

# EXPLOR ATION RA DIO

*Episode 29*

**A MAJOR DIFFERENCE  
with  
Steve McIntosh**



**EXPLORATION RADIO** is a podcast focusing on the past, present and future of exploration. Hosted by Ahmad Saleem and Steve Beresford, the show is impartial with the content produced, intending to unearth fresh perspectives on issues and challenges faced by the global resources industry. This podcast is free from vested interests, is self-funded with limited sponsorship, and is freely available on iTunes, Apple Podcasts, Stitcher Radio, Google Play, Spotify, or through our website.

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**STEPHEN MCINTOSH** is the Group Executive for Growth & Innovation at Rio Tinto. He has close to 30 years of service with the Rio group after joining the business as an exploration geologist. Stephen has deep experience across a wide range of commodities and geographies, having worked on projects in more than 45 countries. In his previous role as Rio Tinto's global Head of Exploration, he led teams operating in 20 countries and drove a step-change in safety improvement while delivering industry-leading discovery performance.

Stephen has been actively involved in the management, exploration and evaluation and discovery of a number of Rio's exploration discoveries

*Welcome to another episode of Exploration Radio. I'm your host Ahmad. Almost everyone in our industry has an opinion on how big companies should do exploration. We criticize them for being too risk-averse, not moving quickly enough and probably the most common complaint heard: "They're not doing it like we used to in the past." Now some of these are probably justified. But we also have to remember that we've not seen companies the size of BHP, Rio Tinto or Vale in our industry before. So trying to compare how these modern large companies work to ones in the past is a fallacy. We're not really comparing apples there.*

*Before we get too judgmental, we probably have to realize that exploration groups have to continuously figure out how they can fit effectively into the corporate structure of these multi-billion dollar companies and more importantly, how they can continue to provide value to the overall business. So maybe it's time we have an honest conversation of what works and what does not when it comes to running exploration groups in major mining companies. Our guest today is Steve McIntosh who is the group executive for growth and innovation at Rio Tinto and has been involved in managing exploration activities within Rio Tinto for a few decades now. Steve joined us live in-person from his offices in Brisbane.*

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**Welcome to Exploration Radio, Steve. It's taken us a while for you and I to be in the same room. But we're finally here. So welcome... welcome on the show.**

Thank you very much Ahmad. It is great, as you say, to finally get here.

**I should also say that you were one of the first people to actually write to us and encouraged us to keep going with the podcast. We appreciated it but we also hold you accountable for the fact that it's become bigger and bigger and has created more work for us. So thanks a lot for that.**

Excellent. Well, I'm happy to be held to account on that one. I think you and Steve have done a fantastic job. And you know, I think, you have told some great stories, connected with some wonderful people, dug into some really interesting subjects that clearly are front of mind for a lot of people. So well done.

**And hopefully this interview lives up to that standard that we have set. So no pressure Steve, it's all on you.**

**So I wanted to get into why we wanted to have a chat to you. The theme around this episode really is ‘How has mining and exploration as a business changed?’**

Great. We’ll look forward to trying to shed some insights, or share some insights I should say, on that.

**So let’s start off with a little bit about your background. You’ve been involved in CRA / Rio Tinto for a number of years, we won’t say exactly how many. I think you originally started in CRA or in Rio Tinto.**

Actually, I didn’t. I actually joined Kennecott as it was. So you know, by way of background, I’m a Kiwi, did my undergraduate degree in geology.

**Don’t worry, we won’t hold the fact that you’re a Kiwi against you on this one.**

That’s okay. I noticed your partner in crime is one. I did my undergraduate degree in Auckland in geology and did my Masters degree in physics and geology, and really was meant to go and join the oil and gas industry. But in the early ’80s, we obviously had the gold price spike, gold exploration started in New Zealand. So while I was finishing my Bachelor’s degree, starting my Master’s degree, I got dragged off to do vac work and gold was it. Caught the bug and therefore never entered the oil and gas (industry) again.

**You came to the dark side then, or the bright side – whichever way you want to look at it.**

Correct. And so while I was working in New Zealand for a joint venture between a New Zealand and an Australian junior, the Aussie junior had a whole bunch of these ex-Kennecott people that had worked in Papua New Guinea. So they said I needed to go and talk to the current Kennecott management about a job so I expressed an interest, got offered a ticket to fly across to Sydney for an interview. You’re certainly not going to turn something like that down and basically the rest is history. So in 1987, started with Kennecott working in Papua New Guinea. Spent a little bit over six years in PNG originally going to what’s called the Tabar group which today has the Simberi gold mine and then worked at Lihir.

***“...I needed to go and talk to the current Kennecott management about a job so I expressed an interest, got offered a ticket to fly across to Sydney for an interview. You’re certainly not going to turn something like that down. And basically the rest is history.”***

**That was after CRA/ Rio Tinto merger?**

No, long before. So interestingly, Kennecott because it

had these projects in PNG - Lihir, Simberi. Sort of our deemed competition was CRA. So we would meet the CRA Exploration team, typically at you know industry meetings. But they were sort of the arch-enemy if you like, the competition, the benchmark against which we were measuring ourselves. And so that was an interesting relationship. It's like all good things, a nice bit of competitive tension. So I joined in '87. Kennecott was a subsidiary of British Petroleum Minerals Division at the time. So there's a little bit of complicated history here. In 1989, RTZ purchased BP Minerals and in doing so, it acquired the Kennecott mine in Utah plus a bunch of assets in the Americas and Lihir and Simberi in PNG.

So in '89, we had become a part of RTZ. But really, we continued to explore as competitors until '92. At the end of '92, the feasibility study for Lihir was finished. Basically the senior management in London had opined that it's rather crazy having the minority-held CRA competing with a wholly owned Kennecott in a couple of parts of the world. So Kennecott went back to work in the Americas, CRA expanded its mandate all the way through South-east Asia. So sort of it was a takeover if you like and so at that point I then left PNG and joined RTZ in the UK, looking after project generation in that part of the world.

