

Rio Tinto, the Organization Facing Aluminium Technological and Environmental Challenges

Sylvie Fraysse

General Manager, Aluminium Technology Solutions

Rio Tinto, Voreppe, France

Corresponding author: sylvie.fraysse@riotinto.com

<https://doi.org/10.71659/icsoba2024-kn004>

Abstract

In Rio Tinto's Aluminium R&D and Technology Group, our focus over recent decades has been on productivity (volume and cost) and health, safety and environment. Today, these areas remain critical and are complex to improve given the progress made. However, new objectives have been added, centred on finding better ways to provide the aluminium the world needs while reducing our carbon footprint and making net zero a reality. To meet these new objectives as quickly as possible, we must work differently. This means adapting our R&D and technology portfolio, moving faster, working with external parties and technologies, and being more ambitious and bolder.

Continuous improvement and innovation are part of our DNA at Rio Tinto. In response to this new context, Rio Tinto has established a global organization based on the strong existing know-how and skills of the R&D teams, combined with a more centralized support model to our product groups and assets. This model aims to be more efficient and impactful and will enable us to find and adopt technologies, to find the right partnerships (from labs to industrial companies), and to move quickly from idea to implementation at operational sites.

In Rio Tinto Aluminium, we have extensive experience in both research and development (R&D) and the industrialization process, bolstered by our robust technology sales history and strong ties with our smelters. Additionally, we benefit from a vast and rich ecosystem. This paper demonstrates how we are leveraging this solid foundation to go further and faster while enhancing our organization.

Keywords: Innovation organization, Academic and industrial partnership, Technology development.

1. Introduction

Innovation is about doing things better and trying new approaches. Rio Tinto's purpose – finding better ways to provide the materials the world needs – relies on innovation to find new pathways. Our focus on innovation has helped us achieve our goals in the past, but the context we operate in is changing rapidly, and our approach to innovation must evolve accordingly [1].

2. A Balanced Portfolio for the Aluminium Value Chain

2.1 Strong Foundations

To tackle new challenges, improve efficiency, and accelerate progress, we are firstly strengthening our internal foundations. At Rio Tinto, we have extensive experience in developing aluminium technologies, supported by our R&D centres and experts, our history of technology sales, and our strong connections with our smelters.

We oversee and develop technology across the entire aluminium value chain, from bauxite to final metal products, from production processes to residue valorisation, and metal recycling. In R&D and Technology, we have spent decades developing tools and knowledge that enable us to deliver industry leading performance. Our technology stack includes modelling tools, development platforms, process control products, specialized operational and maintenance equipment, and process engineering packages.

Due to these strengths, Rio Tinto Aluminium (RTA) now runs the world's most productive cells in terms of tonnes produced per square meter. Over the past 20 years, a consistent increase in amperage of about +1 kA per year has boosted the Saguenay Lac-St-Jean region annual production capacity by over 215 000 tonnes.

All these elements give us a strong core business position that we can optimize and improve continuously upon. It is only the first and foundational step in building a broader R&D portfolio.

2.2 New Challenges and New Technologies

Whilst in recent years most of our R&D effort has been centred on productivity and efficiency initiatives – we are pivoting in line with the Rio Tinto Group strategy and building a balanced portfolio to support our drive against delivering impeccable Environmental, Social, and Governance (ESG) performance and to solve new system constraints such as power supply sources.

Just some of the opportunities and challenges to solve for include enabling our smelters to deal with the intermittent energy supply resulting from renewable power and removing CO₂ from our production processes as it contributes to around 21 % of Rio Tinto's Scope 1 & 2 emissions alone [2].

