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Paul Thies: When it comes to data science and transportation, the use cases extend beyond enabling autonomous and connected vehicles. Transportation systems, managers and planners are deploying cutting-edge solutions in their data collection and modeling efforts, which is helping them to maximize road safety and better contend with potentially hazardous locales. Hello, I'm your host, Paul Thies. On this episode of *If/When,* we discuss advancements in data sciences deployed on behalf of transportation safety.

Our guests for this episode are Sean Co, director of special projects and services at StreetLight , and Michael Brown, data and technology director at Jacobs. They recently collaborated as part of a team that successfully brought to market a transportation data solution for one of the largest metropolitan planning organizations in the US. In this episode, they shared insights from that experience, as well as their thoughts on how organizations can integrate data solutions into their workflows, and what they see as the path forward for the future transportation data landscape.

Michael and Sean, thank you both so much for joining me today. We're going to be talking about transportation data and safety, and it's little something that both of you know quite a bit about, actually. I'm really looking forward to talking with you. I think, both the StreetLight data capabilities, as well as that the Hive platform at Jacobs, specifically Hive safety, really fascinating in terms of transportation, and what can be done to enhance safety, enhance the mobility experience. It's a very fascinating topic to me. Appreciate both of you joining me today to unpack this for our listeners.

Michael, let me start with you. I want to just to set the table a little bit. Can you unpack for us the complexity of transportation challenges, especially in regards to safety and planning?

Michael Brown: About a year ago, my colleague Teresa Crisp and I built the council, some of our leading highways and roads transportation clients. Part of our client engagement was to understand where data could be better leveraged to solve some of their biggest needs. As we listened, it became apparent that they consistently face really three main challenges related to data. The first is similar to honestly, many organizations. They face data fragmentation issues, and may have silos within their own organization.

Secondly, their technology systems can be really outdated with limited capabilities. It's honestly not uncommon to have a technology system purchased today, and when you look at other systems that may have been purchased 10-plus years ago, they're very different from each other with many inefficiencies there. Really, the final element here to this is that it really all comes to a head as we live in a world with the promises of big data, and these transformational insights that we can achieve from this data, data that we're just sitting on.

Transportation organizations are not recognizing that potential on their data, and that promise of insights really, is not being achieved because of those two prior issues I described. Really, as we talked to these clients more, and our Jacobs experts, we wanted to truly identify where the greatest potential exists to leverage data better to help solve some of their challenges. What we heard was that increasing safety on

the roads, and a much more transparent planning and prioritization of their infrastructure improvement projects are two of the most important and really, I would say, complex domains for planning that they face.

All this led us to develop this solution that we call Jacobs Hive that we're talking about today. Hive is really intended to provide transportation organization the data Integration insights platform, specifically, two tools, Hive prioritization and Hive safety. It's really about breaking down silos of data, agencies, and people to create that ecosystem of data products that can integrate with each other.

Really, within transportation data solutions that are developed by Jacobs' transportation digital experts, Paul, as you've mentioned, the focus here is the Hive safety tool and for context on why safety is such an important focus, there's over 350,000 people, about half the population of Vermont, unfortunately have died on US roads from 2011 to 2020. That's from our national roadway safety strategy.

That's really a staggering number that every transportation agency is focused on reducing to zero. That's an area that Jacobs is very passionate about, and we believe providing additional solution in this space would help our clients reduce that number.

Paul: I imagine the challenge is pretty onerous, because like you alluded to, you've got these systems that vary in age, and I'm sure Departments of Transportation, they have to fight for funding and stuff. I'm assuming maybe they have to make due sometimes with like-- and I won't say antiquated, because I think that's wrong, but maybe they can't always get the most cutting-edge system with regularity.

They need to be able to have a solution that different systems can talk to each other. I also maybe, and you correct me if I'm wrong, but sometimes the data from different data collection systems doesn't always match up. I know data science, that's a big challenge, clean data, that sort of thing. I think it's really fascinating that the work y'all are doing is to unknot some of those problems. Can you describe for us, Michael, what does the Hive safety tool in particular do, and what are its benefits to end users?