***“...Kennecott was a very American company ...very strong, sort of hire-fire American culture, but strong technical capabilities sort of in the copper and gold space specifically.***

***CRA was... a different company, a different style, probably much more focused on I guess the high science of exploration at the time. Like most companies in Australia quite strongly models driven. Whereas I think Kennecott was very much driven by the data.”***

**So there's a few companies that were involved in what eventually became the group that you're part of now. Do you care to comment how they differed?**

Oh, very different cultures. So Kennecott was a very American company at that time headquartered out of Salt Lake City. A very proud company, even though it had been ultimately purchased originally by Standard Oil. Standard Oil was then taken over by BP. So a very proud history and certainly is one of the strongest technical copper porphyry companies in the world.

So we had sort of the residues of that company, very strong, sort of hire-fire American culture, but strong technical capabilities sort of in the copper and gold space specifically. CRA was seen at that time, and I know you've talked a lot about Western mining in the context of these podcasts in Australia but probably, CRA and Western Mining are sort of the two technically most preeminent, I would have thought, in a stable of very high technical capability in Australia in the '70s, '80s, '90s. But a different company, a different style, probably much more focused on I guess the high science of exploration at the time. Like most companies in Australia quite strongly models

driven. Whereas I think Kennecott was very much driven by the data. Ironically, I would use the phrase 'let the rocks speak' even though that's a Haddon King line that we still hear from the CRA old days. But there's no doubt technically, it was seen to be really the benchmark. And through that period, '89 increasingly through to '92 but in particular '92 up to the dual listing in December 1995, we got closer and closer to the CRA team and you realize that technically they really were a powerhouse in a number of different areas.

And I was straying backwards and forwards between doing geology, basic exploration geology, drilling, sampling, mapping all the way through to running geophysical programs. And Kennecott Australia had one part time geophysicist and I think CRA in Australia had fifty or sixty at that time. So it was a little bit overwhelming to go and engage with the team at CRA.

***“...Kennecott Australia had one part time geophysicist and I think CRA in Australia had fifty or sixty at that time. So it was a little bit overwhelming to go and engage with the team at CRA.”***

**It does sound like a pretty good marriage that if you had one group that was a lot more technically driven and another one that was a lot more applied or empirically driven you should say. It sounds like a pretty good marriage of the two companies coming together.**

Look it was. But I think in the coming together in late 1995, early '96, it was also a difficult time economically. So part of the promise out of the dual listing of RTZ and CRA was obviously synergies. Exploration got to feel a lot of the heat from that time so we had a significant restructuring.

And it's probably also worth going back a step that in 1989 also for the first time RTZ appointed a Global Head of Exploration, whose name was John Collier. He had come out of CRA and had been a long-time senior executive in the company. And John was one of the most driven people I've probably still ever met. A really interesting character, was obsessed about discoveries and continuing to grow. The company thought big, continuously challenged everyone to think outside the square. And so he shaped a lot of the company sort of between 1989 and the time of the dual listing.

We then had another former CRA senior executive, David Klinger, who became the next Head of Exploration. And I'm guessing David did that in about '96/'97 - probably in late '96 I think from memory. And he was the Head of Exploration until late 2004. So David oversaw the global restructuring of the exploration group to create the RTX as

we call it, the Rio Tinto Exploration of today. He's the one that essentially created the strategy that we use today. A few tweaks obviously as time shifts and technologies and other things shift, but it's a very profound document and set of thinking at that time. Painful restructuring but basically set up what we have today.

**So if you had to go back in the past and redo it, is there something you would focus on changing? Is there something you think, could have been done better than that?**

I think like many things, it was a difficult period from the mid-'90s to the early 2000s. And like anything with change and restructuring, we just probably didn't go fast enough. And I know there's a big human factor in that and I absolutely accept that. But I think what happened was, in some parts of the business, their reflections on that period was death by a thousand cuts. And it's sapping, morale fell in certain parts of the organization and therefore I think as a senior leader, if you believe that there is a compelling reason for change, the best thing you can do for everybody is to move at speed and to give people certainty, one way or the other. And so that was probably would be the biggest part to it.

***“...as a senior leader, if you believe that there is a compelling reason for change, the best thing you can do for everybody is to move at speed and to give people certainty, one way or the other.”***

The second really was that the pivot from what I would describe as a somewhat academic pursuit, if I can be brutally honest, to running the exploration group like a business. And that's really what David Klinger brought to the team, and that's the core of the strategy if you like. And I'm sure you're going to get to a number of other questions as we dig into this. But that change and therefore saying, you've got to spend this money as if it's your own. We need to be held accountable to our shareholders. The one thing we do know is that, it probably was expressed a little bit through the John Collier period was, we got busy being busy as opposed to busy being successful. Our systems and processes weren't strong enough to sort of contain the organization and to hold it to account. And what David brought was there's only a finite amount of really good ideas we can actually bring into an organization like this.

We think about the portfolio very similar to a pharmaceuticals company. Big hopper at the front but tightly stage-gated, and we need to define really clear kill criteria for things. We don't actually need to answer every question. I know the scientists inside the organization who are desperately keen to know why. And there are

***“...we need to define really clear kill criteria... We don’t actually need to answer every question. I know the scientists inside the organization who are desperately keen to know why. And there are times where we just have to say irrespective of understanding the why, this isn’t going to make it.”***

times where we just have to say irrespective of understanding the why, this isn’t going to make it.

We’ve got an opportunity cost here by trying to spend more time understanding something that probably isn’t going to particularly help us. So we need to move and there was a lot of pressure put into the system: make a decision quickly. For a period of time, we used a rather unfortunate phrase of being MAD scientists. And the MAD the acronym was Minimum Appropriate Data. So what was the minimum amount of information we needed to collect, to understand do we have something of interest to the company or not? Not of interest to the individuals.

