NVIDIA Corp At Adobe Summit

Company Participants

• Jensen Hsun Huang, Co

Other Participants

- John Mellor, Analyst, Unknown
- Scott K. Belsky, Chief Product Officer & Executive VP of Creative Cloud, Adobe Systems Incorporated
- Shantanu Narayen, Chairman, President & CEO, Adobe Systems Incorporated

Presentation

John Mellor (BIO 15089928 <GO>)

Good morning. Welcome to day 2 of Adobe Summit. How's your experience so far? Yes? Awesome. The Adobe marketing, content and the events team, they just do an amazing job turning this event into an experience. Let's give them a round of applause. Well done.

So a question. How many here is this your first Summit? And maybe we can raise the lights a little bit. I love this. Oh, goodness. Wow, we've got about half of this audience is here for the first time. Well welcome to Adobe Summit. We're very glad you're here. We're very glad you're part of this community.

For those of you who have been to Summit before, you'll know that day 1 is typically focused on product. We do our product vision. We talk about our announcements. So that's really the focus of the day 1, which was yesterday. On day 2, we focus a little bit more on the personal side of transformation and what each of us is going through and how we find inspiration for this change.

So true to form, yesterday was an amazing morning of product innovation. We talked about how Adobe is defining the industry's first Experience System of Record with the Adobe Cloud Platform and how our analytics, advertising and often imitated but never duplicated Marketing Cloud continue to lead the industry in innovation. And our announcement of the Adobe Experience, this was particularly exciting to me because we all need to awaken that experience maker within.

Yesterday, we talked about being an experience maker and how now is the time to change, to evolve, to grow from being an experience thinker to an experience maker. So I want you to ask yourself: Are you an experience maker? Well if you're not

sure, now is the time to take action. And Summit is the place to begin, especially this morning.

We define experience makers as the agitators, as the rabble-rousers, right, the people who dare to believe that things could and should be better. Then they roll up their sleeves and they get to work. Well I'm giving you permission to agitate and to go rouse rabble on behalf of your customers. And this is what we're going to focus on today.

We have an incredible lineup of individuals who are going to help us think about innovation across technology, sports, humanitarian efforts, social media and entrepreneurship. So my ask of you this morning is to think about what change you want to drive in your organization and more importantly, in yourself to become an experience maker.

So let's get started with 2 of the most influential thought leaders in this industry, Jensen Huang, Founder, President and CEO of NVIDIA; and our own Chairman, President and CEO, Shantanu Narayen. Ladies and gentlemen, please welcome Jensen Huang and Shantanu Narayen.

Shantanu Narayen (BIO 3332391 <GO>)

Thank you. Really appreciate you being here, Jensen. It's thrilling to have my friend here with me onstage today. And in particular, I appreciate you taking the time away because this week actually turns out to be GTC in San Jose, which as Jensen was telling me is probably the biggest concentration of what's happening with AI and research and graphics in Santa Clara today. So really again, thank you for being here today.

Jensen Hsun Huang {BIO 1782546 <GO>}

I would do anything for you, Shantanu.

Shantanu Narayen {BIO 3332391 <GO>}

Appreciate it.

Jensen Hsun Huang {BIO 1782546 <GO>}

Including giving up on my own conference.

Shantanu Narayen {BIO 3332391 <GO>}

Well...

Jensen Hsun Huang {BIO 1782546 <GO>}

You're killing me.

Shantanu Narayen {BIO 3332391 <GO>}

The one thing we are doing, Jensen, is we're actually broadcasting this live.

Jensen Hsun Huang {BIO 1782546 <GO>}

Yes. Whatever. He's trying to make me feel better.

Shantanu Narayen {BIO 3332391 <GO>}

Well with your technology...

Jensen Hsun Huang {BIO 1782546 <GO>}

I would do anything for you. I just -- first of all, I was just going to say the work that we do, we're amazing. Ladies and gentlemen, we're amazing. And the amazing thing is we've been amazing for a long time.

