PODCAST TRANSCRIPT

Talking Research – Q2 2024 Update

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Katie Boyce: During the S&P500's most recent earnings season, more companies mentioned artificial intelligence than ever before. That's hardly surprising, given its prevalence in the headlines and indeed, many people's daily lives. We've all read the stories, listened to the podcasts, about how it will change the world. But what is arguably more pertinent right now is how that transformation is actually taking place. Through meetings with companies that include Nvidia and TSMC and California, ASML in the Netherlands and Infineon in Germany, the team at Walter Scott has been interrogating these businesses on the challenges and opportunities for those operating in the AI and semiconductor ecosystems.

Hello and welcome to *Talking Research*. I'm Katie Boyce, an investment writer at Walter Scott, and this podcast is an opportunity to hear directly from our Research team on what they've been up to and the topics at the forefront of their debates. Today, I'm delighted to be joined by investment managers Tom Miedema and Jamie Zegleman. Both are seasoned Walter Scott investors, having been at the firm for 17 and 16 years respectively, and they've both rotated around all three of the regional teams. In recent weeks Tom and Jamie have been out on the road meeting with a host of companies in the US and Europe, many of which are closely connected to the AI story.

> Before we get started, a reminder that the podcast is intended for investment professionals only and should not be construed as investment advice or a recommendation. Any stock examples discussed are given in the context of the theme being explored, and the views expressed are those of the presenters at the time of the recording.

So… Tom, Jamie, welcome.

Jamie Zegleman, Tom Miedema: Hi, Katie. Hi, Katie.

KB: It's been a busy second quarter of 2024 both in markets and within the team. It's obviously a huge topic, with Nvidia having recently taken the world's most valuable company title. Tom, you met with the company in California. Perhaps you could tell us a bit about that?

TM: Yeah, of course. We met them too long ago in California, as you said. We also actually met them the year prior, so we've been following Nvidia for a long, long time. You know, obviously it's a very important company in the kind of tech ecosystem.

KB: What is it about Nvidia that is so crucial to the AI story?

TM: Okay. Well, Nvidia started off making GPUs, or still makes GPUs, but it started off really as a maker of gaming chips. Those chips were found to be very, very useful in machine learning and kind of the early development of AI, but they're also exceptionally useful for training large language models, which are the centre of the kind of AI boom that we're seeing right

now. And so, yeah, they have an incredibly dominant market position in selling those chips, as well as lots of other components of the ecosystem that you need to have for building the data centres to train those models.

JZ: And the software in the background as well. So they've got a very strong position in the programming software language that is used on these GPUs.

KB: Who else did you meet when you were on the West Coast?

TM: Actually, the main reason for the trip was to meet with TSMC (or Taiwan Semiconductor). And we met with Applied Materials, another kind of company in the semiconductor space, as well as a range of other companies. So we made use of the journey across. And we spent half a day with TSMC which was really interesting. They were also trying to talk about AI, trying to grapple with just how much demand that this will create across the hardware space. They are the main chip supplier into Nvidia, but also AMD [Applied Micro Devices] and Apple and many, many others who are also trying to look at what they need to produce going forward.

TSMC also spent a lot of time trying to determine how much capacity they should build, because, ultimately for them, their customers can dream about how big this market could be, but TSMC ultimately have to decide how much physical capacity to actually build, because if they end up building too much, then you'll have empty factories and lower profits, and that will be a challenge for them. And the final thing is how much to charge their customers. So the different dynamic in AI and these chips is that for every wafer, every set of chips that you produce, these chips are incredibly high value relative to the normal chips for a smartphone or for a PC. And so TSMC's wondering how to extract the maximum value from these customers.

JZ: I thought it was interesting when you returned talking about them trying to manage that capacity expansion. But, at the same time, the demand is currently outstripping supply and so they almost can't keep up. So there's a balance between making sure you've got enough physical capacity on the ground that you can satisfy demand as efficiently as possible, but then you don't want to get caught out by overextending, especially when you're talking about billions and billions of dollars to build one of these fabs, and now having to do it in, not just in their Taiwanese heartland, but also now in new markets like in Arizona, in the US.

KB: And capacity seems to be a perennial challenge, not just for TSMC but for various other players, for example, the vast data centres required to power so much of this technology, the potential rate of expansion just seems beyond the realms of possibility.

TM: No, absolutely. I mean, it's such a fascinating time. What we're really talking about here is building data centres to train these models, at least initially. You know, the next stage will be using them for inference or when these models actually come into full scale production. But at the moment the race is on to build these huge data centres to train the models. So yeah, for the last generation, you're talking about using 10,000 Nvidia chips in one big data centre to train your ChatGPT or your GPT-4 type models. For the current generation that's under training, you're talking about more like 30,000 or even 100,000 GPUs.