**Which is a trap. We are largely technical people, so I think knowing the why or the how I think becomes really important. But that’s maybe not what the business wants really out of that.**

It’s not that we forgo trying to answer this question in the background. But what we will often do is actually have that question go off and be posed with somebody else. Put that back into academic institutions. Go and ask others to opine about these things. But our job is to find the metals and minerals to sustain our company and support the growth of our organization. The other one was how we engaged strategically through a business language with the organization as a whole. And I think one of the risks for the explorers is, we communicate with ourselves in a certain language very technically, but we often use exactly the same language when we go and talk to the business.

***“...I think one of the risks for the explorers is, we communicate with ourselves in a certain language very technically, but we often use exactly the same language when we go and talk to the business.***

**Yeah that’s right. And they have no idea what the hell we’re talking about.**

Correct. So one of the other keys was we had to learn the arts of speaking to the business in business-speak and the language of business. I think we did that very well through the early 2000s. We were able to increasingly connect better with the organization.

***...one of the keys was we had to learn the arts of speaking to the business in business speak...”***

**So do you think that exploration having to become more of a business is part of it fitting into larger organizations?**

I think it’s critical. I think it’s how you’re able to bring yourself into the strategic space of big companies. How do you communicate to a board? How do you communicate

***“How do you impress upon them the importance of long lead times in a business that is driven to a “in the shift” hourly, daily, weekly, quarterly, annual, sort of drumbeat?...***

***...it’s very easy in companies to get caught up in the now and the short term....***

***...you need to have a really clear narrative about how you can bring everybody back to that sort of medium and long term strategic thinking and think through the cycle. And we’re not always successful in it...”***

to senior executives? How do you impress upon them the importance of long lead times in a business that is driven to a “in the shift” hourly, daily, weekly, quarterly, annual, sort of drumbeat? I think it’s very easy in companies to get caught up in the now and the short term. And therefore, you need to have a really clear narrative about how you can bring everybody back to that sort of medium and long term strategic thinking and think through the cycle. And we’re not always successful in it but I think we’ve positioned our company very well to be able to have those really strategic conversations.

**Because there is a very strong dichotomy in that a large part of mining is about optimization in almost like a linear way. Whereas exploration is optimizing in a somewhat random or very exponential way. Which if you’re a mining company, it’s not a clear fit in how exploration would fit into that kind of linear optimization method of working.**

I would agree and I think at times we’ve struggled. But again, what I would say is today I think we’re very well positioned. We have a board that is truly thinking about that long term. We’ve got a company that is sort of very well positioned today and knows where it is, knows where it wants to go, understands the levers that it has to pull to be successful through the cycle. And I think is pretty clear about what all parts Rio Tinto needs to play to help in that journey – including exploration. What I would say is the teams are probably feeling, the exploration team that is, is probably feeling the love more than it has in quite some time. That in itself puts pressure into the system, but that’s no bad thing.

**Is part of your role, the challenge that you have to manage up to the board so they have the right expectations about what you’re doing? Or do you think the challenge is also the fact that you have to take the board’s vision down to your team as well?**

So clearly both. Yes I do spend time engaging with the board on issues related to exploration. But my portfolio also includes resource custodianship as well. Similar to John Vann’s conversation with you, having those two teams actually within your span of accountability is actually really important because you get to think about from the ore body out. So we think obviously a lot about greenfields, brownfields. I also like others don’t get overly caught up in the definitions as long as the work is being done. Our greenfield exploration teams do support in

the brownfields of our existing operations. I describe that work as the “outside in” view, as opposed to the inside a reserve or resource model, in a block model, attempting to go out. You need both views because they are different. And again I think John Vann has certainly with his expertise historically, as a consultant, understands that world extraordinarily well. I would agree with comments that he made in the podcast that you did with John, the explorers in truly greenfields environments need to feel that they have sufficient resources to be successful. But also, and again critically, I think need to understand that failing fast is critical in exploration. And we actually need to celebrate it.

### **Do you think we do though?**

I think we do inside the exploration group in Rio Tinto these days and I think we have done increasingly for the last couple of decades. Again going back to that David Klinger period, because actually, as I said earlier, the opportunity cost of sort of sitting on something that actually ultimately is never going to make it is just so great because that means you’re not at the next one which could be that big project, the Eureka moment.

**I think in exploration our biggest enemy really is time in a lot of ways. You need to be able to maximize what you can get out at a certain time, not just in the market but the company cycle, all of these things. Like you said, if you’re not optimizing to what the best opportunities you have, then you’re going to pay the price at some point.**

***“...about the period sort of 2007 through to 2018, the exploration group spent around about US\$1.8 billion... And returned about US\$1.8 billion in divestment income... therefore the things that the exploration group has generated and handed over to the group are in essence free...”***

Look, absolutely. And I think an important aspect of that trust that we have from our board and senior executives is the fact that we’ve had a very consistent set of funding now for close to two decades. GFC aside, a little bit of an aberration there, but in reality, very strong support. So today we will spend in the greenfields environment a little bit north of US\$200 million a year. That’s a lot of money and we understand it’s a lot of money. But that point about running exploration as if it’s a business, when we go back and think about the period sort of 2007 through to 2018, the exploration group spent around about US\$1.8 billion through that period. And returned about US\$1.8 billion in divestment income to the group through that period. Again, one of the nice things to be able to do is go and say to a board is, therefore the things that the exploration group has generated and handed over to the group are in essence free. That exploration has washed

***“...exploration has washed its face through the cycle.”***

its face through the cycle. Now we also understand that we went through a super cycle, we sold some things for some pretty impressive prices. But I don't think the cycle is dead at all. I think when we look at supply and demand and discovery rates and things, we know that there will be an incentive coming to find more.

