AI: Enhancing The Possible in Building Automation

June 2024

Featured Speaker

Deepinder Singh
Founder, CEO
75F

Introduction

- Deepinder has over 27 years of experience in electronics and computing, bringing a wealth of embedded products to the market, with the key goal to simplify operational complexity and make products intuitive
- Deepinder started 75F in 2012, a company specializing in smart building energy management, creating smart, connected environment that optimize energy usage
- Prior to founding 75F, Deepinder has designed some of the world's fastest core networks for Tier 1 service providers like AT&T, NTT and Verizon

Podcast Host

Aakash Bhasin
Managing Director
ALANTRA

Introduction

- Aakash with 25+ years of experience, leads the Building and Industrial Technology practice at Alantra and has extensive sector knowledge and expert execution capabilities
- Aakash has significant experience in structuring and executing a wide range of complex domestic, international, and cross-border M&A transactions including acquisitions, divestitures, mergers, joint ventures, corporate restructurings, recapitalizations, leveraged buyouts, hostile takeovers, takeover defenses and agitating shareholder situations on behalf of clients in the Americas, Europe and Asia

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Episode Highlights

- In this episode, Deepinder Singh, founder and CEO of 75F, delves into the **transformative impact of AI on the building automation sector**
- AI-based machine learning makes it possible to **optimize automation in complex environments like commercial buildings, and contributes to decarbonization goals and mitigate climate change impacts**
- Large language models are helping democratize technology by **making expert knowledge accessible globally**
- Together, machining learning and large language models, are making building automation systems **easier to deploy, even in smaller buildings, without highly trained professionals**
- Given rising energy costs and growing global focus on reducing emissions, **smart energy management is becoming a critical focus for building owners and tenants alike**
- 75F stands out by developing its **own proprietary hardware to ensure the collection of accurate data** for its machine learning system use. The company combines this with some of the most **energy efficient algorithms to minimize energy usage and maximize comfort**
- The interactions between building smart energy management systems and smart grids allows better outcomes by **balancing comfort and energy usage**

> **"If you imagine a world in the future where you are going to have a self-driving car, can you imagine that your buildings are going to be run the way they are? Of course not. The entire world is going to be very different. We should take that for granted that buildings are going to be smarter. They're going to be run by AI. There is no other way."**
>
> Deepinder Singh, 75F Founder & CEO

Episode Transcript

Aakash Bhasin (00:06):
Good morning, everyone. Welcome to Alantra's podcast. Today we have with us Deep Singh. Deep is the founder and CEO of a company called 75F. 75F leverages AI to make smart building automation systems and make them in a way that they can be leveraged not just by large buildings where traditional BMS go today, but also by small and mid-size buildings. My name is Aakash Bhasin. I'm a managing director Alantra. I lead our building technology practice based here in New York, and hopefully you'll find the podcast helpful and interesting.

(00:48):
The first question I wanted to get into is, where do you see the market for building automation solutions in 2024, and what is your outlook for some of the key trends you expect in that market over the next decade?

Deepinder Singh (01:00):
That's a hot one, Aakash. I think overall, in general, the building sector itself has been highly neglected. Most of the automation that has really occurred is in a very small sliver of buildings. So we keep looking at the places like the Burj Khalifa. We look at all the skyscape, which in New York looks really cool, but unfortunately there are a whole lot of buildings which are outside core downtown Manhattan.

(01:25):
It's interesting that basically even **in a country like the US, about 84% of the buildings have got absolutely no automation at all**. The current systems are really more visible, but that doesn't mean that they have actually gained a huge amount of penetration. So what we are really seeing is a proliferation of these technologies which would allow more automation. If we talk about the more renewable future, it is imperative that these buildings are automated and smart so that they can actually interact with the grid real time, and that's going to be very, very key from our perspective.

