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Cars can be much more than just boxes that get their owners around. John Viera, a former director and sustainability lead at Ford Motor Company, and Raj Kapoor, chief strategy officer at Lyft, join Stanford adjunct professor Pedram Mokrian to discuss opportunities for innovation in the field of transportation, particularly in the context of sustainability concerns and accelerating urbanization. Innovators, they suggest, need to think of transportation as a converging ecosystem, rather than as a collection of disparate technologies and business models. As shifting energy sources and big data come into play, car sharing companies and automotive manufacturers will find themselves both competing and collaborating in new ways.



Transcript

- [Narrator] Who you are defines how you build.. - So my memories of this program were actually as a student, where this course was actually offered in the Terman Auditorium for those of you who have any recollection of where that was, it's now turned into a pond on the other side of campus.. But I remember sitting there as a student and just sort of listening to all of these amazing speakers.. I am not the amazing speaker, these two gentleman here are.. I've asked John to come all the way from Michigan to actually join us this afternoon and Raj from just down the street.. I know them in different capacities.. And Raj and I used to work together at Mayfield, which is a venture capital fund and I'll let him talk to you about that.. And John and I are on an advisory board on Phillips Petroleum together, so it's really interesting two completely different perspectives but one common theme, which is the future of transportation.. So we're really excited to have this conversation.. But before we get going, I'd love for Raj to just....

A couple minutes about yourself and what you've been doing lately at Lyft.. - So, great to be here.. I was a mechanical engineer, twiddling around in the mobile robotics lab at Carnegie Mellon back in 1992.. Lo and behold, after doing a long career in internet entrepreneurship as well as being the BC at Mayfield, I'm back in robotics kind of because I'm running our autonomous business and we have, as you've mentioned here, a facility with about 300 people that we're building out the full hardware, software system for self-driving in addition to some other things I could talk about.. But anyway, so.... I've been an entrepreneur, started a company called Snapfish an online photo service.. That's a long story over a beer where I sold it once, lost a lot of money, and then bought it again, and sold it again to HP.. And then there was Mayfield for 7 years.. I was really fascinated by network effect businesses because this is where you could potentially increase the value of every person on it by other people using it because that builds a real true competitive mode.. It's hard to build competitive modes today..

Intellectual property is not as much of a mode as it used to be.. So that's been an exciting 7 year stint there.. Working alongside people like Pedram was amazing.. And then I started another company in the fitness space, which was called FitMob which kind of inversed the fitness model.. Again, a separate beer conversation probably not here.. Had to iterate that three times and finally got it to work and merged it to ClassPass, which is now the largest fitness subscription service that's out there.. And the interesting thing that happened in terms of how did I get back involved back into this, I led the series A in Lyft, which was Zimride at the time, so I was there when the company was about 20 people.. And I did that because I was as much passionate about also climate change and making a difference and I thought why in the world are there all these cars where only one person's in them? They're 75% unoccupied running around and I've also read enough to know that if you add more cars and more roads, it doesn't solve the problem.. And so I thought there was a better way there, which is why I invested in that.. But then after FitMob and ClassPass, I was thinking about what to do and I came over to Pedram..

And to Stanford in particular and spent some time here.. And realized that.... I really wanted to make a difference on climate change.. It was 2016.. It wasn't about telling people about climate change, although it still feels with some people in the White House we have to say that, but it was more about making action.. And what Pedram opened my eyes up, and the work here by Ray and others that are here is that, urbanization is this massive trend that's going on, which is that there are 2.5 billion people over the next 15 years moving into cities.. There's 5 trillion dollars being spent on urbanization.. If we could take a percentage of that and direct it towards technologies that are carbon-efficient, more so and using technology to do that, you could make a huge difference.. You don't have to wait for policy changes.. You don't have to wait for consumption changes..

If you could just go to the core root of the growth and where the money's being spent, it's around urbanization.. And that got me thinking about it, which then got me full circle back to where can I make the biggest impact in that.. The team at Lyft said come here and do that.. So, that's the story of where I am.. - Terrific.. And on that exact same theme, John I know that your last position at Ford was actually focused on sustainability, but maybe you could sort of tell us a little bit about your journey there and the types of things you're doing.. - Sure, absolutely can.. So my last position was in sustainability at Ford, but I'll leave that 'til last.. So I was at Ford for 34 years, and I know a lot of you out there.... When I graduated back in '84, University of Michigan undergrad, Mechanical Engineering, I remember at the time my father came to me and he was a Depression Era kid, and he's like, "It's great you're working for this big company at Ford..