**I mean it is inevitable, it has to come back.**

Correct, it has to come back. Again the confidence that the team has that the money will keep coming as long as they keep generating a solid suite of options is a good thing. They basically, they don't need to think about that. What they need to think about is how they get their pipeline full of high-quality options and how they can keep moving those options through the pipeline. That really is the focus of the team: how they think about technology, how we think about partnering, how we think about the countries that we are exploring in and therefore sovereign risk, how we think about the commodities of today but also the commodities for the future. So actually, I'll say that the team has a really privileged position.

**I want to go back to a point which you made which I think is quite important, is that if you do run exploration as a business, you have to accept that not only will you bring projects in but you have to divest projects out as well. Are you surprised that other people don't do it this way? I mean the tendency seems to be in the industry is to have a fire sale of assets at the wrong time of the cycle. In exploration, would it make more sense to run it as a business in that sense? Where you maximize whatever opportunity you have?**

Well look I really can't talk for others Ahmad. But this has worked well for us. That healthy tension that we have the right commercial capability to do divestments embedded in our exploration teams. Often what happens in many companies is that those commercial teams are somewhere else.

**Or they are always like a functional level removed or something like that.**

Something like that. We actually have the commercial capability. And these people in those commercial roles have two distinctly different roles. One is to support the exploration groups to option into and joint venture ground and opportunities, and to therefore, when those projects don't make it through those rigorous stage gates, to exit

***“...over fifty percent of the things that we found didn't quite make it for Rio. We ended up divesting in lots of different ways. A couple of those things...were company makers”***

for value. We try and work very closely with obviously our joint venture partners and others. We want to build a strong relationship. I know through the '80s and '90s, that there's probably some legacy, lots of stories around the behaviours of the majors. I'd like to think that we get this more right than wrong.

And you know one of the things I did before coming in here sort of tot up many of the historic discoveries over the last thirty odd years. And when you go through the list, over fifty percent of the things that we found didn't quite make it for Rio. We ended up divesting in lots of different ways. A couple of those things made companies, were company makers. Selling Sepon in Laos basically created the Oxiana that was. We made a gold discovery in Turkey in the late '90s called Çöpler which made the Alacer Gold of today in the Anatolia province. Going back to Simberi when it was on and in the sort of mid to late '80s and mined by St Barbara Gold today. Lihir obviously by Newcrest today. You can go through the list and actually see our company's contribution also to the greater industry has actually been high. I think it's very often discounted. People will have a very narrow view on one or two issues. But I would say there that we are having to continue to play our part in the greater mining ecosystem.

**That totally makes sense to me because the size of company you guys are and the opportunities that you have to seek. I think fifty percent is actually a pretty good rate. I would have thought it would be less. It intuitively makes sense that a lot of opportunities wouldn't fit your economic gate. But that doesn't mean that they are bad opportunities. They are the right opportunity for someone else.**

Look absolutely. So we understand I think scaling of the opportunity very well. I know one of the things that you talk about a lot on these podcasts is risk. I think Jon Hronsky was very passionate on the subject in the podcast that you did with him. It was an interesting one because I recall one of the more senior people in the exploration group today we hired in from another company. When he got in and understood exactly what we were doing, he said, “Oh my god, you people take so much risk. How come? Why are you allowed to do it?” And by this, I mean technical risk. We said, “Well, if you aren't pushing that technical risk-reward frontier, you're never going to find anything of interest to Rio Tinto.”

***“...if you aren’t pushing that technical risk-reward frontier, you’re never going to find anything of interest to Rio Tinto.”***

If we play it safe in the well-picked over areas, you’re down in the second, third tier, the small tiddler kind of things. We’ve got to lay some big bets. But we need to make sure that there’s some science and deep thinking behind where we make those investments. If we go back and reflect post the dual listing, the restructuring of the company, looking, starting to think a little bit about the very early signs, and I’m not saying that we necessarily picked the China boom. But we could see that there was a requirement for certain commodities of a certain scale that would be of interest, obviously to a much bigger company now that we had merged. So the discovery of Simandou in the late ’90s. The discovery, the rediscovery if you want to call it of Resolution, really understanding what Resolution could be.

**Yeah, that’s right. The true discovery of Resolution.**

The true discovery. Then through to one of the places we visited last week with my team was in Serbia and looking at this lithium borate discovery there. Those are really interesting kinds of finds. Because normally when you find a new mineral, in our world, it’s something under a microscope. You don’t normally find many hundreds of millions of tons of a mineral that’s never been described before.

**I mean finding an ore mineral, that’s nearly impossible usually.**

Correct. So jadarite is a really fascinating mineral. The discovery of Jadar is a great discovery, under 400 to 800 metres of cover. Lots of questions about how you found it and all of those good things. But we had a team of experts who knew what they were looking for and what we were looking for was borates. We’ve been very clear on that. And we found borates. It just comes with an awful lot of lithium. But it’s big. Therefore it has that hallmark of something that may ultimately be of interest to Rio Tinto. And we sort of sequence around the world looking at equivalent sort of scale deposits and opportunities. And also trying to imagine what else could be here.

***“Robert Friedland isn’t interested that Kamoa is discovered on the wrong side of the copper belt in the wrong stratigraphy. In fact, he and his teams are most excited about being in the wrong place...”***

Again this issue of being, maybe trying not to be as fixated on models as some people have been. Robert Friedland isn’t interested that Kamoa is discovered on the wrong side of the copper belt in the wrong stratigraphy. In fact he and his teams are most excited about being in the wrong place, but again being led by the data. What could be there versus you are in the wrong stratigraphy.