(01:58):
The overall building stock needs to be retrofitted. The number of new buildings, especially in developed countries, is reducing. So we'll see a lot more smaller buildings coming up, which traditionally have not necessarily been automated. And I think there's a huge opportunity to deploy solutions which are relatively easy to deploy, which can be put in much faster. And more importantly, they can be put in by people who are not necessarily controls experts. We keep hearing about this acute shortage of trained labor, and that is a true thing. The skills which are required and the complexity which is growing, it is unlikely that we are going to be able to find enough trained professionals to be able to truly go and cover these buildings in a wide swath. But I think one of the saviors is how can we actually deploy technology to overcome some of these manpower shortages, and how can we make things easier so that these solutions can be scaled across a much larger swath of buildings?

Episode Transcript

Aakash Bhasin (02:56):
Even with the data that we've looked at, just in the US alone, the 6 million commercial buildings, and the vast majority of them are below 200,000 square feet. They are small and mid-sized buildings. There has always been this talk about shortage of trained professionals that can install BMS systems. So I think some of the trends that you're talking about in terms of easy to use, easy to deploy, I think are going to become very, very important on a go-forward basis.

(03:22):
Why is client interest in smart energy management systems increasing? And how do these systems really interact with broader BMS systems?

Deepinder Singh (03:36):
I think primarily it's really being driven by the COP agreements. So one of the key things, what's called a global stock trade, is to actually figure out where each of the countries' (the 200 countries who are signatory to this agreement) take stock of where they are in terms of emissions. And they've agreed to cut them down significantly, I think it's 46% from the 2019 levels. That's a very aggressive goal, and this is by 2030. So we have a short window in which we have to assess where we are in terms of our emissions and then we actually have to cut them down by 46%. And unfortunately, we are actually still exceeding those carbon emissions from where we were in 2019. So it's not as if we have actually made any progress to these goals.

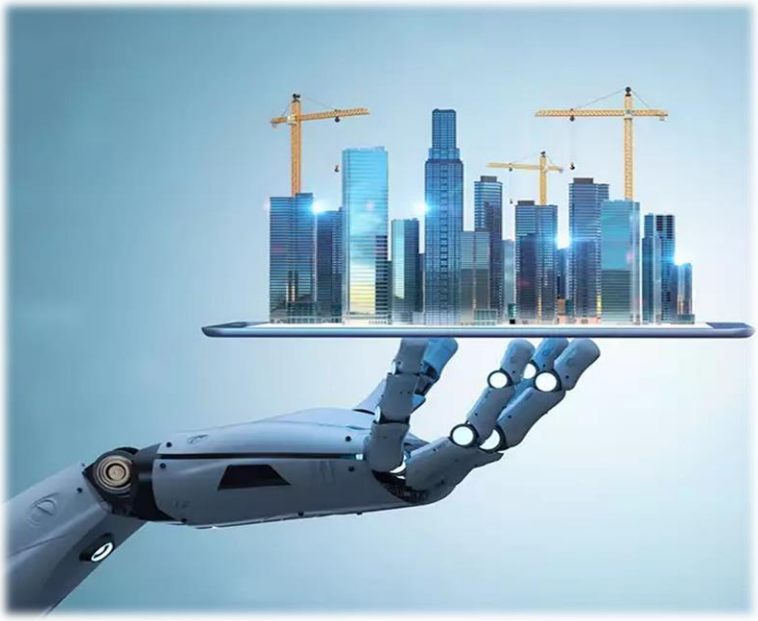
(04:17):
So we have some very aggressive goals, and the governments are recognizing that they need to have both the carrot and the stick. So you'll see a fair amount of legislation, but you also see a fair amount of incentives that the utilities or the governments are giving to make sure that the buildings are run more efficiently.

Episode Transcript

Aakash Bhasin (04:32):
From a more global perspective, are there certain geographies that are likely to see greater deployments of these smart energy management systems versus others?