You're gonna work there 40 years." And then I said, "Whoa dad, there is no way I'm gonna be at the same company my entire career." As a matter of fact, the average coming out of school way back then in 1984 was 5 to 7 companies.. So I said, "Dad maybe it's not 7, maybe it's not 5, but 4 companies for sure, so.... Great idea but no.. I'm probably gonna be moving around." It was just kinda interesting.. After 30 years, I got a call from my dad.. And he's like, "You're kinda at the same company, so just wondering when are you gonna start making a move?" (students laugh) So I never thought I was gonna be there that long, but it was because I had such a variety.. So, Pedram mentioned at the introduction some of the things that I've done, sustainability.... But I actually started as an engineer, mechanical engineer.. I know like a lot of first and second year students here in engineering school, I didn't really know what I wanted to do.. Got into automotive, kinda did the traditional design engineering, development engineering, worked in our assembly plant, so I was really an operations guy..

But it was interesting, when I look at where I ended up in sustainability, I go back through my career and actually one of my first real interesting projects that I worked on was in the late 1980s and it was working in the alternative fuels organization.. Right? That was developing, I'm gonna call it power trains, for any type of fuel except for petroleum.. So I actually was focused on natural gas.. So our team developed the first natural gas pickup and actually sedan.. So I started, loved that space, but kind of moved on into more traditional roles.. I was mentioned Chief Engineer, which you have profit and loss responsibility for different vehicle lines.. I was a Chief Engineer for Ranger, the Ranger pickup truck in the late 1990s.. And the relevance again to sustainability was I had this little side project called the EV Ranger.. So this was a Ranger in the mid-1990s, super high technology, the bed was filled with lead acid batteries like you find under the hood.. I'm like, whoa this is high tech right? But it was really interesting that particular project..

Again, thought it was interesting, didn't know that that's what my focus was going to be moving forward.. But then fast forward 10 years later, I was actually named to lead our sustainability efforts for Ford, and when we talk about the sustainability efforts, that's our environmental efforts, so it's all about as we look at the vehicles that we produce, how do we ensure that the materials that were used in the vehicle are responsible right? That they're having hopefully a zero impact on the environment.. And then also lots of work on emissions.. If it's CO2 emissions or other emissions right? That was a big focus of how to develop those strategies.. Clearly the plants we build those products in was a big focus.. I would say though that the hidden gem of sustainability, and it's something that I'm going to be touching on I'm thinking throughout this talk, was the social aspect.. Right? From a social sustainability.... And it was something that I wasn't that familiar with.. I was an engineer, a technical guy.. But I had this team of social sustainability experts..

And they actually when I was there developed a policy letter, which is kind of like an amendment in the United States.. Very hard to have 'em at Ford.. So you have kinda like this Constitution and these amendments are kind of the policies that are inviolable.. And this policy letter addressed human rights, working conditions, fair wages, anti-bribery, and we added sex trafficking, human trafficking to that.. And it was so awesome because we put this together, first in the industry.. Not only did we use that to make sure that we were behaving correctly at Ford, but we're actually able to drive that into the supply base.. So really making a difference in the world.. That was a piece that, I'll tell you what when I was a first and second year student at Michigan, that wasn't even on my radar screen.. But my background helped me in the overall sustainability space, loved that.. I eventually picked up all of the negotiation responsibility for environmental standards..

For fuel economy, emissions, so very interesting.. Working with governments throughout the world from China to the US to Saudi Arabia and let me tell you, the governments are a little bit different in those countries right? So, very fascinating on driving our sustainability through those regulations.. And then currently, I'm retired from Ford.. But I'll just say quickly, I'm an Executive in Residence at the University of Michigan of something that they call the Erb Institute.. And the Erb Institute is a program at Michigan that combines a 2 year MBA program at Ross Business school with a Master's in Environment and Sustainability.. So you get two degrees.. And there's just a big focus on taking sustainability and making it part of your business mindset moving forward.. - Yeah, such a great story.. And one of the reasons.... So typically ETL is one person replying on their background and their views of the world..

