Deloitte.

The Deloitte On Cloud Podcast

David Linthicum, Managing Director, Chief Cloud Strategy Officer, Deloitte Consulting LLP

Title: **How companies are leveraging cloud to help ease the semiconductor shortage**
Description: Semiconductors aren't normally hot news. However, the recent chip shortage has them front and center—especially since they power the machines that power cloud. In this episode, David Linthicum talks with Deloitte's Brandon Kulik about the state of the semiconductor industry—how it's leveraging cloud to move faster, and how hyperscalers are beginning to manufacture their own chips to meet demand. Brandon also discusses new players in the market and what the future holds for the industry.

Duration: 00:25:25

David Linthicum:
Welcome back to the On Cloud podcast. Today on the show I'm joined by Brandon Kulik. He's a principal at Deloitte Consulting Technology, Media, Telecom, and Industry practice and leads the semiconductor industry segment. He has more than 20 years of experience helping technology companies transform their businesses. He brings together a broad array of market strategy, operational talent, and technology solutions. He's also a thought leader in artificially intelligent systems, internet of things, cloud, and customer industry disruptors. How're you doing, Brandon?

Brandon Kulik:

I'm doing great. Thanks for having me.

David Linthicum:
That's quite a list of things you know, so tell us how you got here at Deloitte and what you've done in the past and why you're focused on semiconductors now.

Brandon Kulik:
Sure. Sounds great. So, I actually began my professional career in the United States Army as a West Point grad. I was fortunate enough to become an armor officer, so that's tanks. And I served for five years. I left as a captain, and there's an industry that recruits junior military officers, and, so, after interviewing, I think, with over two dozen companies, I came to join one of the larger electronic distributors, and that's how I entered into the semiconductor space. So, I spent a good number of years working with OEMs and contract manufacturers, the companies that assemble different electronic components, and during that time came to be introduced to Deloitte. I joined Deloitte and worked most of my career serving technology companies in and around growth and sales and marketing and the customer side of all the things that tech companies tend to do, including semiconductor companies.

David Linthicum:
So, semiconductors—actually we were talking about that prior to the recording. I know little or nothing about the space having worked around computers pretty much all my career, as far as how semiconductors are created, the innovations behind them, and the process it takes to make that happen. I know it's fairly complex, I know it's changing a lot in the last two or three years, so how are we defining the semiconductor space?

Brandon Kulik:
Sure. So, the way we look at the industry is the companies that design, manufacture, and test the semiconductor chips themselves, but they're also the companies that provide the equipment that makes the semiconductor companies, the companies that provide the services to those equipment makers, and to the factories, and to the companies. That includes design software companies that are part of it, and all of the kind of way points in-between of the industry, as well as the materials providers. So, it's a fairly diverse company, although there are a handful of brand names that you think about, but we look at it as a much more kind of diverse, and integrated, and interdependent industry.

David Linthicum:
So, I noticed that everybody realizes that semiconductors are much more important than they thought when there was a shortage of them. Suddenly we can't get cars, we can't get games, can't get appliances, can't get a lot of things that we need that are kind of critical to lots of the way in which people live. So, what other changes have occurred in the last few years around semiconductors? I know people are more aware of them now, but where has the technology been going? What are the trends?

Brandon Kulik:
Sure. Everybody reads today about the supply shortage. It's in all of the headlines. It's impacting the global supply chain. There's conversation around inflation linked to that shortage globally and certainly here in the US, but the industry is a lot more than what you read about in the headlines. So, the industry's been going through what I like to think of as a kind of a once-in-a-generation change, and that change began before COVID, before the supply shortage.

We recently did a survey of 40 of the top industry executives around transformation, and we asked them to what degrees are you transforming, and what's driving that transformation. And we began that survey before COVID, and the responses were—more than two-thirds of the companies that we interviewed were either in the middle of a major change in the way that they operate or go to market or the way they manage their teams or are structured or were planning one within the next 12 months.

So, the industry has realized that it needed to change some factors that are driving that. The industry's continued to consolidate, so mergers, acquisitions, divestitures, restructuring has been a big component of it. And driving cost down has made that a consistent theme, so that's not new; it's just been more emphasized. But, also the diversifying needs of the industry as forces like IOT and AI and 5G and the ecosystems around that and new vertical industries have created new demands for these companies.

And then another force that's driving change is the fact that there are companies that used to buy semiconductors that are now designing and integrating those semiconductors into their own products, and, so, some of the biggest retail consumer electronic name brands, but even automotive companies are starting to consider, and some already to put their own chips into their own devices. So, it's new kinds of companies that are entering into the fray. And again, these forces around the diversification, the verticalization, the consolidation are all contributing to major changes. And then COVID and the supply shortage accelerated a lot of what was already going to happen and made it a lot more urgent in order to drive the change that is needed to meet these new needs.