Deepinder Singh (04:43):
Right now, globally, Europe has been one of the better citizens in terms of enforcing what's called EPBD (Energy Performance of Buildings Directive), the European directive around building performance. And what they're doing is they're actually mandating that buildings over a certain size have a certain EUI – energy use intensity. They're being far more aggressive than other countries in the world. I think the US is following suit now, specifically at the state level and at the federal level, but ultimately it boils down to where the money has been committed, and that's been in Europe and the US specifically at this point. I think the countries in the Middle East are trying to be good citizens themselves, and Saudi Arabia, of course, is trying to also use some of their free cashflow that they have and pour that back into making sure that the new construction that is going on there is more efficient.

Aakash Bhasin (05:29):
Thank you, Deep. Turning to the main topic for today, what impact is AI having on the building automation market, and how do you expect AI technologies to transform the individual experience in commercial buildings in particular and possibly other kinds of buildings? AI seems to be really coming into the forefront, so would be great to get your views on how it's impacting your broader ecosystem.



Deepinder Singh (05:52):
I think **AI has been truly a great savior in terms of our ability to democratize and customize technology and knowledge.** Machine learning, which a specific form of AI, has been going on for a number of years. But I think with the coming of the large language models and OpenAI, it has in some ways given a voice and a face to AI, so it's far more recognizable. It used to be working in the background, but now we can actually have AI converse with you. It's a little bit more real in some ways. And it's also interesting, In terms of just the use cases which are exploding, how you can use that to fill in some of the gaps that we have or shortages that we have in labor. There is just not going to be enough trained labor to run buildings more efficiently.

Episode Transcript

Deepinder Singh (06:40):
Can we deploy technology to basically help augment the people who are running those buildings, and can we actually do the things that would normally take a very highly trained, skilled person and basically offload those over to AI? That's definitely where I believe the industry is progressing. That's one of the key things that 75F is really working hard on. One of the things that I'm really excited about is that **AI has allowed us massively to democratize some of this technology and some of this knowledge.** What it means is that it is no longer resident in a very few number of highly-trained, highly-skilled individuals, but it can actually be shipped, and it can be deployed in buildings which cannot actually afford these highly-skilled professionals.

(07:29):
The other thing that I'm really super excited about is that this has come, in fact, much easier than you would have normally expected, is the amount of the large language models which have been trained by people like OpenAI. **What they're allowing us to do is transfer this knowledge across multiple languages, and that's really making these technologies far more accessible to geographies where they would not necessarily have been deployed before.**

(07:54):
So even in places like Middle East, you can have an AI that allows you to converse with your building. So that's one of the key things that 75F has done is the generalized AI that understands HVAC, understands energy, and allows you to basically interact with the building. There's a digital twin which powers all of this, but more importantly, this digital twin communicates seamlessly across multiple geographies and in multiple languages. So it really is super helpful for all the non-English speaking areas. Some of these technology innovations had not necessarily percolated before.

Episode Transcript

Aakash Bhasin (08:35):
I just wanted to tease out a couple of things you said. One, AI is allowing technology to be deployed more broadly and globally, and secondly, AI is helping people use that technology with greater ease. Maybe you can comment on both of those, and maybe that's a good transition point also a little bit into 75F and what you and your company do.

Deepinder Singh (08:56):
I think that's a really good observation that you have. One part is you said the optimization piece, which is the machine learning piece, and that is the algorithmic part. That's the more geeky part in terms of how do you use AI to transform and run buildings more efficiently and do this, which in some ways could be called very large scale data crunching. And the second part is the more conversational, more accessible, how do you make that data to be more accessible? And that's where the large language models have really come in. It is very fascinating to see what used to be geek speak can now be put into words that people can really understand, so it makes it more real for them.

Aakash Bhasin (09:35):
Maybe a little bit on some of the advances you have made, especially over the last five years at 75F and how you're using AI to create a customer experience that is matchless.

