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MANAGEMENT DISCUSSION SECTION

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Hey. Good morning, everyone. I am Adam Jonas from Morgan Stanley's global auto and shared mobility team. Welcome to Day 2 of the Morgan Stanley 8th Annual Laguna Conference. I am still saddened when I see Mark van der Pluym's memes and fake imagery of the coastline of Laguna. My working assumption is next year we can watch the dolphins and seals and surfers all flopping around in the water and the breaking surf of the Pacific. But until that time, we are delighted to have virtually with us for the team from Ford, Ken Washington, Chief Technology Officer; and Lynn Tyson, Executive Director of Investor Relations with us.

I'm going to read very quickly a disclaimer that this webcast is for Morgan Stanley clients and Morgan Stanley appropriate employees only. I'm appropriate – I hope I'm appropriate today. This webcast is not for members of the press. If you're a member of the press, disconnect now. For important disclosures, go to www.morganstanley.com/disclosures. If you have any questions, don't hesitate to reach out to your Morgan Stanley sales representative.

So, with that, Ken, we got about half hour. Let me give you a chance here on the webcast to kind of make some introductory remarks and key messages for investors through this nice presentation that you've got on the webcast. Ken, thanks again.

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

Great. Thanks, Adam, and good to be here, everyone. Let's go to the next slide. The value creation framework at Ford is the foundation of everything we do. And what I want to talk about today is how we're using and developing technology to drive customer-centric differentiated value for our customers.

Next slide, please. Jim Farley first introduced this framework of fix, accelerate and grow earlier this year in February, accelerating connectivity and technology and the tech stack that I'm going to talk about today as a significant and foundational part of the company's growth strategy and our acceleration strategy.

Next slide, please. I want to focus on connectivity because there's no mistaking that connectivity has accelerated and has changed the way the smart world has developed and evolved, starting with wireless and 5G which has ushered in at a pace that no one really expected. In fact, the first 5G phones were introduced to the market in the first quarter of 2019. Since that time, we've seen the adoption and exploration of 5G and smart cities as well as in our smart vehicles. And Ford is deeply involved in exploring that and we have plans to feather that into our tech stack.

We've even seen home automation go through an inflection point, where smart devices are common in homes today with technology like WiFi, Bluetooth, Z-Wave, Zigbee and other technologies that are enabling our smart homes to connect to the rest of the smart world, including our smart vehicles of the future. We're even seeing the introduction of extraterrestrial satellites and constellation of tube sets that hold the promise of less expensive connectivity all over the globe. All of this is underpinned by a revolution in global edge, cloud, and fog computing that represents more than a \$9 billion opportunity with a 30% CAGR in the year 2023. So connectivity is upon us and we're committed to leveraging that in our work.

Next slide, our tech stack is designed to build on that to accelerate the development and delivery of differentiated customer experiences. And this includes both our retail and our commercial vehicles. We're designing this tech stack to be future-proof, to connect the vehicle to the smart world around it that I just spoke about. It's going to be able to evolve and continuously integrate into the smart world and get better over time through providing over-the-air updates. We're designing it to move the intelligence from the sensors and actuators into a central compute – high performance compute cluster in the vehicle, so that we can create a true digital platform upon which we can innovate with software and add-on services that will provide experiences like the consumption of TV, music or even shopping apps.

These are the building blocks also for more advanced infotainment as well as the level for autonomy. The unique and ambitious approach we're taking is powered by our core technical capabilities and our innovative spirit. We've brought more than 3,000 advanced computing experts to work on this tech stack and the surrounding technologies to bring this to reality. We're also going to not do it all ourselves. We are partnering with tech companies in this important technology strategy work, as Jim Farley shared with you earlier this year at the June Deutsche Bank Conference. We have no news to share with you today on that front, but stay tuned.

Next slide. Vehicle connectivity is an enabler to value creation through improved customer experiences as well as internal enterprise benefits and fitness. We're also seeing cities get in the game, introducing technology for connectivity to make intersections smart, doing things like enabling the vehicle to talk to these intersections to improve safety, enhance mobility services, provide for data collection as well as improve and enhance autonomous driving.