David Linthicum:
So, let's talk about companies actually building their own chips. I notice in the cloud industry the hyperscalers in many instances are designing, even manufacturing their own chips for their cloud systems, and they're bespoke in terms of how they are able to deal with storage systems and compute systems and do so in a much more power efficient and also multiuser and multitenant efficient way. Is that going to be the trend going forward? Are the semiconductor companies going to step up and start building those kinds of chips, maybe partnering with the hyperscalers, things like that, or is this something that's always going to be the case where they're always going to be building their own chips?

Brandon Kulik:
Well, building a semiconductor requires a lot of money and a lot of time. It's a really technical process to design and then to manufacture, and, so, there's been historically a very high barrier of entry to come in and do something like that. But the hyperscalers and other companies that have decided to do this have gotten to a scale where it's worth their investment and where their products and services are unique enough that they feel that they've got the capital to do it and the knowledge and that their customers will benefit from them owning it.

My feeling is that the shortage is going to bring a lot more interest from companies that wouldn't think about doing that and wonder can we, should we design our own chips in order to control much more of our own supply chain. I would think also the effort to nationalize and drive more supply chain resiliency is driving governments to help companies that are important to the countries that they govern to also consider this. So, I actually think this trend is going to grow. I think that the semiconductor companies that serve these customers are now going to have to work to complement some of the chips that they make and design on their own or figure out how to help them to do it better.

David Linthicum:

Yeah, and I think the opportunity's there for them to innovate at the chip level, which is something they didn't do in the past. In other words, it was about building applications and building services on top of an array of chips or an array of storage systems, things like that to bring unique services into the marketplace. If you think about it, now we have the opportunity to put some of the core AI processing down at the primitive level on the chip and have people who are purposely building chips for that purpose, and I think that may be a game changer moving forward. Am I off base?

Brandon Kulik:

No, I think you're on. I think there are a number of different increasing demands on the industry. One is just increasing need to process more data, and it's kind of geometric in terms of the amount of information that human beings are creating, and they need to consume and process. And, so, that pulls through a lot of high-performance compute, and the hyperscalers are at the core of that. And the AI that sits within the chips that serve that end is becoming more sophisticated. And that's where the higher end, the bespoke, the most complicated chips are. But another force on top of that is the need to manage and process that data on the edge. And by the edge, we mean wherever there is someone using a device, whether it is a farm or whether it is a hospital or whether it is a factory.

And, so, when you put more of the AI in the chip, and you can put the chip in the device, then the remote compute needs are reduced. So, if you need to compute and that compute is happening 1,000 miles away, it creates latency, it creates security risk. So, there's a lot more of this AI that's happening at the edge where the device is, and, so, that's creating a new generation of devices that require this, and that therein creates new and different types of demand for the industry.

David Linthicum:

Yeah, and I see a lot of startups that are focusing on this as well, the ability to kind of build chips that are designed for edge-based systems, and they're low power concentration, they may have communication which is directly built into the chip. Some of these things we didn't see in traditional processing chips, CPU chips we saw a few years ago, which is basically did processing. So, moving forward, is this an area where some more startups are going to get into the game, or is this going to be where the larger players dominate?

Brandon Kulik:

Well, it's interesting. Deloitte just released its TMT predictions, and it notes in the predictions there's a good portion of it dedicated to this industry that there's more private-equity money coming into semiconductor and funding a lot of the startups and new smaller companies and technologies than there has been in a long time. And, so, that's going to drive and accelerate innovation in the industry, which I think is a very healthy thing. So, the consolidation has made a lot of the innovation more monolithic and owned by fewer players, but I think that startups, the money that's being invested in the startups, and the promotion of that is a positive trend in the industry.

David Linthicum:

Now, is the reason that startups are able to get in there is because technology like cloud computing is allowing for them to punch above their weights and enable them to build these chips in a way that was typically only the domain of the larger players?

Brandon Kulik:

I think that the domains that require chips as they have diversified and increased, it opens doors to companies that work in these verticals that combine the software and the hardware and the business problem, the unique business problem. And that opens the door because there's a limit to the number of very specific use cases that a large semiconductor company can address as quickly as some of the startups can. And, so, all of the niches that are merging, I think, are making room and drawing in the investment and the intellectual horsepower that is needed to start a new company in semiconductor.

David Linthicum:

Yeah, and this is actually something I see is an improvement in the industry. So, in other words, if I'm going to go off as a startup, and someone who's venture funded, and I'm going to build some sort of an IOT device, say that's used in a home, I'm not necessarily limited to larger chip manufacturers to get my chips to do communications and processing and storage within those systems. I can go out to a much wider array of startups that can actually work with me to customize how these things are going to work and build a chip that's specially focused or purpose built for the way in which I'm using the chip, for the use case in general. Is that true?

