tailings

Engineering waste management in greenfield and brownfield sites

- Know the deposit, know the products, optimise the impact
- Technical, economic, environmental, societal

Diagram:
- Deposit knowledge
- Mine
- Concentrator
- Waste rock
- Process tailings
- Reserve
- NextGen Tailings
- Waste or Resource?
- Disposal

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- Lower cut-off grade
- Double resource to reserve
- < 50% energy
- 3% increase in metal recovery
- 25% more metal production
- ½ water
- No grinding media
- Upside 40% production
- Reduced RISK

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Integration chasm

Social  Environment  Economic
Content

- Technical depth
- Integrated value system
- Environment, social, economic sustainability

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Platforms

Simulators, reports, workshops
Enhanced digital delivery
Academic outputs
Embedded integrated technical knowledge
IOR

Ono-on-one, champions

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Future value – Our contribution

Resource definition

Related to

Flexible processing options

Providing

Increased recovery

Greater reserve value

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## Our key stakeholders and their expectations

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>2 years</th>
<th>5 years</th>
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<tbody>
<tr>
<td><strong>Mining companies</strong></td>
<td>• Survival</td>
<td>• Socially, environmentally and economically sustainable operations</td>
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<td></td>
<td>• Opex and capex reduction</td>
<td>• Focus on Technology push</td>
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<td></td>
<td>• Future employees</td>
<td>• Develop disruptive Technologies to unlock the value of sub-economic</td>
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<td></td>
<td>• Reliable performance prediction</td>
<td>deposits</td>
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<tr>
<td></td>
<td>• ROE</td>
<td>• Employees with appropriate skills</td>
</tr>
<tr>
<td><strong>University of</strong></td>
<td>• Research excellence (Reputation)</td>
<td>• Same as current +</td>
</tr>
<tr>
<td><strong>Queensland</strong></td>
<td>• Financial viability</td>
<td>• Enhanced conduit to industry</td>
</tr>
<tr>
<td></td>
<td>• Industry engagement (Impact)</td>
<td>• Internationalisation of UQ brand</td>
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<tr>
<td></td>
<td>• Produce RHD students</td>
<td></td>
</tr>
<tr>
<td><strong>Students</strong></td>
<td>• Employability</td>
<td>• Same as current +</td>
</tr>
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<td></td>
<td>• Hands-on experience</td>
<td>• Flexibility</td>
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<tr>
<td></td>
<td>• Access to cutting-edge research</td>
<td>• Overall business knowledge</td>
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<td></td>
<td>• Pathway to permanent residence</td>
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<td></td>
<td>• Fully-funded scholarship</td>
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<tr>
<td><strong>Staff</strong></td>
<td>• Job stability &amp; challenging work</td>
<td>• Same +</td>
</tr>
<tr>
<td></td>
<td>• Growth, promotion &amp; personal development</td>
<td>• Long term secure employment contracts</td>
</tr>
<tr>
<td></td>
<td>• Reputation and impact on industry</td>
<td>• Demonstrated clear pathway to growth and promotion</td>
</tr>
</tbody>
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## Research Areas - Content

<table>
<thead>
<tr>
<th></th>
<th>2 years</th>
<th>5 years</th>
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<tbody>
<tr>
<td><strong>Leverage current knowledge across the cluster</strong></td>
<td>Consolidate JK and BRC</td>
<td>Understand and incorporate social and environmental impacts</td>
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<tr>
<td></td>
<td>Integrate production value chain</td>
<td></td>
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<tr>
<td></td>
<td>Economic modelling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explore social and environmental impact</td>
<td></td>
</tr>
<tr>
<td><strong>Develop and demonstrate disruptive technologies (eg shown)</strong></td>
<td>Conduct proof of concept demonstration</td>
<td>Prototype across production value chain – (Mining - comminution and separation)</td>
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<tr>
<td></td>
<td></td>
<td>Integrated with social, economic and environment.</td>
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</table>
## Services

<table>
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<th>2 years</th>
<th>5 years</th>
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<tr>
<td><strong>Education</strong>&lt;br&gt;• RHD&lt;br&gt;• Continuing prof. dev.&lt;br&gt;• Undergraduates</td>
<td><strong>Education</strong>&lt;br&gt;• RHD (with some coursework)&lt;br&gt;• Masters by coursework&lt;br&gt;• Continuing prof. dev.</td>
</tr>
<tr>
<td>Develop a depository to store historical knowledge and IP (JK and BRC)</td>
<td>Disseminate and propagate the knowledge through modern platforms to enhance UQ brand (eg use Uqx)</td>
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<tr>
<td>Integrated deposit characterisation for production processes (mining to recovery)</td>
<td>Integrated deposit characterisation for full life cycle</td>
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<tr>
<td>Production value chain optimisation</td>
<td>Holistic options analysis (as shown)</td>
</tr>
<tr>
<td>Advanced consulting services (production) – with JKTech</td>
<td>Advanced consulting services (production, economic, social and environment) – with JKTech</td>
</tr>
<tr>
<td>Mine to mill optimisation (Geology – mining – comminution and recovery)</td>
<td>Enterprise optimisation and options analysis based on integrated process knowledge</td>
</tr>
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Business Platforms (how we promote our contents)

5 years

- 1-on-1 large research projects: 20%
- Collaborative research: 20%
- Codevelopment partnerships: 40%
- Small one-on-one research projects: 5%
- Self-funded students: 5%
- Competitive grants: 5%
- Other: 5%

5 years

- Base and precious metals: 50%
- Iron ore: 20%
- Coal: 20%
- Others: 10%
### Technology Platforms

<table>
<thead>
<tr>
<th>Modelling and simulations</th>
<th>Production systems</th>
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<tbody>
<tr>
<td></td>
<td>Embedded in enterprise systems</td>
</tr>
<tr>
<td></td>
<td>Integrated with social and environmental impact</td>
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<tr>
<th>Sustaining and delivering Value</th>
<th>As preferred technology partners of our clients</th>
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<tbody>
<tr>
<td></td>
<td>As a total enterprise of our clients</td>
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<tr>
<th>Knowledge dissemination</th>
<th>Quality research publications</th>
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<tr>
<td></td>
<td>Online targeted continuous education</td>
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<tr>
<td></td>
<td>Online interactive monographs across the process chain</td>
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<td>Disseminate and propagate the knowledge through modern platforms to enhance UQ brand (eg use Uqx)</td>
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