***“...we’re trying to put that sort of tension in with the teams... Just to rethink those issues around: what do we know? What do we think we know? And what don’t we know? I would say our geoscience friends maybe are not always fully honest... around those three categorizations.”***

So we’re trying to put that sort of tension in with the teams as well every day. Just to rethink those issues around: what do we know? What do we think we know? And what don’t we know? I would say our geoscience friends maybe are not always fully honest with ourselves around those three categorizations. In my head, I always like to take it back to those sorts of things. Again talk about well let the rocks speak. What does the data say?

**I want to go back to a point you made, which is quite an interesting one around risk. It sounds like in some ways you have to be risk-averse as a big company in certain areas – like jurisdictionally and legislatively and things like that. But that allows you the opportunity to take on more technical risk. Would that be a fair way to say it? That you’re trading off that risk profile, essentially from one side to another?**

Look I think it’s always a hard one. Every single deposit, every single business opportunity will have its own very specific characteristics. If we think back to the ’80s, the early ’80s, and you think about the decision by BHP, ourselves and the Japanese to enter into Escondida at a time during a period immediately after essentially a military dictatorship. I think a lot of people in the industry probably thought we were a bit crazy. But neither, none of the parties were betting the company on the opportunity but they could see the geological opportunity was great, that the business conditions on the ground were improving. Whereas if you’d sat outside the country, maybe that wasn’t very obvious to people.

So I think one of the most important things is you need to get into certain places, especially countries in areas that are changing and understand that. Because it’s not always the same when you sit outside and you see it maybe in a too sort of rolled up strategic fashion.

**Yeah, that’s right. But you as a company can definitely make a bet on whether you go long or short on which way the country is going to go, or regions or things like that.**

Correct. I think also we have the luxury that we can let the explorers go out there and test the operating environment in these countries and understand if we find something, perhaps in the non-OECD or some more difficult countries, we know what it takes to operate there. What we can then do is make a judgment. So could Rio Tinto, so there’s one thing for the explorers to be able to oper-

ate in certain places safely. But there's another thing to make a large investment and say that the company also would be able to do well here. I think we can make those sort of judgments and therefore make an invest or not invest decision. It gives us sort of a very strong knowledge base to work on. It sort of becomes an advanced guard if you like that we can we can use. And we do.

**I guess the reason why I asked that question is because I guess to me it seems like your competitive advantage in the risk space is the fact that you can take on more technical risk than other people. And I think the criticism often against big companies is that they are risk-averse. But I think that's incorrect. Because your competitive advantage is in the technical risk, which you probably don't broadcast as often or it's not easy to unwind as easily as the next company going into the Central African Republic and opening up a new mining belt. To me, it always seems like it's a misunderstanding from the market in where your competitive advantage in the risk space actually sits.**

***"...within the exploration portfolio, there is a bell curve of risk."***

And look I would agree with that. Because the size of the budgets that we have, even within the exploration portfolio, there is a bell curve of risk. From things that are relatively low risk but we then get to probabilities. And to things that are higher technical risk and higher sovereign risk, and a bunch of other ones. But you don't again put all of your bets on the one corner in that space.

From all of those, whether it's different commodities, whether it's different geographies, whether it's different geology, the organization learns. I think one of the most important things is that we have an organization every day that goes out and is hungry for success and is doing stuff and a lot. Today we would be drilling, we would have the most projects being drilled probably nearly in the last two decades. A lot of people would probably be a little bit surprised by that. They hear about one or two, but we have a lot of other activity going on around the world. It's encouraging but it has taken time to sort of rebuild and restock the pipeline after the impacts of the global financial crisis. So my sense is we're now in a pretty good place.

**I think that post GFC hiccup that essentially the whole industry went through, I think one of the good things that Rio Tinto ended up doing and your group ended up doing is that you didn't shed a lot of people at that time. You tried to retain as many as you could, and you**

***“We basically took the view that the brains trust within the organization would be almost impossible to reassemble... What we did do... was basically let go opportunities in the pipeline...”***

***We also let go a large part of our execution team and that definitely showed. When the world of exploration kicked back up... our safety performance was poor”***

***“...we’re probably at a point where we have the most diverse team...[and] I would say, we’re the better for it.”***

**did it at the expense of projects. Because I think if you lose a group like that, it is almost impossible, nearly impossible, to build it together in a short amount of time. Yes, you give up the part that you don’t have a great pipeline, but at least you have the people and you keep the company legacy or the information at least. And you don’t lose that.**

It was a very conscious decision. And a difficult one, but a very conscious one. And you’re spot on. We basically took the view that the brains trust within the organization would be almost impossible to reassemble when you think about the experience that sits today and sat within the team at the time. What we did do, as you say, was basically let go opportunities in the pipeline. We also let go a large part of our execution team and that definitely showed. When the world of exploration kicked back up in 2011 and ’12 and we got busy again, our safety performance was poor – because we’d actually lost the people that know how to go and run projects. Yes, we had a large part of the brains trust intact but not the execution arm. So we had to go out and rebuild the execution capability. I think as many people have said here: exploration is an absolute team sport and just having the brightest smartest people is insufficient. You need a well-balanced team to take to the field. And again I think now, we’re at a point where we’re very comfortable with that. Interestingly, we’re probably at a point where we have the most diverse team, whether it’s on the basis of gender or ethnicity. But also on the basis that a lot of the team has come from other companies and have backgrounds that are not just CRA, RTZ, Kennecott. I would say, we’re the better for it.