Deepinder Singh (09:47):


We've been big proponents of AI for a long period of time. We did a clean sheet design of what we thought the buildings in the future are going to look like. We were already planning for this concept around that there's going to be far more renewable energy sources, so there's going to be more solar, there's going to be more wind. But one of the things that people don't necessarily talk or recognize is that both solar and wind tend to be more fluctuating in terms of their overall capacity to serve. So when wind is low, your grid is not going to be generating as much power. If there is occlusion or cloud cover, what you actually end up seeing is that overall power generation on the solar side is reduced. Up till now we've always taken it for granted that the grid is always reliable and always has the capacity to meet our needs.

Episode Transcript

Deepinder Singh (10:34):
Unfortunately, that is not going to be the case unless we massively deploy energy storage and it is at the level which is almost going to be uneconomical. So what we have to do is now live in a more adaptable world where the load itself, of which HVAC is a very large part, is variable. Buildings are the fourth largest emitter of greenhouse gases, and a very large part, about 67%, of that is on the HVAC side. That's a very large load that can actually be more mutable to the variations in the grid generation. Now the question is how do you interact with the grid and how do you do it real time? And that can only be done by machines. So that's one of the key things that we decided is that we are going to create an out-of-box what's called an IoT-based building management system.

(11:19):
It required a rethink of the current paradigm that we have, which is direct digital controls (DDC). Those **DDC controls are very manual, they're very cumbersome, they're too slow. They will not operate in the buildings of the future. So ultimately you have to do a complete paradigm change.** So we did that and we did a redesign of how we thought the buildings are going to be run and how a building management system is going to be and rethought of that architecture completely coming up with this paradigm of IoT-based VML.

(11:47):
So we'd been doing it on the machine learning side. We've been using it for optimization and making sure that the buildings are running more comfortably. How do you look at a building more holistically in taking into account the number of people inside the building? So we've been thinking about how buildings are going to be interacting with the grid. How do you take into account the number of people inside the building? And then how do you actually combine all of that with indoor air quality and predict how the building's going to behave, and how do you optimize it from an energy perspective?

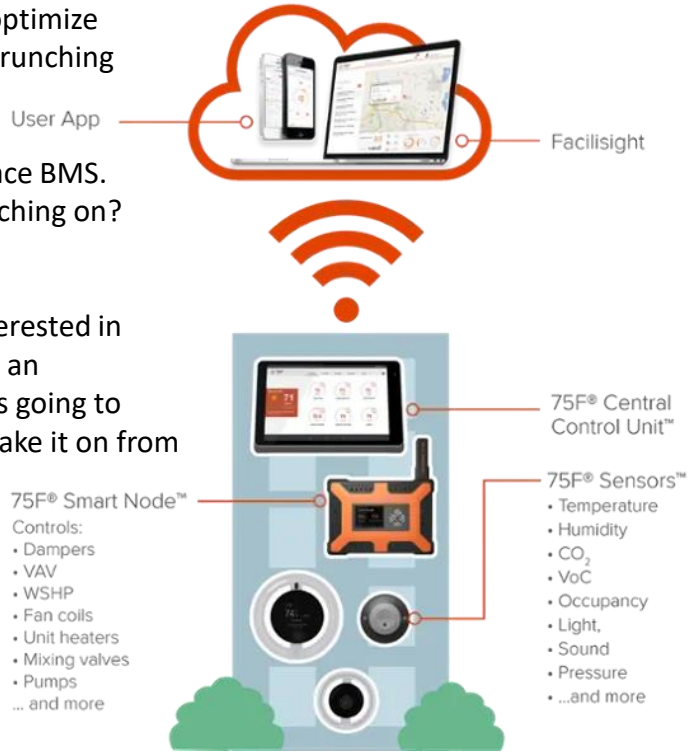
Episode Transcript

Deepinder Singh (12:17):
On top of that, we're able to leverage the AI, and what we were able to do is now inspect and talk to the building. So we have what's called a conversational AI. We launched that last year, and that's actually been very unique. And it's still unique in the market because no other company has been able to do that. And the reason they have not been able to do it, because they did not have the digital DNA to begin with. They were not looking at AI machine learning to go and optimize. We were. So we were able to leverage that and feed that to AI, so we could actually have a generalized AI model that allows you to go and converse with your building in multiple different languages at any time.