But one of the reasons we decided to have these two gentlemen on here is because they actually represent two completely different perspectives on the world of transportation.. You have a company, well Lyft by itself is about 6 and a half years old and it was Zimride longer, but it's about a 6 and a half year old company, more digital versus a 115 year old company, right? More mechanical, yet you're kinda converging onto the same spaces right? You're starting to really think about sort of ways in which you're competing, collaborating, cooperating.. But I wanted to sort of get your different perspectives of what does that mean to be digital in the world of transportation? Sort of from your perspective I know obviously about network, about businesses, but also some of the work and some of the statistics that you have John and sort of connected cars as well.. So

what does it mean to be digital in the world of transportation, how does that push us forward? - Yeah, taking a step back transportation is one of the most important vital areas.. It's linked to so many things around even education, poverty, making sure people can get to jobs, making sure people can get to their medical assistance.. I was shocked at what second order effects that occur because of transportation system.. And it is the industry, which now is going through probably the biggest upheaval that has ever been there since the car was there.. And one point of history is that when the Model T, which you guys were responsible for, thank you very much, was first created and mass production came to be and you could see this picture in the 1900s, 19.... I forget the exact, early 1900s of the Easter Parade in New York and there was just one Model T - Right, right.. - And it was all horse and buggy..

13 years later, no internet, no social media, 13 years later it was all cars and one horse and buggy that was there.. And it's amazing how quickly that that technology disseminated because it's so vital and so important.. So what we're seeing now with the advent of digital and a whole bunch of other things that are there as well, there's AI.... That we're going into another revolution that's right now feels like it's going to be happening slowly, and like most things like you look at the mobile revolution, it's gonna hit like super aggressive and turn everything that's there.. And the reason is not just because there's technology and we can do it, it's because we're facing a fundamental problem.. Americans spend more on transportation than they do on food.. It is the second largest expense aside from housing.. 90% of the way that Americans move around is through a car.. Their car is utilized, no offense to the car industry, and I feel good talking about this here with Ford because I think Ford gets it and Ford is moving in the direction, but a car is utilized 4% of the time.. 96% of the time it's sitting and not being utilized..

And when it is utilized, it's 75% unoccupied as I mentioned before.. So we have this asset that people are spending a lot of money on that is also responsible for unfortunately, there's significant amount, 94% of accidents are caused by human error.. We have emissions problems that we've talked about before and of course congestion of adding more cars and urbanization as 2.5 billion people moving into cities.. So when you add all that up, it's not just technology, it's that we have to have a solution.. We need a solution in the next 10 to 15 and it just so happens that the building blocks are here now which is on demand technology.. The word that's often used about the future of automotive transportation is CASE.. C-A-S-E which is connected, autonomous, shared, electric.. And the thing that I will say right now is if you have just one of those technologies, it's not gonna work.. You need all four for the system to work.. For us to fundamentally rewire the transportation system in the world..

All four must be there.. Because if you just have autonomous, you'll just end up with a lot more cars.. And that won't necessarily solve the problem, so you need shared.. If you have autonomous and shared, you're still generating emissions and we can't even afford one more ton of carbon into the atmosphere than we've already been putting in.. So you need all of them that are there and so that's what I believe represents this huge change, is that atoms and bits are coming together.. It's not just about digital.. 2 years ago we were an app and you would just connect to drivers that are out there.. Now, we have 35,000 cars in our fleet and we're building hardware up the street.. So our world has become Ford's world, and Ford is getting into software.. I won't speak for Ford, but you can..

- You're doing pretty good right? You must've studied a little bit Raj, but no that's good, very good.. - What's your view from the Ford perspective? - So it's interesting.. And Raj and I did not talk before this particular class.. I swear to you, but I'm so glad you brought up Henry Ford so thank you for that little plug.. I'm gonna refer you to the graphic up on the screen because the connected piece and the data in particular is really, I think, changing the transportation industry.. So if you look up at that graphic it says, "Every minute in the United States, 30 new vehicles were sold." Well I'll tell you, if you go back in recent history of even the automotive sector, it was all about selling the box right? I mean that's what we did, we sold the box.. That was it.. We sold that box.. And there was quite a few that were sold.. However, what we have been realizing is what Raj brought up..

Right, look at that right side.. Right, you sell the vehicle one time.. People are only using that vehicle every so often.. When they're in the vehicle though, look at that, they are.... There's a lot of miles being traveled.. People aren't necessarily from a personal ownership just buying their own vehicle, what they're moving into shared rides because they're saying, "Hey I need transportation, I need mobility.. Maybe I don't need to buy a vehicle." So vehicle ownership is changing.. And the auto industry needs to start thinking about not just selling the box but also the use of the vehicle.. Getting into those types of businesses.. And then clearly from a data standpoint..