We're using connectivity also to help us with anomaly detection and to mitigate errors. In the past, we had a heavy dependence on our detection through warranty claims and through – improving these issues through dealer [indiscernible] (00:06:17) and deploying updates. That's the past. In the future, we're going to leverage connectivity to be able to detect issues in the field dynamically, and then fix them through over-the-air updates. The Mustang Mach-E and the F-150 are the first vehicles that will have this advanced connectivity capability. And we're poised to take advantage of it, providing bumper to bumper over-the-air update capabilities. Ford vehicles are evolving to tie into the connected future digital world.

Next slide, please. We're also working to implement cellular cellular-V2X into our vehicles. Ford has been a leader in providing Cellular-V2X technology in vehicles. In fact, we've made a commitment to watch Cellular-V2X into our connected vehicles in 2022. This technology is going to enable us to assist drivers well beyond the line of sight,

even seeing around corners, enhancing the ability to be more safe and to provide advanced autonomy capabilities. We'll be the first automaker to deploy Cellular-V2X in US vehicles starting in 2022, provided that there's a supportive regulatory framework in place.

Next slide, please. Importantly, our software and hardware platforms are designed to support a variety of driver assist technologies. As you can see by the graphic, there are many sensors and many cameras on our vehicles. And we're integrating all of these to inform and assist and automate portions of the driving task with the potential to help customers drive with more confidence, and help them reduce driving related stress. It's really important to us that we have the capabilities and talent to pull this off. Over the last decade, our research driver assist team has increased by an order of magnitude. We've grown the team from 20 engineers to more than 200 over that time period. We've also gone from having an engineering team in only our Dearborn campus to having them all over the world in the innovation hubs of the world including Palo Alto, Cologne and Aachen in Germany, Shanghai and Nanjing in China, and Tel Aviv in Israel.

Next slide, please. This talented team has developed driver assist technologies with differentiated customer features, including active park assist, intersection assist, pre-collision assist and automatic emergency braking, Intelligent Adaptive Cruise Control and lane keeping with blind spot assistance. There's many more designed for various purposes such as helping us on our daily commute, assisting us with work and helping us play, as shown on the next slide, please. These technologies significantly increase our confidence, improve our dependability and trust in the Ford brand.

With that, I'll end, and look forward to discussion and questions.

QUESTION AND ANSWER SECTION

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

Thanks very much, Ken. That's a great introduction. And I think it gives us a nice platform to explore the connected vehicle mobility and tech stack and the kind of software-enabled car, which is the thrust of your work, in addition to other responsibilities. But, let's start with – if I can just start with the car, and I'd love for you as we go through these questions to think about and not just the tech, but also how Ford differentiates from your competitors, because of course everyone face this big challenge of making [indiscernible] (00:10:01) completely redesigning the car itself, but also redesign that ecosystem and how it plays with it. But if I were to tear down, let's say, Ford from the year 2030, and compare it with a torn down Ford from 2019, let's say, where the biggest differences that you'd highlight that we'll see in terms of software operating system, electronic architecture, sensor compute, OTA, interface any anything you want to highlight?

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah. Thanks, Adam. That was a great question, because it's true that the whole industry is looking at the premise of rethinking how we wire up the vehicle electrically inside the vehicle itself. So, if you were to tear down a future Ford, say 10 years from now, the biggest difference you'd see is, as I said, you're going to see that the software compute and sensing services are being serviced by a central compute module. And that's really important because that's more like we're accustomed to seeing with the smartphones and the smart devices that we surround ourselves in our homes with every day.

So, this design that you would see would enable us to really leverage the power of high bandwidth connectivity that happens around the vehicle. So, imagine you wanted to change something after the vehicle was sold to a customer, and create a new experience, you wouldn't have to change out the technology inside the individual sensor. You just change the intelligence via software in this central compute center. The biggest difference really is that you would be able to interact with the way in which the modules create experiences through changing the way that the software algorithms work, both in the vehicle and back in the cloud, because they're going to be interconnected to a high bandwidth cloud connectivity.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

So, Ken, I mean as you kind of build the software-enabled car that can, not just have greater capability and bandwidth, but also I assume help decomplexify the vehicle, make it – lower the variable cost, improve reliability and flexibility for updates, what operating system does Ford use today? And kind of – can you elaborate a little bit on the in-house software capabilities, because -correct me, if I'm wrong, but it seems like it starts with the software?