And then you get into constraints around how do you physically get the amount of power, electricity into those data centres? How do you scale up all the other things you need? You need plumbing, you need electricians, you need all these people to build these data centres. We were in Texas pretty soon after being on the West Coast. And that was the challenge. You know, Texas is one of the hubs where they're building these data centres. They're also building chip manufacturing plants there. So we met with Texas Instruments as part of that too. And you can just see that activity there and the strain on the resources of all different kinds. So it's not just TSMC, it's a whole ecosystem of different players trying to keep up with the demands. And if we can fast forward where these models are at the moment, doubling in terms of parameter and scale every three to four months, you start getting into some interesting numbers pretty quickly.

KB: You referenced Texas Instruments. They're a major producer of analogue semiconductors. Jamie, you also met with another business, Infineon, in Germany last month. Despite all this semiconductor, AI excitement, analogue has had its worst downturn since 2008. What's been going on there?

JZ: You're right, this is one of the longest down cycles in the analogue semiconductor industry since the [20]08 crisis, and it's kind of driven by a couple of things. I think that, first and foremost, it's just there was a huge spike in demand during and post Covid as we all went out and bought more electronic equipment, many of which require analogue semiconductors. Infineon is particularly strong in power semiconductor management products, which are used in basically anything that is electrified from your smartphone charger right through to electric vehicles or renewable energy.

But because there was such a big expansion in demand, we're now seeing the other side of that. And there's obviously some excess inventory in the market. Half of their business is going into the automotive industry, particularly electric vehicles is a big growth opportunity for them. You use a lot more of these semiconductors in an electric vehicle than you do in a traditional vehicle. But other just general electrification of vehicles as well is very helpful. And the other 50 odd percent of the business is going into industrial activities.

And you've just had both markets coming under strain at the same time. So for electric vehicles, it's been a bit about the lack of new models out of Tesla, for example, and the models being released by some of the auto players in Europe, just not quite gaining the traction people were expecting. And so you've seen a bit of a slowdown. I think there's been a little bit of a pullback in the hype around electric vehicles of late, but something that Infineon think will turn as we move into 2025 and you see more models coming back to market and some of the digestion of this inventory.

And the industrial side of things, it's much the same. So you've seen a lull in industrial activity around the world and you've got this higher level of inventory. So it's not an ideal situation. But we know that this is a cyclical industry historically. And the outlook for these areas and the use of power semiconductor tools and power semiconductors is still very strong.

TM: As you say, Katie, this is a big down cycle here. And all those nuances that Jamie talks about are entirely correct. But

if you zoom out to a much higher level and you look at overall demand and take out inventory corrections and the nuances of different markets like EVs, there's a strong link between logic – which is your processors like your Nvidia processors, your Intel processors memory, your storage capacity, and analogue – which is your power management, your sensors, etc. Every system, if it's a car, if it's a data centre, if it's a PC smartphone, it includes all three kinds of semiconductors.

And when you look at the longer term cycles, they tend to go together pretty tightly. And so today we're seeing logic and memory really recover very sharply from their downturns. But analogue is trailing by a bit. If you do look at that big picture, it's inevitable that analogue will follow and ramp up out of its current down cycle and enjoy some of the benefits the other parts of the industry are seeing today.

KB: Going back to some of the comments you've both been making, the obvious question seems to be about the scalability of all of this. There's a huge amount of investment being spent on AI, but beyond the obvious names like Nvidia, who will be the winners long term?

TM: Yeah, I think it's the super question. Clearly there's going to be a lot of beneficiaries. But I think you're right. I mean, it's going to be players who have got the capital. There's a lot of different areas. You know, I think people are laser like focused on Nvidia. It's the easy go to option for AI, but there will be so many other beneficiaries. It requires scale to play this game. So you know your incumbents, your Alphabets, your Microsofts etc. are extremely involved, building up their cloud infrastructure to build these data centres for training, but also for the next generation.

Looking at inference, you're going to see other hardware vendors. So the PC market, the smartphone market, these guys are getting very excited about big refresh and upgrade cycles for what they're trying to do. Microsoft just announced a new Copilot PC. So it's a high spec PC that allows you to have AI functionality on PCs. This gets the PC infrastructure very excited. Apple just announced their new Apple intelligence setup that needs your latest Apple processors to run it. And so again, you're going to have a potentially a big smartphone upgrade cycle if you want to have smartphones capable of delivering light and miniaturized AI models on the edge on device. And never mind electricity providers, infrastructure providers. It's going to be a lot of beneficiaries, particularly if the world is kind of speculative dreams of OpenAI or anthropic, and these guys really kind of comes anywhere near to being accurate.

JZ: I think what we've seen so far is it's all been about infrastructure buildout. So all of this investment to date is going into data centres to train these models. More chips, more servers and everything that is required to facilitate that. But the really interesting question is: well, okay, but what's the ROI on all of this? Who's going to make money on this huge investment? Billions and billions of dollars that's going into the ground at the moment. The infrastructure players are doing very well right now, but ultimately people are making these investments because they think there are future gains for themselves.