There's so much data being generated right now.. And when you think about the goodness of how that data can be used, right? And Raj touched on a lot of different elements, right? It could be the element of data use in terms of smart vehicles for lower emissions.. Clearly from a connectivity standpoint, vehicle to vehicle, vehicle to infrastructure.. You could really address safety concerns and address the accidents.. When you talk about vehicle to infrastructure, how are you linking in with other entities outside of the industry to ensure that data is being used by cities to help out with congestion? So I think that there's huge opportunities from a social standpoint to use data moving forward.. From a business standpoint, just to throw some numbers out there, so to produce the box auto makers throughout the world, you name it if it's US auto makers or European or Asian auto makers, 6 to 12% profit margin is considered at the high end, 12% is considered really good, right? In terms of building that box.. When you talk about getting into the services and I know Raj is probably not going to divulge the profit margin of Lyft, I'll tell you what, when we look at the profit margin associated with the use of the vehicles right, it's 20%

profit margin easily and higher.. So when you think about that, if people are moving more toward those types of vehicle uses, the profit margin's a lot higher.. We have all this data available to do some amazing things for customers and for services.. The industry is really starting to say, "We want to get on that right hand side, really use that big data to our advantage." - So in terms of just using the data to the advantage, I just want to touch on this point and the point you made before, which is sort of the social impact..

So let's just dive right into that.. Transportation makes such a huge component of our lives, right? And we don't really think about it much here because there's so much around it and access to cars, and vehicles, and ride shares.. But there's a huge swath of the world right now that really has not necessarily been taking advantage of all these technologies.. How do you see sort of the world of transportation not only touching the developed ecosystems, but also the developing ecosystems? From just the social perspective.. And where do you see the future going there? - Yeah, so really good question Pedram.. And I'm gonna reference Henry Ford as well if I could Raj, okay? - You're allowed.. - So I'm gonna reference Henry Ford because I'm going to take us to where transportation is hopefully going.. And it could have a big impact from a societal standpoint.. So kinda going back to the time of Henry Ford, Model T, 5 dollar a day wage, when you talk about having a societal impact, a positive societal impact, clearly you could say yeah that was very positive, right? I mean doubling the daily wage that other industries need to follow, really help build up the middle class.. But I think it wasn't just building up the middle class, it now made it affordable for more of the masses in the United States to have this mobility, this transportation..

And around the turn of the century, the average American didn't travel any more than 25 miles from their place of birth to when they died.. Never went more than 25.... What was the reason for that right? Infrastructure wasn't there.. Roads weren't there.. Transportation was unreliable, hopefully you had a good horse, right? So that was a big problem.. When the Model T came along, the first person in the outlying areas that had the Model T was who? Does anyone want to guess? What was the first occupation that had the Model T? Anybody want to guess? I think I heard it back there.. I don't know, we'll give credit to one of the first year students.. The doctors, right? So doctors had the Model T because they're able to get out to the villagers, right? To actually provide medical service.. That was a big breakthrough.. Then people started to be able to afford these vehicles on their own..

They could get into the cities, right? For medical, for education, for jobs, for all kinds of things, so that was fantastic right? Mobility was an enabler for really building up the standard of living.. Now let's fast forward to today.. Let's look at a lot of the developing countries, right? Like Sub-Saharan Africa for instance.. Here's the bottom line right, we're not over time.... Time will never happen to the point where the masses in Sub-Saharan Africa are probably going to be able to afford personal use vehicles.. However, there's still a need for those individuals particularly those living outside of the city to have access to medical, to education, to all of those types of services.. And what I'm really hoping transportation's gonna start doing is to say, "How do we use the brain power, how do we use innovation such that we could take mobility and bring those services out to the villages?" How do we change the business model so that villages could own a particular vehicle and get into the city? That's what I think from a societal standpoint mobility could have a huge impact in these developing countries.. - And Raj I know you got back into Lyft because you were looking probably at sustainability and you and I spent a long time actually looking at cities and infrastructure and urbanization.. And we both agree that sort of Lyft's role within that overall ecosystem was pretty profound.. Not just from a sustainability perspective but from a social impact perspective..