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah. No, you're right. It does start with software, but also starts with the design of the electrical architecture, both inside the vehicle as well as in the cloud and in the enterprise. And so, a couple of key features, if I could describe how we're enabling the software to be unleashed in our architecture. First, shared memory is really important, because if you bring sensing back from a sensor or an actuator or some module in the vehicle, you want to be able to share that information between modules, so that you can really ideate and create like differentiated experiences. So, we're designing the architecture in the vehicle so that the individual modules can share memory with each other.

Secondly, zonal power is really important, because we want to be able to power the individual elements of the vehicle independently and on-demand. And so, in the past, the vehicles are either on or it was off, while in the future with the zonal power architecture, you can power individual modules when you need it. So, imagine you want to create an experience where you turn a camera on to do some tasks or to create some experience when the person's not even in the car, you could do that with that technique.

And then, lastly, creating this platform, upon which you can build software and then drive AI innovations into the experience is really important. So, all of these things are what we think will differentiate the Ford architecture and the Ford tech stack. And then last thing I should mention is, this is going to be deployed on our really important nameplates like the F-150 and the Bronco two and four-door. So, we anticipate we're going to have large scale, as we implement these technologies on our vehicles and our platform.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

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So, Ken, how important is in-house development of the operating system? And remind me what OS you use, because there seems to be this decision that the automakers face, which is to – maybe they do some OS now, but it's a bit of a patchwork and that longer-term they might use an Android Auto or Google Automotive System or Apple Auto or some kind of third-party development. I didn't know how you view that whether that was – whether OS is like really sacred IP it needs to be done in-house long-term. And again, just remind me what OS you're using.

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah. Currently, we partner with a variety of technology companies on our OS and our tech stack development, including QNX and AUTOSAR in Linux. Currently, our IBI systems are based on a QNX operating system that comes to our partnership with BlackBerry and we – but we build on top of that, leverage – creating middleware using an internal software team to create differentiated experiences.

So, in the future, across our business, we will plan to partner with – continue to partner with technology companies to evolve our OS. And as I said before, we are working very closely with technology companies that Jim Farley mentioned earlier, and we don't have something to announce today, but, yeah, I'm very confident in the OS evolution that this partnership, and the partnerships that we have in the queue will lead us to be industry-leading and differentiating.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

Great. And it seems like an enabling technology to develop an OS is the ability to do over-the-air updates, particularly a firmware. Can you give us an update right now on how which of your cars or what level of capability, either across your range you have for OTA update or firmware, and when you could get to a point or what's your target for – when you would have, let's say an F-150 with full OTA updatability of firmware for the vast majority of software and/or electromechanical battery functions, et cetera, not just things like the HMI, for example?

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah. That's a great question. And starting this year in 2020, we began equipping most of our redesigned vehicles with the ability to do what we call advanced over-the-air updates. And so, to your point, this is not limited to the IDI, this is true bumper-to-bumper over-the-air update capability, where we can get to each module and deploy new software capabilities to fine-tune or fix some issues or create a new experience.

We'll first launch this technology for enabling updates of any module in the vehicle bumper-to-bumper on the all-new F-150, the Mustang Mach-E and the Bronco two and four-door. And the significance of that is, this will create over-the-air update capability on a massive scale, but will also have massive amounts of data from the scale of the F-150, and the Bronco for us to learn from and improve the capabilities of those vehicles and other vehicles, because of the learning that will come from having these connected vehicles in the field. So, we're very excited about the promise of providing this capability.

And by the way, we have 5 million vehicles connected globally today, so it's not just these new vehicles that we're putting into the market that's going to give us that signal, it's the 5 million that we already have connected today. This is going to give us an advantage of scaling this technology across many vehicles, so it's an exciting time for us.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

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All right, Ken. We're going to leave the car now. And I'd love to give you a chance to focus on what you think is the most important part of the mobility ecosystem beyond the car. And I know Ford has been really a leader in developing capability of the what you call the transportation mobility cloud or I guess that's your version of vehicle-

to-vehicle, V2X, vehicle-to-everything comes. Can you kind of give us your – the Ford's – what's unique about Ford's approach and why it's an advantage?

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

So, outside of the car, we are thinking about building the connected infrastructure or the mobility ecosystem, so that it works with the system and that system includes the car, but it also includes smart connected things in the world. So, I spoke earlier about cellular, beta everything, and we're leveraging that to connect it from the car to the edge, to the cloud, so we can create new experiences based on that ecosystem. We're going to leverage the speed and the technical capabilities of 5G in the future. So, we're wiring it up, so that it could be expanded and evolve along with the evolution of technology.