Michael: Hive safety, at the simplest is a web-based safety planning solution that we developed with some of our transportation safety and analytics experts Kim **[unintelligible 00:06:10]** Hive safety pulls together a variety of transportation data sources, and to your point, Paul, it's about combining them and then adding on additional intelligence to enriching that data, really. That's what we feed into our safety analysis model. Output from that model, really not only visually highlights safety hotspots, but it also identifies the critical outliers in the data.

That's one of the big value adds here, because we use that to intelligently recommend crash modification factors of the highest benefit and at the lowest cost to implement. We're helping really narrow in on how to get the biggest bang for your buck, and really align these treatments to safety programs. Users can design safety projects in the tool, they can track some of their key performance metrics, and really configure that safety program to the goals and constraints that they face. Because not everybody has an unlimited amount of cash to spend on these things.

Really, what's great, is it can track that at across the portfolio of projects that they design. It's really around letting the clients essentially track these KPIs, be able to pull in new data as it comes in, and help them really understand the effectiveness of their safety program, and tracking benefits against some of the predicted outcomes of our models. I think one thing we've really heard from that council of clients was that transparency is key. That's one of the big things that this does, is it puts it out in the dashboard. It shows the map, shows the hotspots, shows what went into the analysis, and it's a really powerful tool for communication with stakeholders as you make these planning decisions for safety.

Paul: That's super fascinating. I can imagine all kinds of efficiencies that can be achieved with tools like this, and then also when they're seeking funding in the next budget cycle and stuff, being able to show positive impact can certainly help them. Now, Sean, StreetLight is a leading transportation data provider, as well as a subsidiary of Jacobs. We're seeing a lot of emerging collaboration between the StreetLight and Jacobs teams, one of which is the program that we're talking about today.

We're leveraging the combined strengths of the technologies and domain expertise across both organizations. Can you describe, Sean, for our listeners, what the StreetLight Insight solution does, and its benefit to end users?

Sean Co: Yes. We measure transportation and how streets move, and we like to say that we can measure any traditional transportation metric by using big data. We distill a massive amount of transportation data into actionable insights that our clients need to make decisions, and we've been doing this since 2011, where we harnessed hundreds of data sources that contribute to our route science data engine. We pioneered the use of massive amounts of location-based service data.

Through the years, we've been onboarding and evaluating many different data sources, with connected vehicle data as being the latest example, and these capabilities allow us to quickly validate new data sources as they become available.

Paul: Yes. I can imagine too. In fact, I just saw a headline today, coincidentally, about how San Francisco is filled with autonomous vehicles or connected vehicles these days. I'm imagining that urban landscape is just filled with data generation, lots of data, a lot of transportation data that's being generated, so, a lot of intelligence which is exponentially feeding into a system like this. Michael, can you describe for us the partnership between StreetLight Insight and Hive Safety? How do the two products fit together?

Michael: First off, when Jacobs acquired StreetLight Jacobs and especially the Hive team were extremely excited as we already actually identified StreetLight as a partner due to the value of incorporating their data and insights into our solution. The partnership really is a great one, we've merged the Brain Trust and really been able to amplify the scale, intelligence, and capabilities in our solutions and products. As we combine and embed that deep domain knowledge with StreetLight's big data, and data analytics that Sean just talking about. To answer your second question really about how we fit together, I see Hive safety really as like a solutions tier on top of the data Insights is a service offering from StreetLight . It's highly complimentary and I think touches on what makes StreetLight such a perfect fit for Jacobs.

StreetLight provides such valuable data around origin-destination, demographics, traffic volumes, and a whole lot more from which we can then layer on a very focused safety solution to create something totally new and really tailored to solve those challenges we heard directly from our clients.

Paul: I understand that the team recently and successfully engaged with one of the largest metropolitan planning organizations in the US and the client in question is pretty massive. It's responsible for on the magnitude of transportation planning for 19 million people in 191 cities and more than 38,000 square miles. Safety is of course of paramount importance. Sean, can you walk us through why this client selected the Jacobs StreetLight team to work with?