(12:52):
So the construct that we are going towards, and now you can actually go and inspect your building. You can ask it to do things on your behalf like change temperatures, but also you can actually ask it, "Why is the temperature in my room not warm enough?" as an example. So it'll actually go and do a diagnostic that'll actually go and do what's called an internal monologue to actually figure out and train the people asking this question on what that analysis is and come up with a reasoned answer, just like you would have an expert HVAC technician go through this. As a company, we've been preparing for this future for a number of years. So now what we did is **we could feed this data back over to AI, both in terms of our own internal desk articles, in terms of how we've responded to calls, also in terms of how the technical documentation that we have on the product. And along with the real-time data, this makes for a really, really powerful symbiotic relationship that allows the equivalent of a highly-trained expert for each and every building.**

Aakash Bhasin (13:54):
So you're using AI in two ways. One is using AI to optimize energy usage. That's the algorithms and the data crunching aspect of it. But you're really also using AI in a completely different way – conversational AI. I know you've pioneered this term of a zero interface BMS. Do you see that as a trend and do you see that catching on?

Deepinder Singh (14:16):
Ultimately, if we look at what people are really interested in is an outcome. So if you go back and take a look at an outcome-based system, how the delivery is done is going to vanish into the background. And so if we were to take it on from the outcome perspective, what we are expecting is a world where these buildings are going to be running by themselves, they're going to be running more optimally, and the only reason you would interact with them is when you have exceptions or you have a change in direction that you want them to follow.



Episode Transcript

Aakash Bhasin (14:47):
Talking a little bit more about 75F, one of the things that strikes me as interesting, there are a lot of companies out there that are currently developing or have developed smart energy management systems. And they seem to be taking two very different approaches, which is there are solutions that are software only, and then there are solutions such as yours that is a combination of software and hardware. Why did you choose that latter route, and what advantages do you think that that gives you?

Deepinder Singh (15:19):
Excellent question, Aakash. We didn't choose this path. We decided originally we were really looking and making something simple, and the simplest way is to actually go and leverage just software, which is what the bulk of the companies do. So you'll see there's a bunch of companies who are already coming in. But as we embarked on a journey, one of the things we really found was that the sensing technologies that we have from what would we call incumbents, those are just not scalable. So most of them are really using analog sensors, and those are highly susceptible to signal degradation, they are susceptible to noise, and they need to be recalibrated over time, what's called a drift. What that really means is that if you are using AI and if your thesis is that AI is the one that is actually going to be making these smart decisions, the noisier you signal, the worse your outcomes are going to be.

(16:08):
So ultimately an underperforming sensor is always going to lead you to garbage in, garbage out. And this is specifically true in AI systems where the system itself becomes habituated and trained on the garbage that you're actually giving it. The first order of problem was can we make sure that the integrity of what we are measuring is verifiable? So that is one of the reasons why we chose to do this hard path of making sure that from the sensing technology that's ours. The second thing that we saw is issues that the current paradigm that we have with what's called direct digital controls, they're highly dependent on the programming which is done by the people. So the actual algorithms and sequences of operations are really implemented by folks in the field, and those people typically will try to do the easiest, simplest way of getting the job done rather than what would be the most optimal way of running it.

Episode Transcript

Deepinder Singh (17:00):
Another issue that exists with existing controllers was that once they've done the sequence of operations, there's no way of updating them remotely. It requires on-site visits, that's highly expensive. So we really had to make **a control system and a controller around a paradigm of what we call software-defined hardware, and the software-defined hardware necessitated us making our own hardware, which could be more amenable to software over-the-air updates.** And that's just like your Tesla gets smarter. So now we make our own sensors that measure things like temperature, humidity, volatile organic compounds, CO_2 levels, occupancy, and then we pair it with the software-defined hardware controller.