What differentiates us really is that we're going to have massive scale, given the number of vehicles that we sell that will have this connectivity and the knowledge of connecting those vehicles back to a cloud ecosystem, where we have a cadre of software experts working on using the data that comes from the connected ecosystem to create new experiences and to build out new internal fitness capabilities like warranty and prognostics and improving our – even how we present the vehicles in the market as we integrate with the smart world.

A great example of that was our demonstration project that we just did in Corktown with Bedrock and Bosch, where we demonstrated how a smart connected vehicle could work with an instrument at smart garage to provide valet parking through a smartphone. And this was the first demonstration of a US-based smart vehicle infrastructure based valet parking. So, you can expect to see more capabilities like this as we deploy our smart connected mobility ecosystem together with our connected vehicles.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

Yeah. I want to get into the business model and telematics. But before, I just wanted to bring up talent – and you brought up Corktown. There's an argument out there that traditional OEMs in some ways are a big disadvantage to attract talent and capital when – for emerging tech efforts, when those efforts are kind of run by these massive kind of companies that are 95-plus-percent exposed to the internal combustion environmental liabilities. I wanted to know your view on this and kind of how you're winning the talent battles when you go head-to-head versus Tesla or Amazon or the startups and how important has Corktown been for you to try to create kind of a cultural lightning rod?

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

That's such an important point. I mentioned earlier, but I'll say it again because this is really significant, is that we brought in more than 3,000 advanced computing and analytical capable employees over the past several years. And this has helped us transform our company. And I think talent and people with capabilities, they notice that. And the second thing is that – it's – we have an environment at Ford, where people with technology, talent, software capabilities have an opportunity to work on important problems and work with likeminded people. And we've seen that has been a magnet for us to be successful in our recruiting in some of the really tough areas where you need to recruit.

And as an example of that, our Palo Alto lab grew from basically a handful of people in 2015 to more than 300 over the course of the last five years. And during that time period, our attrition rate for high tech individuals was less than the industry average. So, we were tracking just under 10%, which was beating industry average. So, our

overall attrition rate and our traction capabilities in this high tech demand area has been quite good. And I think it's because people see that we have an environment where they can innovate and make a difference as well as work on really exciting and interesting projects. So, yeah, we continue to work on it and it is a war for talent, but we're holding our own.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

All right. So, when you kind of put all the pieces together between the car and the cloud, I'd love for you to elaborate on where you see the most exciting opportunities to generate recurring software or service revenue, whether software as a service or some other telematics. Again, I know that there's a lot on your plate between working with smart cities and helping commercial customers, lower cost of ownership and fleet management and even within your own business of a warranty cost, but I'd love you to kind of elaborate on that. And then I kind of want to follow up specifically – or maybe you could just address in that question, the Metromile partnership that was recently struck on insurance.

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah. So, we're really excited about the promise of using connected car technology and the tech stack, and all the capabilities that it will bring to our teams to really build out new differentiated experiences for our commercial vehicles. We're leaders in the commercial vehicle market with transit being number one in North America and in Europe. So, we see this as an opportunity to really take that to the next level, and use connected car data to build experiences to make every insight count, to make every interaction with customers count, to make every trip count when you have a commercial vehicle participant using our vehicles.

We can really optimize the experience and also optimize the operation of a small business owner who uses Ford vehicles in their fleets. They don't want to spend time worrying about or dealing with the complexity of managing the fleet, making sure they're washed and getting them fuelled up. We can build new services and experiences and connect their needs to other partners using the capabilities of this new tech stack. So, we're really excited about that and we've got a dedicated team focused on ideating what are some of the most promising services we can build out, building on services that we already have, including WiFi and Sirius. So we have some experience of working with other technology providers to integrate into our tech stack to provide services. And we're going to just build on that to create a great portfolio. That's what we're really, really excited about.

And by the way, I should probably mention that the fact that we have chosen to internally integrate this tech stack, so that it enables us to do this differentiates us from many OEMs that are still outsourcing much of their electrical architectures. And when you do that, you don't have the ability to pull the intelligence to a central compute module and to do the kind of differentiated services that I'm talking about. So, I think we're positioned in a really differentiated way, and we're really excited about what it might enable us to do.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

That's great, Ken. I'm getting a couple of questions here, and I've got about three minutes left. I want to try to combine these questions on the webcast into one or two, if possible. Ken, you've made the point that – you just said in-house development of electrical is a huge advantage. I think we all get that. You've also talked about the importance of insourcing critical components of the operating system, even if you leverage third-party tools and then your own OTA ecosystem to kind of keep building on it in-house.