So can you kinda talk about that journey and sort of the things that you've seen firsthand now that you've been there for a couple of years? - Yeah, I would say first of all what's interesting is that the roots of Lyft go back to the Founder and CEO Logan visited of all places Zimbabwe.. And that's why it was initially called Zimride by the way.. And he noticed that entrepreneurs would purchase these 19 person, 18 person buses and go figure out what are the most profitable routes and run a shuttle service around.. And they made a much more efficient use of vehicle than what we were doing in the United States that was the initial calling there.. Now fast forward to that concept was born and now Lyft is readdressing that concept, so one thing to mention is that we also believe that the consumer is not really thinking about ride sharing necessarily, they're thinking about getting from point A to point B.. And already, if you open up Lyft, it's evolving to the point where it's about getting all the options out there.. Even though some of them we don't touch a dime of money on, so for example we've integrated transit options, we integrate walking wherever you can because it's much more efficient in terms of the pickup and then there's bikes and scooters that have also been put in, which are an efficient way.... short distances if you're going yourself and the weather can support it in doing that.. So what we're seeing is bring that whole set of solutions is what really unlocks the connection with the city and being able to get in all the different areas that you need to go in doing it.. That initial idea that he had, going then to the efficiency that's there, one of the other things we've done, and this is something that hasn't happened but, we're thinking about things like how can you reinvent what buses are? So providing an efficient transportation to people especially those that can't afford it has been done through basically government subsidy where you're running these very large buses, 60 person buses at demand times that don't necessarily need it but you need to make sure that you can hit every community..

It's really important.. That will always be a need there, the question is can you make that a lot more efficient? So one of the things that the industry has introduced including Lyft, is this concept of shared rides but also with walking and really what it is is an on demand bus.. So people are saying, "I need to be picked up" in five different locations and what we're doing automatically saying, "Okay you walk 2 minutes, you walk 3, you walk 4 minutes." And we're making virtual bus stops and we'll pick you up along the way, which is a lot more efficient than going point to point to point, which would take too much

detours and you won't get the same matching efficiency that's doing it.. So with that now, you can start putting larger format vehicles on and you start getting to what is a more efficient transit service and a more efficient bus service.. And these are things that we're exploring.. We're working with 35 different transit agencies right now trying to help them solve those problems.. - That's amazing.. So speaking of those types of problems, let me get a little bit provocative here.. And let's for a second assume that you had a magic wand and you had the ability to solve one problem be it technological or market oriented that would sort of unlock a vast array of opportunities in the transportation sector, what would that be? What problem do you think is worthy of being solved immediately that sort of unlocks a whole new future of transportation? - Yeah, so if I had the magic wand I would say that that magic wand would be to actually come up with an incredibly affordable energy storage system for renewable energy.. So it could be a battery-like storage system, fuel cell storage system, but incredibly affordable..

Because right now the challenges, and everyone is working really hard on reducing the cost of lithium ion batteries and other things, right now here's the problem with electric vehicles somebody said, "The good news is with electric vehicles you could take a renewable, clean energy source right, and the cost of..." Pedram we talked about this really coming down.. So free energy, it's clean, that's the good news.. The bad news is you got a \$10,000 fuel tank.. You go to the internal combustion engine, the good news is you got a \$100 fuel tank, but the fuel is not clean and it's expensive for the customer, right? So that's the problem.. So the solution is, how do you have the first element, but take away that \$10,000 fuel tank.. So if I had a magic wand, it would be energy storage at an incredibly low level.. And if you could get energy storage at an incredibly low level, then you'll absolutely be able to touch on the societal issue of how do you make mobility and transportation affordable for the masses? - Raj? - So I'll give you a quick answer and then more related to the AV world.. The quick answer that you and I've also talked about in my opinion is putting a price on carbon.. I think a lot of things will flow out of that.. Like when we think about shared rides, that would drive potentially more, make it more economically attractive..

All the things that we're talking about with renewable energy.. So that's the policy thing, which I'm not sure I'll be able to have an impact on in the next 50 years, but in terms of what's the other piece that goes a little bit deeper into the automotive industry that's there.. So let's look at autonomous self-driving.. It's a hot area.. There are, I think, over 150 programs that are going after this.. And each of the programs, my estimation needs to spend about 800 million to 1 billion dollars a year in sustained R and D.. And no one really has an idea that can tell you it's gonna be done on X date.. It's something that is continually going.. You look at the amount of money going into that and you wonder why, like why is it all going into that? Well it makes sense if you're thinking about it from a venture capital perspective.. This is a 2 trillion dollar market..