Shantanu Narayen (BIO 3332391 <GO>)

The good news is my board is here today. So maybe I'm getting my performance appraisal in real time here with my board being here. So it's a good thing, Jensen. But what I was going to say was the fact that we have this great technology, done by NVIDIA, is probably going to appear in Santa Clara that we're live there as well. So with virtual reality, I think we're all okay. But Adobe has always been about images. And the fact that Adobe has always been about images, I found one of you that I really like. So what I wanted to do is show that image of Jensen.

Jensen Hsun Huang (BIO 1782546 <GO>)

Oh, come on.

Shantanu Narayen {BIO 3332391 <GO>}

What an incredible honor.

Jensen Hsun Huang {BIO 1782546 <GO>}

Thank you very much. It's just -- I always -- I wonder if he has anything else to wear.

Shantanu Narayen {BIO 3332391 <GO>}

No. I...

Jensen Hsun Huang (BIO 1782546 <GO>)

Here's what a CEO should look like, a wise man.

Shantanu Narayen (BIO 3332391 <GO>)

We call ourselves the bearded man and the biker behind -- at backstage. But...

Jensen Hsun Huang {BIO 1782546 <GO>}

Wise man and the biker.

Shantanu Narayen {BIO 3332391 <GO>}

In all seriousness, this conference is all about disruption and what everybody is seeing with respect to what's happening with industries, the transformation that's happening. And I thought it would be incredibly valuable for people to hear a little bit about the NVIDIA story. You cofounded it 25 years ago. But I'd love to just take us back and talk about the beginnings of NVIDIA.

Jensen Hsun Huang {BIO 1782546 <GO>}

Yes, Shantanu. You and I have a lot of technology history together. We both love computer graphics. And the reason why we've loved computer graphics is because for the longest time, it's been one of the greatest challenges of computer science to recreate reality. And so 25 years ago, if you recall, take you back, Windows 3.1 had just come out and 3D graphics was not available on PCs.

And so we had a great idea. We said, "Hi. look, one day, everybody is going to be a gamer." Just as I believe one day, everybody is going to be a creator. And we said, "One day, everybody is going to be a gamer." And if we could figure out a way to make the personal computer into a 3-dimensional graphics workstation, if you will. But for consumers and we could create these virtual reality environments for people, 2 things are going to happen.

One, we're going to enable this incredibly large market, video games. At the time, Electronic Arts had, I think, 14 employees and their CTO was -- I think had to be driven to work because he didn't have a driver's license. And so the video game industry was really tiny. And so one, we created an enormously large industry. But the second thing is that computer graphics, because it's so computationally difficult, that we could become one of the companies in the world that could be the driving force of the future of computing.

And those 2 things combined was the inspiration behind NVIDIA. And I would say that, that idea, the idea that 3D graphics is the driving force of computing and that video games, the creation of virtual reality, these virtual experiences that allows you to be teleported into anything you want to go, that insight, I think, was really great and has really driven our company.

Shantanu Narayen (BIO 3332391 <GO>)

And I think you used the word insight appropriately. I mean, I was at Silicon Graphics at that point and everybody thought that SGI was indestructible. And the brilliant idea that you had was how can we make that in the hands of millions of people, which has certainly paid out phenomenally. But what a lot of people may not know is that while that was the genesis of the company, you've actually made dramatic changes over the years. And again, as I said, people are talking about how one changes culture and changes companies. So tell us a little bit about some of the other big investments or bets that you've made along the way.

Jensen Hsun Huang (BIO 1782546 <GO>)

There were 2 -- there were probably 2 large changes. Well for the people who have been watching NVIDIA for a long time, our industry, our industry changes so incredibly fast. And technology forces are tremendous and we're surrounded by -- NVIDIA is a larger company today. But for the last 25 years, we were always a tiny company in the presence of giants. And so with technology changing so fast, it's hard to even stay alive. And so we -- job 1 was just simply to recreate ourselves, reinvent ourselves to stay alive.

But there were 2 things that happened. One, we decided that more than computer graphics, we would expand the aperture of our computing to be able to simulate the laws of physics. And the reason for that is because in order to create reality, you have to simulate the laws of physics. That expansion of our aperture allowed us to go into all kinds of fields in scientific computing, which led ultimately to artificial intelligence.