Sean: About two years ago we engaged in what we call a pilot project with them that gave the team access to our analytics platform. They also used our services team, which I'm part of, we're the consulting arm within StreetLight where we deliver solutions that are not available in the platform. They were really happy with both our transportation analytics and for our service team. They decided to do a competitive bid, which is I would say fairly typical, particularly for larger dollar amounts and ongoing multi-year agreements.

As part of that bid, we offered our Insight platform, our professional services team, and we also introduced a few different data partners Hive that we've been talking about was one, and we've also introduced commercial truck data and real-time traffic data as well. Other clients in the US and North America are really looking for a one-stop solution for data, and I think that's going to become more common where in the past clients might have bought our StreetLight subscription and they may have to get another data source to compliment things that they need for their travel demand forecasting.

We are offering a data solution which they can just contract through us, get any custom services they need whether that's in a platform or a pre-release, and I think that was very appealing to them.

Paul: Yes, I think it's that integrated solution approach as opposed to trying to cobble together from different solution providers hoping that they fit together. Something where you have Jacobs and StreetLight, that integration is already factored in and built-in from the get-go. I'm assuming that enhances the efficiency and the appeal of clients too, so you're not having to like try to master a variety of different platforms that may or may not easily integrate with each other.

Now one thing that we see across different solutions that clients in various disciplines of course, are having to contend with in a world where we have all these rapid increases in technology and capabilities. It's not just enough to develop great tools and technologies, there also has to be thought in how you ingratiate those tools into their workflows. Make it a seamless and organic sense of how they do their work, so it takes out that techno anxiety that professionals may be faced with.

It's like, "Oh, I got to learn this new thing and I got to figure out how to make it work." Sean, can you talk to us about the evolution of data as part of the transportation planning process and how StreetLight and Jacobs are helping transportation

organizations more easily and seamlessly work these data tools into their planning process?

Sean: Traffic counting actually goes back pretty far about 80 years with traffic counting units called traffic recorders that were around in the '30s. It was a strip that was laid across the roadway that printed a total traffic count on a strip of paper every hour counting cars, buses, trucks, bikes. It hasn't really changed that much since then, and the technology has changed of course, but the basic principle remains the same.

When I first started my career over 20 years ago, I would drive a big cargo van full of smelly rubber hoses, lay them on the street, secured the hoses with roofing nails while trying not to get hit by a car. That evolution, and especially with big data, we can now look at all the roads at once or do so over time or even back in time. We have historic data, so if something occurred in the past and you're like, "Oh, you know what? We didn't get the entry-level planner one to go out and put out the hoses on that particular month, we can look back in time."

It's like looking at your city through a straw at a single road to determine all the movements of traffic at all the roads at once and looking through that straw. There's millions to billions of dollars that are writing on how those traffic counts and movements are reported. Now, many of our public agency clients have another tool in their **[unintelligible 00:16:45]** to help current and future needs by looking to answer questions that they have not been able to do so in a cost-effective and innovative way all by sitting at your computer and running analytics.

Paul: My last question is for both of you and, Michael, I'll start with you. Looking at the road ahead, and you see what I did there with the pun, as we see the increasing advent of connected and autonomous vehicles on the road, how do you see tools like Hive Safety, the Hive platform and StreetLight's various offerings well positioned for integration into the future transportation data landscape?

Michael: That's a really good question and two things really stand out the most to me. Connected vehicles offer us a brand-new capability, I believe in identifying safety issues on our roads. We can start to identify things like near misses, better understand behavioral information things like heartbreaking speeding, things like that, and leverage much increased spatial temporal accuracy and granularity.

When we start to pull that data into our models, we can design even better treatments for our roads, and even start to move into more leading indicators of safety rather than lagging ones, which is waiting to measure things like crashes. This is something we've actually already been looking at a little bit within Hive and looking to understand and develop real correlations between that behavioral data and actual crashes.