So to write a billion dollar a year check, let's say it takes 5 years, so 5 billion dollar check towards a potential 2 trillion dollar market, no problem.. So you're gonna get.... There's gonna be no issue on capital that's gonna go after this and this is why we have so many companies, and you're hearing even in the last couple of days, people raising a half a billion dollars, 900 million dollars that are creditable teams that are going after this.. But the challenge is that with all that capital and people not sure about what their core competency is, they're each building in silos.. And so a lot of the work is being repeated across all of these different programs that are there.. I think eventually it's going to make a lot of sense to really start sharing more so and to make that more efficient.. And I don't think we're there yet in 2019, but I'm hopeful in the future and especially when it comes to safety and thinking about the lessons that one program has learned, sharing those out so that the others can learn this.. The airline industry has done this successfully where if there's a safety problem with the plane, it gets broadcasted out to every single airline and every person's supply chain and they figure out the solution and they solve it because they don't want to make safety a differentiator.. I don't think that's where we are today, but I'm also hopeful that we won't be there and so the ability that making that sharing happen I think is going to be critical to an efficient and safe future.. - I think it's such an important issue here because I do agree with you..

There's a lot of silos going after this opportunity because it's so large, but at the same time, kind of looking back from your perspectives, you're coming from effectively the box and you're coming from the network, right? If I were to be so crude.. Where do these things collide in the future? Right, is the value in the ownership of the network? Or the intelligent box? Or some kind of hybrid in between? If we were to fast forward not just Lyft and Ford, but just sort of these ecosystems in general, where do you see these things actually converging and sort of playing fair and friendly with each other? Or do you actually see one side dominating the other? Right, is there a steady state where.... - I'll take a shot.. The point I think that is important here is that you need both.. We are moving towards a transportation network future.. We're already there and it's happening quickly.. But to do that, you need to have vehicles.. And those vehicles are going to come in all sorts of different shapes and sizes.. Scooters, bikes, anything with a potentially electric drivetrain that'll be there.. You're gonna need both that are gonna be there..

The opportunities for innovation are massive in both areas.. So let's just take for a second vehicles.. Again, I'm not the expert as much as Ford is but when I think about 'em and when we talk to our customers in the future about first if you look at vehicles, they've been optimized around the driver.. Now you can optimize the vehicle around the passengers.. And so what we're gonna think about is when we're getting into our Lyfts is what is my cabin experience? That's what's gonna matter most.. Not necessarily the styling of the exterior of the car or necessarily the brand of the car that's gonna make a difference, it's gonna be what is that cabin about? Same thing when you go on an airplane journey.. You care about the seat.. 180 degrees, we get the little fluffy pillows, how's the food, etc.. And you can think about all the different activities that this opens up when you are a passenger and there is no driver.. Whether it's sleep Lyft, I need to get my work done Lyft, I need to entertain Lyft, social Lyft..

All of those things can have different configurations.. And now imagine every single one of those cabins has 5G connectivity and the experience that you can have inside those.. So I think there's plenty of room for innovation on both sides, and innovation results in creating value.. - Couldn't agree with you more.. - No, I.... great example of something that the auto industry is looking at is when we're looking at the box, absolutely correct.. If you don't have that driver, the designers are going crazy like oh my gosh, right? We're talking about having incredibly comfortable interior spaces that their creativity is going through the roof.. I think the other piece associated with that, getting back to the social side, I think it really opens up the door for accessibility.. When I talk about accessibility for those that have physical challenges, for the elderly, I mean I think there's huge opportunities there that brings tremendous value to society.. I think the other area when you talk about a convergence in this space outside the technical area is the policy area..

Right? How could, I'm gonna call it these entities that are working in this space, actually work together like the example Raj gave with aviation to actually come together to discuss what is the right policy that we need to implement.. For instance, to have the right, I'm gonna call it deployment of autonomous vehicles.. 'Cause Raj mentioned it earlier.. If you have a bunch of autonomous vehicles driving around and I'll pick on somebody, I'll pick on Lauren over here because Lauren has been so wonderful.. Let's say Lauren, she's gonna get an autonomous vehicle.. She absolutely loves it.. And you know something, that vehicle's gonna drive her from.... I'm just getting to know the area.. Maybe she lives in Daly City, hopefully that's.... I don't know, I'm just throwing that out there because I saw it on MET..