The second thing, the second big investment that we made was observing that this new model of software that we all called deep learning and AI, it was going to change the way that people develop software going forward, that we could write software finally that no humans could write. Just as we could create companies in the future that no humans could create, we thought that we could create software that no humans could create. And so that observation was a great one. And seven years ago, we took the company and we pivoted into AI and...

Shantanu Narayen (BIO 3332391 <GO>)

The rest, as they say, is history.

Jensen Hsun Huang {BIO 1782546 <GO>}

Oh, my gosh.

Shantanu Narayen (BIO 3332391 <GO>)

Yes. Well it's been incredibly successful. But this week, in particular, Jensen, you're actually -- given we are so big together in terms of what we do with graphics and images, you made a pretty profound announcement associated with what's

happening with ray-tracing and again, how that's going to change the paradigm once again. Maybe you can share a little bit more about that.

Jensen Hsun Huang {BIO 1782546 <GO>}

The computer graphics model that you and I enjoyed, in your case, 40 years ago, in my case, less -- you are the...

Shantanu Narayen {BIO 3332391 <GO>}

Well I do have my birth certificate.

Jensen Hsun Huang (BIO 1782546 <GO>)

The wise old man of our industry. So the computer graphics model that we've dreamt of creating is the idea of simulating light rays as it bounces through the world. Could you imagine, we had to sit -- take one light ray, bounce it all over everything. And wherever it's absorbed, reflected, in this case, refracted through this curved surface. And what I see on the table are these interesting light patterns, it's called caustics, if you remember.

And so this form of computer graphics was only possible in the film industry because they used supercomputers to create every single frame. And in fact, when we walked onstage, the amazing, beautiful graphics you were showing, the subtle shadows, like beautiful lighting, all of that was made possible by this technology called ray-tracing, except it needed supercomputers, these large servers. And every 1 of those frames out of every 30 frames, 1 out of those 30, it takes 10 hours to render each one of those frames.

Well our dream in that whole time that we've been in computer graphics is to do this in real time. And finally, last week, we announced the effort of about 10 years of endeavor, changing the way computer graphics is done, changing the architecture of computer graphics, the algorithms of computer graphics. And we announced the NVIDIA RTX. And we can now do what you just showed in real time. And it's just a huge breakthrough.

Shantanu Narayen {BIO 3332391 <GO>}

And that's something that we really share in common, which is we believe that everybody has a story to tell. And using technology in an intuitive, accessible way, whether you're a student or whether you're a high-end professional, is such an awesome responsibility and opportunity to do. But maybe again, I think a number of people here, whether you're in retail, whether you're in clothing, you're in travel and hospitality, I think they're all thinking about what does augmented reality and virtual reality mean in terms of the kind of experience they can deliver their customers. So what happens with AR and VR?

Jensen Hsun Huang {BIO 1782546 <GO>}

One way to think about AR and VR is this. And this is going to sound crazy. But it's actually an easier idea, right? AR and VR -- in the case of VR, it's a wormhole for us to travel to virtual worlds. VR is simply a path that allows us to telepresence, to wormhole into another virtual world. AR is the way for artificial intelligence agents that are in these virtual worlds to wormhole into us. And so these AR, these agents, these virtual reality -- these artificial intelligence agents in these universes, the way they come into our world is to travel through the AR wormhole. Then they'll be sitting right there in front of us in augmented reality, mixed reality. And the way we go into their world is to travel through VR, which is this wormhole to go into.

Now the other day -- yesterday, I showed something that the world has never seen before. And it's really quite amazing. Let me just -- if I could just tell you about it. And so inside the company, we called it Project Wakanda. Project Wakanda -- Wakanda is, as you guys know, the most advanced society in the world, it's in Africa, Black Panther. You guys know about this. And so they -- and so it's Project Wakanda. What we did was this. We created this Holodeck. And inside this Holodeck, you can go into it and it creates a virtual car. And when I'm inside this Holodeck, I can control, I can wormhole, teleport into an autonomous vehicle anywhere on the planet. And now my mind and this autonomous vehicle becomes one. And I can drive this car from anywhere, wherever it is, from my Holodeck.