Brandon Kulik:

That is true I think from a design perspective. I think it's still—there are large barriers when it comes to actually manufacturing them and getting them out to market. So, in small batches, I think you can do that, but given the supply shortage and the lack of manufacturing capacity, moving from a design element to an actual production and then deployment to the marketplace is still a very heavy lift.

David Linthicum:

Now, I know cloud computing is always systemic to pretty much everything that we do right now. I guess the chip manufacturers are not immune from that, so how are they leveraging cloud computing right now as a force multiplier to do their jobs better, to become a better manufacturer and to adapt to demand better?

Brandon Kulik:

Sure. I think there are a few different things to classify the topic of cloud when it comes to semiconductors. One way is the compute that happens in the chip and the AI that happens in the chip, a lot of that is now beginning to run in the cloud or be designed in the cloud, so you see a lot of releases from

hyperscalers who partner with the chip companies, but the cloud has created an AI capability. That AI capability is now infused in the chip. So, there's this use of the cloud in connection with the product itself.

Then there are the ways these companies actually use the cloud internally, and, so, you have your day-to-day operations, whether it's a finance or supply chain function, and all the applications that they run. And the SaaS products that they use in order to run the company are cloud native, but a lot of what is a semiconductor company, a lot of what they use is not yet, and, so, there's a trend where, beyond the product, they're using the cloud and migrating a lot of their corporate workloads to the cloud.

Another category would be manufacturing, and, so, these fabs, when we talk about the manufacturing capacity constraint, because of the sensitivity to IP and security and for other factors, a lot of the manufacturing data sits on-prem. But we are seeing the industry start to think about can we securely and effectively move a lot of the manufacturing data to the cloud, and if we do so, then we have an idea of looking maybe across our different locations, across the fabs, or across the very complex processes that exist within a fab. Can we do better at things like preventive maintenance, or can we increase our yield? Can we run analytics off of bigger data sets such that we can organize the process better to produce a better output, or can we use the cloud from a design perspective?

And this would be the last category that I'd highlight in order to design the chip or to design the manufacturing process of the chip. And, so, that we call EDA, electronic design automation. And there are companies that specialize in that, but a lot of the tools that the industry uses are homegrown and therefore on prem. And, so, the cloud can help a company run better operationally, a semiconductor company. Could help a semiconductor company design more effectively, and we will see a point at which cloud can help companies manufacture.

And then ultimately, using the cloud within your products will allow you to make better products. So, for instance, if you—automotive is a big topic for cloud. If you have a chip that's in a car, and that information is available in the cloud, then you can understand how the car is used. And if the automotive companies had a real-time understanding of how their cars were being used, they'd make better cars. And, so, there's a lot of vision around that in the industry across devices that we use in industry and in our personal lives, and I think all of that is going to trend to a much better outcome and a better experience for human beings as they engage with technology.

David Linthicum:
Yeah, and certainly as we get more IOT-based systems, more monitoring systems, and safety systems into automobiles like we're seeing now that are occurring—self-braking, for example, and the ability to have LIDAR-based detection, cross traffic warnings, and all those sorts of things that people have now in their automobiles. Get more in there, the net result is saving lives. So, ultimately this is kind of a win-win because the large chip manufacturers are able to, in essence, make their processes much more efficient and cost efficient, and the smaller players that are looking to disrupt the larger players are able to punch above their weight, so it kind of makes it a bit of a fair fight. Is that true?

Brandon Kulik:
It certainly allows for more diversity of players, and therefore I think more sources of innovation. And I think all of that is healthy.

David Linthicum:
Yeah, I think all of that is healthy. I think ultimately this is about building better systems to do a better job and to do so at a much lower—more lower cost. We've seen the prices drop significantly over the years, and also the functionality of these things rises significantly. And also, I see—and correct me if I'm wrong because you're monitoring the industry—kind of a divergence in the patterns in what we're using. So, no longer is it general processing. It's getting into data analytics, it's getting into AI processes, getting into specific IOT-based systems that base computing, rapid communication using 5G, all those sorts of things. So, are we going to end up with a more diverse world in the world of chips, or is it going to be more homogeneous?

Brandon Kulik:
I think that it will be more diverse. I think it'll be at the edges. I think the supply shortage is going to limit the expansion and diversity of the industry just because there is a funnel and a bottleneck when it comes to manufacturing, but there is a lot of investment in expanding that capacity. So, I think if you ask that same question a couple years from now, you're going to see a more diverse industry.