**We’ve talked a fair bit about people so let’s go down that thread for a while. Exploration by nature or quite a lot of things in the innovation space, which also somewhat sits under your corporate mandate, how difficult is it to manage a more creative side of things in an organization that effectively runs on some level of systems or some level of process? The interesting thing I find is something like the startup team that you’re developing. Is that an acknowledgement that there has to be a somewhat of a different model to allow those type of creative endeavours or innovative endeavours to occur in a large organization?**

Yeah so look that’s a great question. I think you let me come to maybe the ventures part of that first. We established Rio Tinto ventures when Jean-Sébastien became

***“the aim of [the Rio Tinto Ventures] team was to very specifically look at the minerals and metals of the future, to be a more nimble commercial team...”***

CEO in 2016 and the aim of that team was to very specifically look at the minerals and metals of the future, to be a more nimble commercial team and it was around the concept of building a portfolio of businesses that actually individually may be deemed subscale, but collectively would have the attributes of let's say one of the product groups that we have today. Therefore, they need to be in growing industrial sectors, the potential to be high margin businesses, long-lived obviously - preferable for a company like ours. That sort of takes you to battery technology, lithium obviously. So Jadar, the deposit in Serbia, actually reports through the managing director of that ventures group, which is great because it gives us an owner inside the business that's very passionate about trying to grow that. And so that team is very clearly mandated to go and just scour the world for those sorts of businesses. The exploration group works closely with them to help both provide insights and new concepts, and identify opportunities that are with third parties, and then also to help vet materials.

**Is the ventures team allowed to run slightly differently than say that the rest of the organization?**

At the current time, in terms of agile, nimble, all of those attributes, should you find something and then bring it into Rio, you're clearly coming inside the perimeter of the company and those things are going to have to obviously align to all of the high-level corporate requirements around the way we work and values and behaviours and all of those things. But again, I think there's an opportunity to run a model of a business inside a business. A new way of working that maybe is a little bit more focused on organizational structures of the future, as opposed to the current. I won't say the past, I'll say of the current. And so there's opportunities for us there. I think that when we then think about how you run the exploration group within Rio Tinto, it's not the only group that we need to think carefully about that we don't kill off the more innovative parts of that organization through sort of the normal processes that we might drive within our big businesses.

It's always about balance. Again, I know you've talked about it on your series but Rio Tinto has only one reputation. We can't have the explorers lose that for us. So we need to be very clear around the red lines for that group. But beyond that, you talked about technical risk, all of those things, this is your part of the business. You don't need to conform to other operating practices in your perimeter. And therefore, what are the metrics that we will

use to drive the best performance for you are absolutely not going to be the metrics that work for a big product group or an operating business unit.

**Is that recognition of the fact of your organization maturing and how you can handle having an exploration team or ventures team, or these kind of somewhat disparate business processes which may not fit perfectly in the mainframe. They are slightly outside. So is that a recognition of the fact that you as an organization have to mature to find other ways of allowing these groups to work?**

Yeah, it's an interesting one. Because what would we probably say is that actually, the rest of the organization in certain areas is moving more towards the exploration model. If we think about the profound challenges and opportunities in digitalisation of our industry and of digital disruption, and if we use the construct of today would be what is working well in many industries as the formation of these agile teams.

Where people get a lot of things wrong around agile, is that agile doesn't mean making it up. Actually, agile runs very tight processes. But you have this whole concept of failing fast or deliver quick, and minimum viable products and scale fast.

**That's like the lean startup model really.**

Correct. It's very driven to that, and that really are many of the attributes that the exploration group already has. So actually, we're probably been running agile for nearly two decades and just didn't know what to call it. And so it's an interesting one where we're now needing to shift large parts of our organization to that more agile mindset and change the cultural behaviours in the business. Break down the barriers that exists between the siloed technical and functional teams across large companies like ours. We're working hard on those on those areas. And it's interesting because my accountability looking after Rio Tinto's growth and innovation organization is, we talk about five buckets that in essence I'm accountable for: so we say Find, Study, Build, Optimize and Close.

***“So actually we've probably been running agile for nearly two decades and just didn't know what to call it.”***

So in the Find bucket, they've got their own operating model, which is, as I said, is probably described as agile. In the Study organization, you've got a group of people that are expansive thinkers. They basically want to take opportunities and go broad, what are all the things we

could possibly do with this opportunity and then bring it down to the one thing that we will take into feasibility study.

**That's right. The most realistic option really.**

The Build group, you know this is execution, par excellence. This group takes the outputs of the feasibility study and they deliver. And whilst there's some really extraordinarily creative things that they do in that, it's more of an army-like kind of process. You know very driven, very procedural – which is necessary.

**Which they have to be.**

Which they have to be to deliver projects on time, on budget. So it's interesting because we get the luxury therefore, to think about what is core and common to all of these various teams.

You know, the Optimize team has our normal technical support types of group. It has our data analytics team, it has all of our IT globally, it has our centres of excellence for service mining underground and processing. So it's a really large and a serious technical capability inside those teams. But again, they have a whole range of different mandates. From being subject matter experts that support, let's say, major hazard risks in our organization, all the way through to people that are doing the latest in data science, or running our networks globally, or all sorts of other things.

And then obviously now with a Closure organization. And I think what that brings, if we go all the way back to Find and Study and Build, we now absolutely need to be thinking also ultimately about Close. So how do we, you know, how do we do that much more successfully than we have in the past? And again what we do therefore is, you move from teams that are working on productivity stuff in the data analytics space, who are in the moment helping to optimize that plant. Or in the IT group, which is a 24/7 follow the sun organization. You know their network has to be up all the time. Through to a team thinking at the start about starting a project and thinking in forty years' time about ultimately closing it.

So you're scaling from in the moment, in the sort of the minute, the hour, the day all the way through to something that happens in decades of time when we ultimately bring something to a close. And I think it is actually one

of the privileges in the organization to be able to span that and move backwards and forwards through it. And actually, I think for the first time, we have a much more cogent view start to finish.

**Whereas before you think it would have been somewhat siloed in the way that it was done?**

And I think inevitably. Most mining houses ran federated models for most of their history as we did. We really only started experimenting with that sort of corporate functions in globalizing parts of our business in the early mid-2000s. Yes, we're now going through operating model changes to think to try to bring that networked model matrix organization to really to life.