She's gonna get her autonomous vehicle, go from Daly City into Palo Alto, drop her off, go back to Daly City, wait for her to get done with work, and then come back into the.... That's not a very efficient deployment of an autonomous vehicle, so I think that there's a huge opportunity from a policy standpoint for entities to get together to say what is the right policy, and I'm gonna call it regulatory environment, to ensure that these new technologies are deployed as efficiently as possible and always in a way that is accessible particularly for the underserved.. - So before we turn over to the audience, there's a lot of young budding entrepreneurs out here and I was wondering if each of you could sort of give one either counterintuitive or sort of lesson learned from the transportation ecosystem that you think would be sort of parted wisdom on this audience that you could sort of share with them? Is there something that most people are talking about which is either dead wrong or sort of counterintuitive or just a bright spot that you see that you think there should be a lot more focus and attention on from your perspective? - So I'll give a personal, less about transportation and then I'll talk kind of more about mission.. On the personal side, I would say especially coming from Stanford, or Carnegie Mellon, or the University of Michigan, whatever these schools are, the one most important thing that you have to remember is you don't need to be the smartest person in the room.. Even though you think you are.. What really is going to be successful is when you capture what is gonna be benefited from the other people that are there and that you don't have to have all the answers in doing that.. That I think takes a lot of pressure off and because the world is about collaboration.. It's not about a single person that's going off and changing the world.. That's rarely ever the real way that things happen.. Second, in terms of mission, I would just say that we are at this amazing time..

When I graduated, especially business school back in 1996 and the internet was just coming out, it was exciting.. The internet was gonna change everything.. But we all went and started digital businesses that were about entertainment, photos, important things, but not super important.. Right now the opportunities in front of you all are out to change the world and have impact in a significant, material way.. So don't shy away from that.. And I respect the people that came out of Stanford to start Snapchat, but don't start another Snapchat.. (John laughs) - John, your take? - Yeah, first of all something that Raj mentioned that I absolutely want to reiterate and that's passion.. Whatever you get into, have passion for what you do.. And if you're getting into businesses, I just go back to.... You could work for amazing companies that are producing amazing products that are making a lot of money for those companies, but think about how your insights could actually help make a difference in the world as well outside of just making money..

And regardless of the discipline you're in, you could always be making a difference in the companies that you're in either from an environment or a social standpoint, so absolutely go after that.. In terms of something that's counterintuitive, I think, maybe I'm dreaming too much at night now that I'm retired and I've got a lot of freedom in my mind, I don't know, but when I think about the big breakthrough in mobility and transportation, I'm thinking it's going to come from a group of entities that we're not even noticing today.. I think that there's just going to be this very creative group figuring out what's really required in the future in a nontraditional sense and they're gonna be the ones that are going to be coming up with this amazing breakthrough in mobility and transportation.. - Awesome.. So, I'd love to open it up to the audience to see if you guys have any questions for these fine gentlemen on any topic you'd like.. First question.. - [Student] So two questions.. If I'm a business, how come I gotta be paying for autonomous vehicles to go pick up my customers, bring them to me, and market to them on the screens while they're on the way? And second, are flying autonomous vehicles valid? I mean Lilium Jet and other people are working on it, but.... - So the questions were flying autonomous vehicles and whether or not businesses would actually be willing to underwrite transportation and market to their customers as part of their offering? - Yeah, so I would say on the business side that'll certainly be the case, but when you do the math, look at for example the advertising or marketing opportunity in a vehicle, the way it is today, it's not very large compared to what a consumer is paying for the transportation.. And the amount that a restaurant, for example, would pay to acquire a customer..

So I think that the math is a little challenging now, but as the costs go down maybe there are other ways to get there.. There is some level of subsidization that I think we can see in doing that.. So I've looked a little bit around flying vehicles,

flying taxis, etc.. And I think from a science perspective, it is valid.. And it is absolutely feasible.. There are, I think if you think self-driving and autonomous has challenges, probably my opinion 3 to 5x the amount of challenges that are there.. So I think the timeline is a bit further out to get that right and to get all the policy questions around aerospace, and noise, etc.. right.. - Back there? - [Student] So, as someone who was in Lower Manhattan during Hurricane Sandy, I would've appreciated probably a Lyft gondola or a Ford gondola more than a driverless car.. What are your thoughts on how human mobility will change in the wake of things like the IPCC Report and stuff like that..