Secondly, this also creates the ability for us to move beyond studies of this stuff and rely on descriptive and predictive types of analysis and move us into more real-time data. That I think is going to open up the possibilities for more prescriptive analytics so we can make recommendations in real time to changing road conditions, driver behaviors, things like that. I see that as a really valuable next step towards safer roads and really helping reach that target of zero deaths.

Paul: Then Sean, same question for you. Connected and autonomous vehicles, how do you see all this rich data generation married up with the tools like the Hive platform and StreetLight's various offerings, how do you see that playing out in the future of transportation data landscape?

Sean: We're just really starting to crack the surface of what's available with connected to vehicle data. Right now we're using it with what we've been doing for the past several years in terms of, I would say standard transportation metrics like speed and volume. There's other attributes that connected vehicles are collecting. There's the body type of the vehicle, so that's, is it a pickup truck, SUV, passenger car? Is it a hatchback? Having vehicle type is really important, not only for safety, because heavier vehicles are more dangerous on the roadway than say a tiny car. They're also bigger, they take up more space on the roadway.

Secondly when you're talking about gas cars. Many, air districts really would like to know the fleet mix in terms of what vehicles are driving on the road. The bigger the car uses more fuel, therefore contributes to more greenhouse gases. That really helps the air quality agency determine the actual emissions from the vehicle fleets. Then there's other attributes which we're just starting to look at. Michael mentioned seatbelt data. There's occupancy which has been really hard to do in the past. Vehicle occupancy is something that has been asked for.

In America most, I think the vehicle occupancy is something like 1.2. Most people are really driving by themselves but we want to understand in some cases, is it more than one, is it two? Again, when I first started counting this, we would actually just stand on the side of the freeway in shifts and try to see how many people were in cars as they were going by at 65 miles an hour in the early morning.

That sort of better big data solution is I think, here and just understanding how we could use that. Then there's other attributes. I know that some vehicles have cameras. We're using heartbreaking as a sort of proxy for a near miss. Particularly when it involves a vulnerable road user, like someone walking or biking, some vehicles are actually capturing the video up to a few minutes before some event, which is a swerve or a hard break occurs.

You could be able to see what exactly was it? Was there a box in the road or a mattress or was it an actual person? I think that's all coming as more of these vehicles have more sensors, they have more technology attached. We just have to look on how we can harness that data and make it useful for our clients.

Paul: I imagine too, it's like in terms of like vehicle type, that there's also impact to infrastructure. One thing that I had heard, and somebody will have to fact check me on this. For instance, electric vehicles with the weight of their battery and whatnot, like those vehicles tend to be a bit heavier than like petroleum or gas powered engines. There's like a resulting impact to like some kind of degradation to the concrete or wear and tear on the roadways over time.

Being able to track vehicle types and impact to roadways and traffic patterns. Then I'm assuming similar to what we see with digital twin and replicas, being able to say, okay, this road, this stretch of PCH1 is going to be degraded much faster and we need to be prepared to like repair this or that so that it's more proactive rather than

reactive. I'm assuming and I don't know because I'm not a planner. I'm assuming there's some efficiencies, some cost efficiencies that might be achieved by being able to tap into the data and say, this is where the roadway is going to be. We're going to see some problems if we don't head this off in the next six months or whatever it is.

Sean: You'll see that on roads where they will that say no trucks allowed. That's because of the impact partially to the roadway itself. It may have not been constructed to support the weight of those type of vehicles. If you're looking at like say an electric Ford F-150, that's a pretty heavy vehicle already with a battery pack, that can definitely have an impact on the roadway maintenance as well.

We had a customer, that was looking at vehicles and if they could predict the number of vehicles on the road to water pipe breakage and to see if they could determine correlations from that. There's a lot of other utilities and things in the roadway that, in addition to the pavement quality could also be affected by the vehicle type.

Paul: Sean and Michael, I want to thank you both so much for, your time today in unpacking this topic, transportation data and safety and again, congratulations on the team's big win with that MPO. A lot of great work that's being done. We will include on the website some more information as well as information about some of the team members who are involved. Thank you both for your time and, look forward to learning more about this as things progress. Thank you.

Sean: Great. Thanks.

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