And you know it's challenging taking organizations that were very driven through the line and trying to sort of break open in certain areas and have conversations that sort of cross – especially technical functional areas. I don't have an answer for you on what good looks like. You know we're right there, we're in the midst of that change. But already, we're bringing people together that historically never talked and communicated, and suddenly we're having these profound conversations. And I think for me, it's probably one of the most exciting times of my thirty something years with the group, that we're actually starting to see these conversations take place.

**I guess I want to take the lead from your point there about that a lot of this involves dealing with people in some sense. For a long time, mining has been about having domain experts that have the depth of knowledge in certain disciplines. But it seems like we're now moving where you have to have depth of knowledge as well as breadth of knowledge over a few different disciplines so you can then interact with people along the side. Do you see that change coming as part of your organization or people that you deal with?**

***“I don't expect to see the demise of the subject matter expert. But I think how they interact with an organization must change.”***

Yeah, look I think there's two parts to that. I don't expect to see the demise of the subject matter expert. But I think how they interact with an organization must change. We're spending a lot of time and effort on technical excellence, as we would call it. And actually going back you know and maybe it is sort of back to the days of WMC that have been talked about or CRA, we're putting a lot of investment in people's technical careers. But what we want to do is build an organizational construct that allows them to be valued for who they are, for the domain

expertise, but marry it up to people that can actually take that expertise and really do something with it. And scale it. In a way that we probably have not done or we have not done in many cases in the past. And I think that does take you to those principles of sort of agile teams, multi-functional teams. How do we bring the best of the whole organization together?

**So in saying that, if the view is that you're going to have to have more rounded people in the way they interact with the different disciplines and not just within their discipline, so there's a training component there that has to come in as well. And how do you train people that are likely going to work in organizations like this in the future. Who do you think has to take responsibility for that? So do you think you have to have skin in the game in this or do you think it's something that universities or professional organizations or something else have to take on?**

Oh, I think it's going to need to be again a sort of an ecosystem approach. I think the company's going to need to describe what is the constructs that we expect people to work in. What are the behaviours that we expect to see? We know cultural change is required here. And we know that's actually one of the most profoundly difficult things to do in big organizations is to shift culture. So I think we're on a journey. I certainly don't have all of the answers.

***“...one of the most profoundly difficult things to do in big organizations is to shift culture... I certainly don't have all of the answers.”***

But what I can say is that we are already bringing routinely multidisciplinary teams, truly multidisciplinary teams together, we're getting the best results by far with the richest insights. And in some cases, 'Aha moments' that we didn't expect to necessarily get. And when I say really broad teams, these are teams where we would have individuals that people would never have expected to be in the room with them, and therein lies I think the value. So just bit-by-bit, you know, we're starting to see that. I think a technical organization can conceptualize the importance of data and data analytics. So I think that one's an easy one. But perhaps some of the softer issues, traditionally, are the ones where actually we're getting some of the more profound thinking coming through.

**Yeah and I think innovation is often thought of as technology. But you could be innovative in how you retain people, you train people, how you allow people to interact in an organization. There are ways that you could innovate as well. It doesn't necessarily have to be al-**

***“[Innovation]...it’s probably least about technology... it’s about the big sort of profound changes to operating models, the way that we work, the way that we frame the problem.”***

**ways just going to take the coolest piece of technology that we have and try to use it.**

And look I think that’s absolutely right Ahmad. It actually it’s probably least about technology. If we’re really, really true and it’s about the big sort of profound changes to operating models, the way that we work, the way that we frame the problem. Throwing tech at things is okay, but you know what is the business problem you’re trying to solve? And I think one of the most important things is, what is the question we’re truly trying to answer? And making sure we’ve really defined the problem statement as well as we can before we go to market for the solution.

**I guess one of the things that often comes up is that when you work in big organizations, there is this asymmetry in the risk you’re allowed to take and the reward that you get for it. Do you think that somewhat has to change where if you allow people to be a little bit more, you know ‘walk off the beaten path’ and try different things? Is there have to be a recognition that you have to change the risk-reward thing as well?**

Absolutely. And you know I think we understand that we need to move this. And again we’ve sort of used the construct of sort of agile processes and the concept of fail fast. Big organizations because of sort of the reductionist approach to risk, get to the point where failure is not an option. Therefore we spend an awful lot of time on the reductionist side to try and get to the sort of the zero risk moment. And often they don’t exist you know. So I think it’s a little bit of a fallacy.

***“Big organizations because of sort of the reductionist approach to risk, get to the point where failure is not an option... we spend an awful lot of time on the reductionist side to try and get to the sort of the zero risk moment. And often they don’t exist... I think it’s a little bit of a fallacy.”***

And so what we’re trying to do is walk back to, what is actually the best thing? What’s the best option ahead of us, even if it carries some risk? But what we need to do is describe it, to be very clear what that is. And work out you know how can we test some of the opportunities in front of us in a way that you’re not going to break the business. So I think trying to unpack the problem a little bit more, rethink again the problem statement. And again in the larger organizations that expressed itself during the China-led boom where we sort of ended up with a range of mega projects, huge amounts of work done on those projects, with a view to reduce risk. But the issue is because you went big, you actually were compounding risk.

And so, I think again what we now think about is right sizing all of the future business opportunities. So that ac-

***“...right sizing all... future business opportunities... [because] in getting its size and scale right up front, you may forgo some value. But that value may have been illusory because it actually came with even more risk because of the scale at which you were trying to deploy.”***

tually in getting its size and scale right up front, you may forgo some value. But that value may have been illusory because it actually came with even more risk because of the scale at which you were trying to deploy. So bring it back to things that are right sized, you then put the right incentives in to try and deliver that as efficiently as you possibly can. And no matter what it is, whether it's a new project, or whether it's an IT project or others. And I think, trying to rethink that. But again, we've got a lot of artefacts in our business that sort of push us back towards the risk reductionist piece. We need to continue to work to make sure we get the balance right. We're not going to just suddenly switch all of those processes off and go free for all.