(17:35):
So think of it like your iPhone. You can use it to play video games, you can use it to browse the net, you can even use it to make phone calls, but ultimately it's one single piece of hardware that takes on different personalities. So that's part and parcel of this construct around an IoT-based BMS that we had to really, from the ground up, construct. And that has given us a huge competitive advantage because it allows us to do these refresh cycles and make the technology better as we learn more things, as the AI gets smarter.

Aakash Bhasin (18:05):
Ultimately the AI does no good if the data was measured incorrectly in the first instance. How is AI impacting and going to impact some of the decarbonization goals and really help mitigate some of the impacts from climate change that we've seen?

Deepinder Singh (18:24):
AI is a big democratizer of technology. It allows the proliferation of what would have been considered expert knowledge, and now it's made more accessible to people who would not necessarily need to be experts in that realm. That's one aspect. The second aspect of it is that **AI allows for mass customization.** One of the interesting things, we've heard it in our industry, is that every building is a snowflake. Why are some of these buildings not automated? It's primarily because it is too expensive, it's too cumbersome, and every single building is different than the next one. When you have this snowflake paradigm, what it really means is that it requires a huge amount of customization going from building to building, which is exactly what the current systems have been created for is to allow for this customization, but it doesn't allow for mass customization.

Episode Transcript

Deepinder Singh (19:15):
AI, once it's properly trained and when you have a generalized AI for a very specific vertical, what that allows us to do is that AI now has a very good depth of understanding, and it can actually take into account and generate new sequences which are novel. It is not necessarily the same thing regurgitated again and again. And that's, I think, the fascinating part around AI is that you could actually have this mass customization occur for a large swath of the buildings, which not necessarily would not have actually normally benefited. It would have been cost prohibitive for humans to go in and deploy these solutions at scale.

Aakash Bhasin (19:53):
Got it. How do you see these AI-based BMS systems interacting with smart grid optimization? Do you see those two worlds ultimately coming together?

Deepinder Singh (20:03):
I think it's inevitable. So if you have an AI which is going to be controlling a building, and that does require that you have the right infrastructure, that you have the right kind of BMS like 75F in there, so you will actually have an AI which is at the utility level, which is responsible for a macro overall redistribution and asking for load shedding as an example. And it would go in interact with the AI, which is sitting in the building, and that AI would then be responsible for actually acting on that action. So that piece, I believe that's going to be a really important part of the future about all of these AIs talking to each other and working and acting on our behalf.

Aakash Bhasin (20:44):
Like an adaptive demand response.

Deepinder Singh (20:47):
An adaptive demand response is not just that the utility sends a signal telling the building, as an example, when to shed off load, **but more importantly that the building is telling the grid back how the condition's changing within for the occupants inside. What that really means is it allows the grid to be more sensitive.** One of the key things that we see right now is with what's called the unidirectional demand response. The utility will actually send a command over to the building and say that you need to cut down demand for a certain number of hours. But the problem is that the utility has no understanding of what discomfort it's actually causing over to the occupants inside the building.

Episode Transcript

Deepinder Singh (21:26):
So what we are seeing is in some areas like California where they've been having DR signals for some period of time, people have started opting out of DR, because what you're doing is you're causing more discomfort to the people during what would normally be already the hottest or the warmest parts of the year. So the utilities have to be cognizant of the discomfort and what's going on in their actual customer sites, and that's one of the key things that we are working with some of the utilities to enable.

Aakash Bhasin (21:54):
Reflecting on this conversation, Deep, and all the comments you've made, the AI trends you've mentioned and the democratization, is it fair to say that there is a very high likelihood that these systems will be ubiquitous not just in the large buildings where they are today, but across the building spectrum, the commercial building spectrum in particular, and potentially into other building verticals like industrial and maybe even residential?

Deepinder Singh (22:19):
I think they're going to be more ubiquitous in the smaller mid-sized buildings than they are in the larger buildings. I believe mid-sized buildings are actually more geared up to benefit from this. In the

future, of course, there are some very large buildings like folks in Saudi Arabia or in places like the NEOM where there is no way that a building like that is going to be ever comprehended by a human being to truly run that building. So you will need an AI for that piece. But I believe that the value proposition might actually be stronger in the near term for the mid-sized buildings. And you're absolutely right. I think it's going to be absolutely ubiquitous. I see no other alternate. I see no other future today.