And so the way to think about that is, all of a sudden, VR is our way of communicating with the future of Al. And this communication system -- today, we call it virtual reality. We think about head-mounted displays, we think about augmented reality as these computer graphics, things that are sitting on our table. But in the future, it's going to be much, much more than that. You're going to create experiences with the tools that you guys have that allows people to create these enormous number of virtual realities. And if we want to go into these new worlds, we'll wormhole into it using VR. If we want to invite one of our agents, these Als that we've created, these little, tiny pet that helps us do something, keeps us happy, keeps us company, it comes into our world. And so I think this is going to be an exciting future.

Shantanu Narayen {BIO 3332391 <GO>}

I think it already is. Just a little bit from technology to how you impacted change. You said that seven years ago, you really made this big bet on Al. How did you get the organization through that, that you were going to make this left shift and Al was going to be the future in terms of transforming the company, the people?

Jensen Hsun Huang {BIO 1782546 <GO>}

Well I think -- well, first of all, I think that Adobe is a great example of transformation. I've known Adobe my entire career. And the Adobe of today and the Adobe that I knew a long time ago has gone through several transformations yourselves. So you know the story really well.

The fact of the matter is there is no alternative to rolling up your sleeves and trying to understand yourself, the implications of the new dynamics of the industry. To try to

understand yourself, you don't have to -- we don't have to understand it deeply. But we have to understand it intuitively, the implications of the technology, the implications of the dynamics that are going on in the industry.

We have to roll up our sleeves. Just as you rolled up your sleeves, you've got to roll up your sleeves to understand these dynamics. Then you've got to invite people to work with us and be our teammates to learn how to apply this new technology or repivot the company into this new dynamic. You've just got to do it step by step by step. And I think there's no alternative to leaders being in the kitchen, playing...

Shantanu Narayen {BIO 3332391 <GO>}

And that's really, in many ways, Jensen, I think the call to action that we made for people here. We're calling them experience makers, which is when you have an idea, how do you take that idea and make that really real? And so I think that's been one of the underlying themes of the conference, people who want to make this change.

But you talked about technology. And I thought actually we have a slight surprise for you. What a lot of people -- and if Scott can come up, it's just -- we put this together, this demo because NVIDIA has delivered this absolutely incredible technology with respect to GPUs and what they could be done. And we talked yesterday about open ecosystems and how -- the power of getting these open ecosystems. So we put our engineers to work a little bit and said, "Let's show Jensen some stuff of what we can do with his Al and our Al together. Scott?

Scott K. Belsky {BIO 2409231 <GO>}

Great. Thank you, Shantanu. And as you mentioned, NVIDIA has a rich history of innovation in the gaming market. And I'm using a gaming laptop powered by NVIDIA's GTX 1080. And we want to run an experiment and see what Adobe Sensei could bring to the gaming experience with these powerful GPUs.

Jensen Hsun Huang {BIO 1782546 <GO>}

Hi. if this turns out really, really good, it's my idea. But if it turns out not so good...

Scott K. Belsky {BIO 2409231 <GO>}

So here I am in the AAA game, Witcher 3, in the town of Novigrad. And NVIDIA has built a great tool called Ansel. And with Ansel, not only can you take screenshots of your gameplay in 4K. But it allows you to immerse yourself in the game with a 360 view.

So let's just navigate the scene in 360 using the Ansel app. Here, I'm just going to zoom in and take a screenshot of this character using Ansel. I think this looks pretty good. Then I took the liberty of adding a Sensei panel to this demo app.

Let's just see what Sensei has to say about the image. So as you can see, Sensei is tagging interesting things in this image. It's identified a man, a warrior. But more than that, it's also making judgments about the images.

Shantanu Narayen (BIO 3332391 <GO>)

So what we are doing in real time, in other words, Scott, is we're actually interfacing with the NVIDIA stuff. And we're using our own machine learning as well as our image recognition technology as people are navigating in real time. So think about the opportunities, Jensen, as it relates to people doing retail or the ability to not just do all this in real time. But even understand exactly what's happening in a deep semantic sense.

