Disruptive innovation and technology adoption in the mining sector

Mining personnel have become extremely skilled at incremental, small-step innovations to improve productivity and lower costs despite the constraints of capital-intensive operations. However, the industry is facing numerous challenges, including declining grades, water shortages, the need to reduce energy consumption, the need for a social licence to operate as well as the usual market variations. To respond effectively to these challenges, mining companies have recognised the need to adopt radically different technologies and engage in disruptive innovation. Disruptive innovation involves developing and implementing new technologies that require entirely new equipment, sets of skills and workflows, making disruptive innovations high risk.

Adopting a new technology is a critical step in disruptive innovation, allowing an organisation to generate value from the significant investment involved in developing or licensing a new technology. Technology adoption involves ‘translating’ a technology from the context of its development to the context of its use. Here, the devil really is in the detail. It is a complex process, and lessons learned elsewhere may not apply to a specific situation as the details of each technology adoption are different.

Organisational Process Model for Technology Adoption in Mining (OPM-4-TAM)

Our team at the Queensland University of Technology (QUT), in collaboration with the Cooperative Research Centre for Optimising Resource Extraction (CRC ORE), have developed the Organisational Process Model for Technology Adoption in Mining (OPM-4-TAM). The tool integrates the latest research in innovation and change management with mining practices and the mining context. It assists senior leaders and relevant decision-makers to minimise the risks associated with developing and implementing disruptive innovations by engaging relevant stakeholders, including technology users, suppliers and inter-disciplinary teams.

OPM-4-TAM consists of an extensive suite of practices, identified as supporting successful disruptive innovation and technology adoption. The practices involved in the process of technology adoption are grouped into three phases, each with three steps.

1. Ideating and strategising
   - Identifying opportunities
   - Examining options
   - Making the case

2. Developing and Piloting
   - Developing, testing, piloting
   - Proving the concept
   - Preparing to implement

3. Implementing and Embedding
   - Transitioning to new operations
   - New routine production
   - Scaling out
How to try OPM-4-TAM in your organisation

To learn more about OPM-4-TAM and how to use it, visit us at the QUT website:

Or contact the project leader:
Assoc. Prof. Anna Wiewiora
Email: a.wiewiora@qut.edu.au
Phone: +61 7 3138 1242

Using OPM-4-TAM

Senior leaders, project leaders, innovation champions and relevant decision-makers involved in any phase of the technology-adoption process can use OPM-4-TAM as a checklist of practices that support the adoption. To use OPM-4-TAM: First, identify which phase of technology adoption the project is in. Then, refer to the complete listing of OPM-4-TAM practices for each phase and examine the listed supporting practices for that phase. Finally, compare these practices with current project activities and practices to help inform planning for technology-adoption activities.

OPM-4-TAM can also be used in conjunction with the Innovation Culture Assessment Tool (iCAT; see the iCAT flyer and video) for additional support in technology adoption.

Phase 1 - Ideating and strategising
This phase guides mining organisations through the process of recognising the need for a new technological solution and deciding on a strategic response, and includes three steps:

- **Identifying opportunities**
  involves scanning the internal and external environment for potential problems and opportunities.

- **Examining options**
  involves searching internally and globally for new technical developments.

- **Making the case**
  involves developing and communicating a robust business case.

Phase 2 - Developing and Piloting
This phase guides the development of the potential technological solution to address its specific operational needs. Practices in this phase are focused on three main steps:

- **Developing, testing, piloting**
  involves a multi-stakeholder team co-designing and co-executing development work.

- **Proving the concept**
  using iterative propose–test–improve cycles at increasing scales to progress the solution.

- **Preparing to implement**
  involves senior management adjusting team composition, roles and key performance indicators (KPIs) and handing the solution over to the site.

Phase 3 - Implementing and Embedding
The new technology is implemented in operations and, over time, is embedded as the ‘new normal’. Steps underpinning Phase 3 are:

- **Transitioning to new operations**
  involves re-designing workflows, role descriptions and KPIs.

- **New routine production**
  involves adjusting organisational levers to support the embedding of the technology.

- **Scaling out**
  involves exploring and assessing how the adopted technology could deliver value elsewhere in the organisation.