But I'm wondering if, while you have a software development in-house and the electrical architecture in-house, whether there is an advantage of also bringing in-house some of the hardware like propulsion systems, e-motors and these kinds of things. We know where you stand on batteries. I won't go there, but I'm just wondering at a high level where if architecture and software is enough or – but you can continue to outsource the other hardware or whether there's an argument for doing more of the hardware in-house too. My understanding talking to our tech teams and Katy Huberty I know [indiscernible] (00:28:27) that there are some – there's some merit to the Apple approach of doing both early designing both in-house, because the hardware impacts the software and then the software helps you optimize the hardware and that having that under one roof is an advantage. I want to know where you and Ford stand on that. Thanks.

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah, it's a great question and where we stand, it depends on which hardware component you're talking about and how much is commoditized. And so let me just talk about maybe three specific examples. When it comes to e-motors that's where we have seen the opportunity to have an advantage by doing that in-house ourselves. So, we actually do do electric motor technologies in-house. And we made that pivot because we can – we found that we can apply our decades of experience in electrical architectures and electrical systems and motors and e-motors and related technologies to do it more efficiently, and to actually save resources and provide a more efficient e-motors design.

We've been doing powertrain optimization and controls internally for years. And we'll continue to do that because there's a lot of value in doing so. But when it comes to subcomponents, the supply base is just better positioned to do because of either their scale or the cost of investment to create that hardware, we choose to not do that in-house. So, I think the answer is it really depends. And where we stand on batteries is a great example. So, we don't do the batteries in-house, but we do do the integration technology into the pack in-house, and so we'll continue to do that. So, it depends on which technology you're referring to. And so, we'll continue to watch that closely and make those decisions, one at a time.

One area that's got a lot of attention recently is the compute SOCs and hardware chips. And so, we're working closely with partners and evaluating options for how to do the compute – high performance compute center and use it – leveraging the supply base. And we're leaving our options open and we'll continue to evaluate whether we should do some of that in-house, whether we do it through a partnership or continue to buy it from the supply base.

Adam Michael Jonas

Analyst, Morgan Stanley & Co. LLC

Q

Okay. I'm going to squeeze in one last one and then – just on Metromile, I think that's really interesting example to me because by having a software-enabled and connected car that's collecting high fidelity and processed high quality information on driving habits, it just seems to me like a no-brainer that there's some value that could accrue to the OEM, considering you to own the data or otherwise have an agreement where you'd share the data with the consumer at their discretion. So maybe just a word on that and then we wrap up, that'll be great.

Kenneth E. Washington

Chief Technology Officer, Ford Motor Co.

A

Yeah, sure. Yeah, and I apologize. I didn't hit that before. You've already asked that once.

Adam Michael Jonas
Analyst, Morgan Stanley & Co. LLC



Okay.

Kenneth E. Washington
Chief Technology Officer, Ford Motor Co.



So, we did enter into a number of data agreements with insurance companies. And Metromile is the latest. Like you said, it's kind of a no brainer because one of the great applications of connected car data is you can actually get precision information about how far the vehicle has been driven. The customer has to opt in. So, trust is really important to us. And so, our arrangement with Metromile is that the customer opts in, and share the driving data with Metromile. Then they can accurately secure and securely count to the number of miles driven from the vehicle's odometer without adding any additional equipment. So, it's a great cost save for them. It gives a better experience for the customer, because they may pay less for the actual insurance that they're a great driver or haven't driven very much. And then, the savings can be shared through a strategic relationship and agreement between Ford and Metromile. So, that's a really basic example. And we are looking at building on that, and doing additional things like that with other potential partners.

Adam Michael Jonas
Analyst, Morgan Stanley & Co. LLC

That's great, Ken. Listen, we're going to wrap here. I want to thank Ken Washington, Chief Technology Officer of Ford Motor Company, and the Investor Relations team, Lynn and Jeff and [indiscernible] (00:33:01) and everybody for making this possible. We're going to – any questions, please don't hesitate to feedback to me. And I can get onto the team, if there was – I know there were some that weren't answered. And with that, this concludes the webcast. Thanks, everybody.

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