**And neither should you. Because I think the fallacy in this space is people go “well, we need to change, so we're going to change tomorrow.” And I don't think that quite works. You can't just throw everything else that you've been doing in the past or the present out and go, ‘Well, now tomorrow, we're going to do something completely different.’ You can't sink the company that way. There has to be this kind of tension between what do you do new? And how long do you maintain the current and the old? And then there's always that tension, I think.**

And I think also one of the opportunities that sits in front of us is new projects, so you know new discoveries. As you go through the evaluation stages of a new discovery, well you know you have an opportunity to do something a little bit different to address some of those issues. So how can we go a little bit faster? But make sure that in going faster, we're not actually setting ourselves up for failure by missing certain things. And in that giving people permission to take on more risk without necessarily all of the checks and balances that we would want normally have. And I say that always with the caveats of safety and behaviours and those sorts of things, we don't leave those at the door. They are non-negotiables.

**Yeah, I think that's a very valid point. I mean, I think the point you've made which I quite like is that it's not so much the end product that you want to get to. You have to have some level of being okay to iterate along the process and know what works, what doesn't, and then see how you go. People always think about it as end products. They think, ‘Where we are now is not good, but where we want to be is in the future.’ But they missed the twenty-five steps, or could be five steps,**

***“Bring not only the latest technology, but also bring the latest thinking about people...”***

**could be twenty-five, could be fifty steps in between. You’re gonna have to go through those steps to get there. You can’t just go A to B without doing anything.**

And I think the good news is, you know it’s exciting. Because what we also can think about, at the end of last year when we announced our investment in the Koodaideri mine in the Pilbara, you know the intelligent mine, which is sort of the next logical steps around automation. And thinking about the mine of the future, and therefore the next thing that follows will be further again down that path about actually rethinking completely aspects of the value chain. How we actually construct and operate mines of the future? Bring not only the latest technology, but also bring the latest thinking about people into this. How you can really create a different culture inside these new organizations that you construct. And I think that’s really one of the most exciting things being in this group. As I said, because we span all of those component pieces and we’re able to help bring all of that together.

**You get to play with the full value chain now, so you can take solutions from the end. I mean maybe the best way is that the closure team dictates how you say do studies. So rather than leaving it at the end, to solve a problem, you solve it right up front. I mean, I think that will be a good outcome if you do it that way.**

Absolutely.

**So we end our interview with two questions. The first one is, what is something that you think needs to die in mining? It could be an idea, a concept, a behaviour, anything that you think we need to jettison out of the industry.**

***“For too long in my career, we saw the really siloed thinking in these businesses... I think we’ve lost so much in that as an industry.”***

So look, I think I’d probably go for the behaviour piece. For too long in my career, we saw the really siloed thinking in these businesses. You know I think we’ve lost so much in that as an industry. So I think again as I said, when we now look at these multidisciplinary teams, and everyone is in the room, and they have a role to play. And so we have the full respect of all of the technical and functional disciplines in those rooms. What we get out of it is so much better than what we get individually.

And so I think one of the behaviours that this organization is, of this industry I should say, is really to embrace that networked model to bring everyone on this journey and get all of the voices, and particularly the quiet voices

in the room, and make sure we hear from them. Not just the alpha males you know as it was historically unfortunately. And I think if we can turn that, because what that then means is, ultimately we become an industry that will attract, engage and attract a broad and diverse base of people to join us, which will ultimately help and if you like the industry's survival. Because we need to have a different face to the public, to our stakeholders than we do today.

**Yeah, and I think as an industry, I mean it will be a healthy sign if we accepted that maybe a lot of metallurgical problems that we're currently having could be solved by someone that's not a metallurgist and maybe they might have solutions. It could be a data scientist. It could be anyone in that space that could do it. And I think it'll be a really healthy sign if we get to a point as an industry where we look for the right solution, not necessarily for the person that has the job title that will be able to solve a problem.**

And look absolutely. And so you know, for me I describe it is as 'work the matrix' as opposed to 'kill the matrix'. Let's really reframe how we do this and really make sure that it's not just lip service that we really want to be in an inclusive and diverse industry as we move forward.

***"...it's a sense of adventure and pioneering. I think we spend a lot of time actually talking ourselves down as an industry... Yet when we look at some of the things that this industry does... there are just some amazing things that we do as an industry. And we are absolute pioneers. We have been for centuries..."***

**So conversely, and last question, what is something that you think we should maintain in mining at all costs. Again can be an idea, behaviour, concept, anything?**

Well, for me, I think that's always been a really simple one. And I think it's a sense of adventure and pioneering. I think we spend a lot of time actually talking ourselves down as an industry, notwithstanding what I just said. Yet when we look at some of the things that this industry does, and the places that it does because we always have to take people and technology to where mother nature has hosted the minerals and metals. In that, there are just some amazing things that we do as an industry. And we are absolute pioneers. We have been for centuries. We need to be to continue to you know to supply the minerals and metals that are essential to human progress. And it's a fantastic industry. There's no time in my thirty-two years with this group that I've regretted being in this industry, and I think that we really want to get people to buy back in to that and really become advocates for what we do.

And we know we've got some profound issues ahead

of us: whether it's around energy efficiency, or climate change, or environmental issues. We can solve these. We've been solving these sorts of issues and we can solve them into the future and be a part of the solution, not a part of the problem. So I think just that really making sure that people you know grasp the mantle and really do promote our industry I think is a really key one.

**I think that's a pretty good spot to end on. Thanks a lot for joining us, Steve. This is great.**

Ahmad, it's been my pleasure.

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