Are you guys looking beyond or just keeping the wheels on the ground? Even if they're floating? - Yeah, it's a great question.. It's a great question.. I think that as we think about climate change and the impact on coastal cities again, mobility is going to be very key.. And I think that there needs to be more thought and discussion now about what those mobility sources could be, right? And again, it gets back to affordability, right? I mean we could have submarines and all kinds of crazy things, but it has to be affordable.. And often times when you think about the cost reduction curve, you have to start things sooner than later.. I think we're all seeing right the impact on coastal areas happening a lot faster than what we expected.. And I actually think there needs to be more focus now on what those affordable mobility solutions need to be.. - So, one comment there is what's amazing is I'm sure some of you have been following the micromobility revolution, which is basically bikes and scooters, and how quickly certain cities have just been.... You go there one day, and two weeks later you can't get them off the street, they're everywhere.. And in doing that, some people think that it's a nuisance..

But in general, people are using it.. They love it.. It's unlocked an ease of use and convenience that they didn't have before, but one of the challenges that's presented with the current microbilty solutions, which are basically e-bikes and e-scooters is, and I would categorize it as extreme weather.. Because what we're going through right now, I was just in Lake Tahoe this weekend and there was 6 feet of snow in 2 and a half days, they closed all the roads.. I couldn't even get out.. That was fun, but it was a problem for people trying to go somewhere.. But the point is is that how do we.... The current way that bikes and scooters look and are designed don't work in those type of extreme weather circumstances that are there, even some bad weather.. So there's a lot of energy that's going in the industry to rethink how we can do micromobility that can work in an all weather environment as one example.. - [Student] So as far as I know, the air transportation industry has notoriously small margins and I was wondering if you think there's a parallel between the ride sharing industry or this land transportation industry, and the air transportation industry..

And if there isn't, what makes ride sharing a good business? - So the difference in margins between air travel and road travel from a sharing perspective? - So I can't go into a lot of details or anything about Lyft, but what I can tell you is just a high level perspective on what I think about that question, which is that there's no doubt about it, we're not gonna hide behind.... This is a huge scale business.. And in the scale business that's there, you need to rely on the fact that there's significant.... What's gonna matter is the volume of profits not necessarily is it a big fat software margin.. And the fact is, we are dealing with hardware.. We are dealing with traffic congestion.. There are also fees that are being charged from cities, etc.. So, I don't think the expectation is that we're gonna be getting the ride sharing industry or other industries that are similar are gonna get software type of margins.. It is a different business, but the scale of this is much, much larger than the air industry.. - [Student] I was wondering where trains come into the picture? I mean in Europe, trains are being used pretty efficiently and it's very mobile..

- So we have Ford and we have Lyft, but we have no trains.. - That's right.. We need a train manufacturer, right? It's a good question.. Trains are incredibly efficient.. I think from a cost standpoint and a policy standpoint, there's just a lot of challenges to bring on trains and that form of transportation.. I think as you look forward to the design of cities in the future and the adjustment of cities in the future, we talk about urbanization and how all this population is moving into urban areas.. I think that trains are gonna have to be a big part to hopefully enable people, if the reason they want to get into the city is because that's the only way they have access into the city, so they have to live there.. I think that as we're designing future cities, I think trains have to be a big part of enabling people to get into the city but avoiding the congestion of either having them living in the city themselves or actually bringing vehicles in, but it is a policy challenge.. - So I would say we looked at high capacity rail systems like that are very efficient.. And they're more efficient than cars, there's no doubt about it..

That is part of the reason why we think part of the solution is to integrate in transit.. And that's why we're working aggressively on that.. To do that.. So it absolutely, and in fact what we want to do is surface for the consumer, "Hey you could save \$15 if you actually take a train now and it'll add 7 minutes to do it." So make the trade-off, what matters to you more in doing that.. So I think they're gonna be there and it matters.. What I think is exciting is that there's also innovation coming in the trains as well.. The CapEx for putting a mile of train as well as the OpEx on it is just huge.. There's so much technology that could be applied to bring both of those factors down, which could make it more affordable, which is I think part of the issue.. So I would say the transportation industry hasn't put enough attention on that, but I know that it's being worked on and it's an exciting area.. (audience clapping) (electronic music)..