So speaking to a company like SAP was really interesting whilst I was in Germany.

I think they're probably very well positioned because their business model of providing ERP software to enterprises taps them into a very attractive data set. They are now looking to build applications that will sit in their software platform, that their customers can use to identify patterns, to identify new insights from their ERP enterprise resource planning data, that should help these companies to cut costs, to drive efficiency; and the real game changer is potentially unlock new revenue opportunities. But it's going to be companies like SAP who have that unique data set and access to that unique data that I think are best positioned to capitalize on the AI developments that are ongoing. So that was a really interesting conversation with them. And the team is certainly thinking about where else there might be opportunities within other companies.

KB: And presumably SAP has well-established relationships with its customers, who trust SAP with their data rather than grant access to a new, unknown startup.

JZ: Absolutely. I think trust is going to be a big part of that.

TM: It's an interesting dynamic where again, the incumbents. You see this in a couple of different technology cycles in the past, where the incumbents again have quite a big advantage. So if you are SAP and you have thousands of enterprise clients who already trust you with their data, and you can be fast to market with bringing AI products and services to those customers, that's much, much easier. They already have the trust. You don't have to give that data someone else. And the same is true for a Microsoft or an Adobe that you have a big incumbency advantage, which I think will play out through a lot of different companies.

KB: You both visited ASML in the Netherlands recently, a company with a remarkably dominant position in a very niche market. I'll let one of you describe exactly what it does. You also had the rare treat when you were there of a tour of one of its fabs, and it would be great to hear about that.

TM: Yeah, I I can have a stab. So ASML is a leader in lithography tools. So these are probably the most critical tools in producing leading-edge semiconductors. So TSMC will be a customer, Intel will be customer, Samsung will be a customer buying these, installing them in their factories. And these tools ultimately decide how small you can make your chips. You might hear companies producing at five nanometres or three nanometres today. This is the how wide are the smallest lines that you're able to draw on a chip. That's how to think about it.

And yeah, we had a great opportunity to visit the factory. Very rare. They don't let a lot of investors into the factory. It takes quite a long time to get dressed up, suited and booted in the appropriate gear and de-dusted and prepared to go in over the over the wall into the factory. But yeah, it was a great experience.

JZ: Yeah, I mean, these are the cleanest of clean rooms, where they make some of the most sophisticated things that I think humans can produce, to be honest. I mean, Tom, how wide is a nanometre?

TM: So we're printing on silicon wafers. So a nanometre is five silicon atoms across. And so the tools that we were looking at… so we were in the production

facilities for the high end NA tools, so high numerical aperture. Those are the kind of latest and greatest machines that they have. So there's two currently with customers scaling up towards commercial production. And these allow you to get down to two nanometres and beyond. So the current generation of tools is called EUV: extreme ultraviolet. That is very much becoming the workhorse of today's leading edge chips manufacturing. But these high NA tools are €350 million apiece; incredibly complex pieces of equipment.

KB: You're talking about such tiny pieces of equipment, but from what you've mentioned, the scale of this kit is huge.

JZ: Yeah. It was my first experience of seeing one of these instruments in the flesh. And I don't think the word 'tool' really does them justice. You know, we're talking about things that are twice the size of a double-decker bus; they're huge instruments, extremely complex bits of kit. I wouldn't want to pretend that I can tell you how they all work in detail, but the point is to make something as complex as the leading-edge semiconductor chips that these instruments are helping to make, is just one of the most technologically challenging things that humanity tries to solve. It was a privilege to be that up and close and personal. And I don't think it's an opportunity that many get to do in their lifetime or in careers. So yeah, it was really, really interesting.

TM: We spent a lot of time then also talking to the investor relations team. We met with the head of the NA project, who took us in through the detail about all of the challenges. This is not an easy thing to do, to take it from where they are today to commercial production. Hopefully in a few years' time when they will be in your TSMC fabs producing your latest AI chips, you know, there's still a lot of hurdles to overcome to get that far.

JZ: And they're the only company in the world that can do this.

KB: To return to your earlier comments regarding capacity: is that a potential constraint for a company like ASML?

TM: It certainly has been. So a big challenge for ASML has been producing enough tools to meet demand at the moment, because we've had this big downturn in the semi industry, that's not a problem right now, but they're preparing for it. So yeah, we were there. They've just done a big deal to buy a lot more, acquire a lot more land just three kilometers away from the existing site. So they've done a big deal with the local government and the Dutch government to prepare for that. But yeah, they're ready for doubling the size of the footprint that they have. And that is about the future demand for these tools.

KB: Jamie, Tom, thank you both very much for joining me here on *Talking Research*. And to our listeners: thank you, goodbye.

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