Jensen Hsun Huang {BIO 1782546 <GO>}

Yes.

Scott K. Belsky {BIO 2409231 <GO>}

That's right. That's right. And here, we've shown that Sensei also created an Auto Mask of this character, which I can easily open up in Photoshop to create different scenes to place this character. Now I'm just going to activate Sensei.

Jensen Hsun Huang {BIO 1782546 <GO>}

That is so cool that with just one click and it just masks.

Scott K. Belsky {BIO 2409231 <GO>}

That's right.

Jensen Hsun Huang {BIO 1782546 <GO>}

Stencils out that character just like that. It's just incredible.

Scott K. Belsky {BIO 2409231 <GO>}

And so as we navigate the scene, Sensei is finding interesting objects here. I paused on this particular scene with the villagers. And Sensei has detected a man, a woman and this cauldron of fire. And as we navigate through, Sensei is taking shots, making judgments about the quality of those shots and trying to pick the most interesting things. So let's navigate some more. We found a barrel, a dog and a horse.

Shantanu Narayen {BIO 3332391 <GO>}

So in real time, as he's navigating, we're seeing this is a dog, this is a human, this is a horse. So that's actually incredible, the kinds of possibilities that they can do. And this was done just by virtue of the fact that you have this open architecture that

allows us. And we are doing the same for our customers here in the audience, which is we're making Sensei available so that experience makers can actually apply their own data science, Jensen, much like we've done before.

Jensen Hsun Huang (BIO 1782546 <GO>)

So you're actually showing something that's really the power of modern artificial intelligence. And so of course, you guys have trained the network on horses, dogs and et cetera, et cetera. And yet this particular image of a horse is a computergenerated cartoon horse. But your model was sufficiently robust and understands the diversity of data well enough that they still recognize that as a horse. Now traditional computer vision algorithms wouldn't have recognized that as a horse. But you and I recognized it as a horse. And therefore, we taught the AI how to do that.

Shantanu Narayen {BIO 3332391 <GO>}

That's right.

Jensen Hsun Huang {BIO 1782546 <GO>}

And so Sensei has now...

Shantanu Narayen (BIO 3332391 <GO>)

That's exactly right. And I think it actually -- can't we even do more with respect to emotions and...

Scott K. Belsky {BIO 2409231 <GO>}

Yes. In fact, we tag about 40,000 different concepts. And here, we've focused on objects as opposed to moods and sort of more abstract concepts. And here, you can see we've closed in on this sort of work area. And we've identified the various tools and the clothes and the stool. Let me just navigate to one other place in the scene. And again, Sensei is taking shots along the way of the things that it thinks are interesting. So here, we have a few guys talking. And this other guy, who doesn't look so happy in the back, who looks like maybe he's a merchant, maybe people aren't buying what he has to sell. But let's close up on him.

Jensen Hsun Huang {BIO 1782546 <GO>}

Yes. That's really good. That's a great model. You guys did a good job.

Scott K. Belsky {BIO 2409231 <GO>}

And Sensei can also actually understand aspects of this character. So we can understand his approximate age, the fact that he's masculine. You weren't so sure about whether or not he was wearing a hat. But we know that he's not...

Shantanu Narayen (BIO 3332391 <GO>)

But doing this in real time then, Scott, I think there's one last thing. So we've been navigating real time in this entire virtual world. You're collecting all the information. As you can see, we now have more information about things like age. What if you go past this? Then how do you recapture all of that intelligence?

Scott K. Belsky {BIO 2409231 <GO>}

Yes. That's the great part. So for example, here, we've even captured that his arms are crossed. And the fact that he's not smiling and has arms crossed means he's probably angry. Now as we captured all these things, we can actually search for the best frames that represent these concepts. And so we have the tags here at the bottom. So I can easily do something like click on dog and see the shots that we took that had the dog. Or we can try the person and do the shots of the person. But let me show you one more thing. We can even construct more complex queries. So I'm going to go up to the search bar. Show me the angry man with arms crossed. And there he is.

Shantanu Narayen {BIO 3332391 <GO>}

That's (inaudible)

Jensen Hsun Huang (BIO 1782546 <GO>)

That's cool.