Regarding R&D and Technology approach, there are two key differences between recent decades and the existing and future context:

- We need to integrate technologies, solutions and tools which are no longer in-house designed and built. For example, the existing CO₂ capture technologies are not specific to the Aluminium process. While we need to tailor these technologies to our specific context, we lack the expertise and time to start from scratch. Additionally, there are multiple technologies available, each with varying levels of maturity and distinct advantages and challenges, especially for aluminium production. Our goal is to identify the optimal solution from these different technology options.
- We must accelerate our efforts and leverage Industry 4.0 technologies. Big Data, artificial intelligence (AI), and smart sensors are now essential. Given our time constraints, we must once again identify, evaluate, and utilize the right tools and partners instead of doing everything ourselves.

Reflecting on this context, one could say that to solve for our R&D portfolio we must focus on sourcing technology and procuring it. Yes and No:

- Yes - The R&D and Technology teams need to adapt their working methods. While they should continue developing in-house processes and tools, they must also increasingly focus on identifying, evaluating, and effectively managing partnerships.
- No - The key to success is finding the right balance between strong in-house expertise and external input. To evaluate and identify the right external technologies and partners,

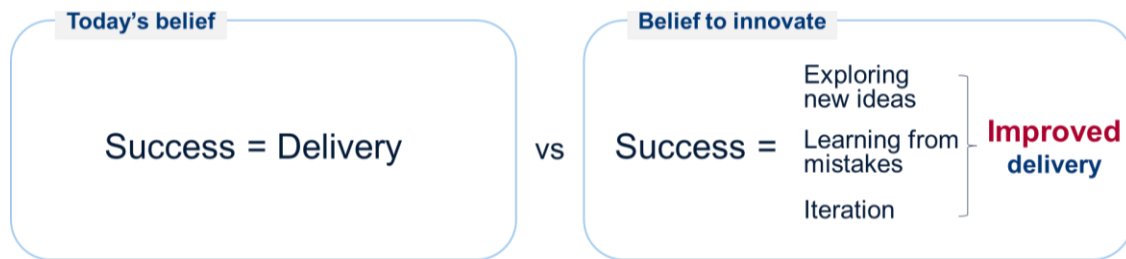


Figure 7. Learning from failures leads to improved delivery.

7. Conclusions

Our strong heritage of innovation continues but addressing climate change and embedding the energy transition require us to think, and to do, differently. The capabilities and technologies needed now surpass our historical achievements. Many challenges we face lack ready-made solutions, making innovative approaches essential. To meet global demands for changing our operating practices, we must mobilize solutions quickly. While some of our greatest innovations took decades to develop, we no longer control the timeline in delivering for the energy transition.

Our overarching response lies in “innovating our innovation,” which, as demonstrated above, involves multiple areas of our organization. We need to optimize and rationalize our portfolio while unlocking our full potential by leveraging our rich internal diversity. Engaging our external ecosystem of partners to develop new ideas and scale up together is crucial. This also means improving the flow of ideas from the outside world and, perhaps more fundamentally, continuously challenging and enhancing our cultural mindset. Importantly, this transformation extends beyond the Aluminium product group to encompass the entire Rio Tinto organization and our broader ecosystem.

Ultimately, everything we use and consume originates from nature. We must use our precious resources wisely and minimize our impact on the earth – whilst providing society with the materials it needs. Science, engineering, and technology development will be crucial in achieving this goal in the safest, net-zero carbon, and lowest ESG footprint manner possible, while creating benefits for society.

8. References

1. Dan Walker, “Why we have to innovate faster than ever”, *Rio Tinto Group News*, 2024 August 18th.
2. Rio Tinto Climate Change Report, <https://www.riotinto.com/invest/reports/climate-change-report>
3. Rio Tinto and BHP collaborate on battery-electric haul truck trials in the Pilbara, *Businesswire (A Berkshire Hathaway Company)*, 2024, May 24th.
4. Nigel Steward, “The right time for science: Introducing Rio’s first Chief Scientist”, *Spirit (RT Newspaper)*, 2021, July 12th.
5. Pioneer Portal - <https://www.riotinto.com/en/about/innovation/pioneer-portal>
6. Innovation Advisory Committee - <https://www.riotinto.com/en/about/innovation/rd-and-technology>