It will be interesting to see as these smaller players emerge and as they are able to develop new approaches to chip design and chip solutioning that you might see the bigger players start to gobble them up because there's a lot of capital that's available to do so now versus these companies growing organically and emerging and being able to stand on their own. So, that'll be an interesting trend to see how it plays out. I certainly think once the capacity catches up, there'll be more of an avenue for a smaller company to get its devices to market.

David Linthicum:
Yeah, and I think the beneficiary ultimately of the consolidation and the innovation that's going to occur around the consolidation is the end user, the consumer. Do you think that's correct?

Brandon Kulik:
I think the consumer is constantly demanding better performance out of the devices they use, and the consumer is expecting those devices to be better connected and more intuitive. And, so, the demand, what we see is that happens on a phone. The phone is more intuitive than it's ever been, but—and especially for younger device users in industry—they demand the same performance of the devices in the way that they interact with technology that they do when they have a consumer experience. So, consumer products for sure, and commercial products just the same to follow.

David Linthicum:
So, put your future-looking cap on and we're going forward two or three years. What's going to be happening or what do you predict happening in the semiconductor industry and what technologies are we going to be talking about in terms of how semiconductors are leveraged?

Brandon Kulik:

Yeah, so there are a couple major trends that I see. One is if you look at the way the software industry has evolved over time, some of the biggest names, there was a lot of protectionism. There was a lot of conflict between software companies, there's a lot of sensitivity to IP, and a lot of the software industry has opened up. So, there's been a lot more collaboration sharing, and not that it isn't as competitive as ever, but I see the semiconductor industry is a lot where the software industry was just five, seven years ago. And I do see the need for semiconductor players to be more open in their IP and share.

We talk about "Risk 5" as a trend in our most recent TMT predictions, and that's a good example where there's more—you can't use the word open source because it's not exactly the same, but a lot more of the decisions that's more available. And, so, I do see the industry as opening up and collaborating, and I feel like that openness is more necessary because of the shortage. And what you see are governments that are demanding companies to work together and share information that wouldn't otherwise do so. And, so, you saw that with pharma, with the big pharma companies through the vaccine design and development where they had to work together and share information that could be considered to be competitive information. But because of COVID, it was necessary.

I think some of that will happen, maybe not to the same degree, but I think some of that collaboration is going to happen, and we do see that there are government efforts in play to better understand the collective view of the industry to avoid supply chain shortages in the future, and especially where there are sensitive needs, which would be in intelligence and in defense. So, that's one trend. I see openness. I see openness from an IP perspective. I see kind of prompted openness from a supply chain perspective.

And then the second trend I see is integration, and what I mean by integration is a long-term desire of the semiconductor industry has been able to be better able to work upstream at the device user level. And, so, you see the semiconductor companies try to influence their customers' customers to want their chips in their products. And as we move from just the same traditional devices—PCs, servers, phones, set-top boxes, gaming consoles—and it moves to the more at-the-edge connected device in the field, the factory, the hospital that I mentioned earlier, that the software and the hardware and the user requirements are going to become much more integrated.

And you see some major names in the semiconductor industry that are acquiring software companies or that are acquiring the integration companies that bring these things together, and that is the result of a trend of semiconductor companies that don't just want to make the chip and be on a bill of materials and answer a procurement kind of RFP. They want to be involved in the design of the entire process and system, and in many cases, they already are, but there will be a much greater opportunity for that in the future, so I do see a much more kind of vertically-integrated software, hardware, and user process solution development. And that'll make the chips better because that will accelerate the visioning of what a product should do such that all the technologies can be built in tandem in more of an integrated design approach than has been more linear in the past.

David Linthicum:
So, where can we find—where can the listeners find out more about yourself and also your practice, your reports, anything you guys are publishing on the web?

Brandon Kulik:
We have a lot that's out there right now, so Deloitte.com has a TMT technology, media, and telecom page where we put out a host of different whitepapers, thoughtware. We're at all of the major industry events. And then you can find our leaders on our website, and we're published quite a bit, and you can find us on LinkedIn, and we welcome anyone to reach out to us and say hi. We're responsive, and we're excited to meet new people that are disrupting the industry, or folks that are at the core of the industry and are making things better.

David Linthicum:
Yeah, this was very enjoyable to me because I didn't know a lot about this industry, and I'm going to keep track of it. This is a fascinating kind of evolution that's going on behind the scenes. And also, we figured out that chips and processors and things like that, semiconductor industry is important to basically most of what we do. So, if you enjoyed this podcast, make sure to like us, rate us, and subscribe. You can also check out our past episodes including those hosted by my good friend, Mike Kavis. Find out more at deloittecloudpodcast.com. If you'd like to contact me directly, you can e-mail me at dlinthicum@deloitte.com. So, until next time, best of luck in your cloud journey. You guys stay safe. Cheers.

Visit the On Cloud library
www.deloitte.com/us/cloud-podcast