Scott K. Belsky {BIO 2409231 <GO>}

Thank you.

Jensen Hsun Huang (BIO 1782546 <GO>)

Now obviously, you could do this for video games. But you can do this for real videos and everything.

Shantanu Narayen {BIO 3332391 <GO>}

That's correct, as well as retail experiences, travel experiences. Maybe just a couple --switching gears for a little bit, Jensen. You're a company that's inventing the future. But how do you think about marketing? How do you think about marketing? Who's the audience? And a lot of the companies here are B2C. But there are also a number of companies that are B2B as well as specialized marketing for audiences. Maybe a little bit about how you think about that.

Jensen Hsun Huang {BIO 1782546 <GO>}

Well you guys, you know that we're the world's largest gaming platform. NVIDIA GeForce is all over the world. There's 100 million people who are on NVIDIA GeForce Experience, which is our platform. And so we're communicating, we're in contact with all of our customers all the time. The way we think about marketing is storytelling. They don't want us to market to them. They don't want us to advertise to them. But we tell stories. We share stories with them, whether it's stories that we create -- and that's why the creative department in our company is so close to our marketing department. And I'm so close to the creative department. The stories that we tell them, the stories that they tell each other, we share. We allow them to tell their story through our platform.

And so storytelling is probably the central part of everything we do in marketing. And it's content creation. We use -- we obviously use everything that you guys create. And we use it to tell a story. Then secondarily, if not for the Adobe Experience Manager, our ability to connect all of our customers to the stories that we tell would have been impossible and -- because we have different stories that we want to tell different people because they play different games and they're interested in different types of stories in different countries. And so we use the Adobe Experience Manager so that we can connect the right stories with the right customers. And so that's kind of how we think about it.

Shantanu Narayen (BIO 3332391 <GO>)

So we have Jensen. He's -- as he described it a little bit before, he reinvents quantum physics when he has his morning cup of tea. You're doing ray-tracing and figuring out the world. But you also talked about the fact that you roll up your sleeves, as I understand it. And help people through change. There's a rumor that when -- you made some sort of a bet and commitment associated with a tattoo, Jensen. Is there any truth to that rumor associated with rolling up your sleeves?

Jensen Hsun Huang {BIO 1782546 <GO>}

Well I roll up my sleeves. And I do have a tattoo. And I'm -- here's what happened. So 4 splits -- 2 splits ago, the management team was having dinner I night. And somebody says, "Our stock is going to hit \$100." And usually, I don't care about things like that and -- but the other person -- somebody else said, "Yes. It's definitely going to hit \$100." And somebody else said, "You know what, if it hits \$100, what are you guys all going to do?" And somebody said, "I'll shave my head." And somebody says, "I'll pierce my nipples." Then somebody said, "I'll do a tattoo." And somebody said, "I'll do an earring. And Jensen, what are you going to do?" And I said, "I don't care, whatever you guys want. It's not going to hit \$100."

And so they said, "Okay, well, you're going to get a tattoo." And I said, "Yes, sure, fine." And now several years went by -- so I wasn't wrong, okay? I was in no risk of getting a tattoo. And so several years later, the stock hits \$100 and somebody happened to have that placemat where all of us wrote down -- and so the thing I was most happy about is that our VP of HR had to get a nipple ring and -- but I got a tattoo.

And ladies and gentlemen, if you could do this -- I'll show you my tattoo. However, I think that Shantanu should get a tattoo. What do you guys think? All right. So you know you're committed to your company if you put the company's logo on your arm, okay? So ladies and gentlemen...

Shantanu Narayen (BIO 3332391 <GO>)

Leading by example. Please again thank me for having Jensen here.

Jensen Hsun Huang (BIO 1782546 <GO>)

Shantanu is going to get a tattoo.

Shantanu Narayen {BIO 3332391 <GO>}

Thanks a lot.

Jensen Hsun Huang {BIO 1782546 <GO>}

I love you.

Shantanu Narayen (BIO 3332391 <GO>)

I love you.

Jensen Hsun Huang {BIO 1782546 <GO>}

You guys are great.

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