Episode Transcript

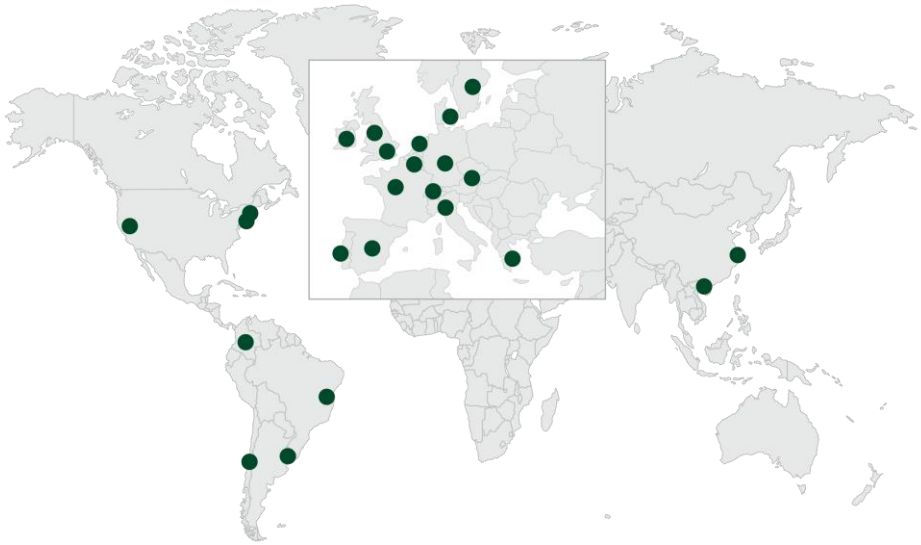
Aakash Bhasin (22:58):
Thank you, Deep. This has been incredibly helpful, and it's really good to get your perspectives given you're at the cutting edge of this. Any final closing remarks from your side?

Deepinder Singh (23:07):
If you imagine a world in the future where you are going to have a self-driving car, can you imagine that your buildings are going to be run the way they are? Of course not. The entire world is going to be very different. We should take that for granted that buildings are going to be smarter. They're going to be run by AI. There is no other way.

Aakash Bhasin (23:26):
Thank you, Deep. It's really good to speak with you every time and really appreciate you making the time this morning.

Alantra – Group Summary

Alantra is a global alternative asset management, investment banking, and credit portfolio advisory firm providing high value-added services to companies, families, and investors operating in the mid-market segment.



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(1) As of March 2024
(2) Since 2013

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Select Senior Coverage Team

Aakash Bhasin
Managing Director
aakash.bhasin@alantra.com

Michael Lenoce
Partner
michael.lenoce@alantra.com

Renee Shaening
Partner
renee.shaening@alantra.com

Jon de Perdigo
Director
jon.deperdigo@alantra.com

James Chapman-Andrews
Partner
james.chapman-andrews@alantra.com

Oliver Parker
Partner
oliver.parker@alantra.com

Select Global Partners

Carlos Rodríguez-Viña
Partner
carlos.rodriguez@alantra.com

Keith Pickering
Managing Director
keith.pickering@alantra.com

Juan Carlos Montoya
Managing Director
juancarlos.montoya@alantra.com

Daniel Lilliehöök
Partner
daniel.lilliehook@alantra.com

Lodewijk Sodderland
Managing Partner
lodewijk.Sodderland@alantra.com

Sandeep Talwani
Managing Director
sandeep.talwani@alantra.com

Saad Ashraf
Managing Director
saad.ashraf@alantra.com

Richard Zhu
Managing Director
richard.zhu@alantra.com

Hernán Sambucetti
Partner
hernan.sambucetti@alantra.com