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Cities' data base

We are seeing an increase in new sources of data from new players in the transportation and mobility market. Many of these new sources of data don't require any additional physical infrastructure and are yet able to provide greater insight for city planners, engineers and operators – so what does this mean for our cities?

“As cities integrate with newer, more dynamic data sources, trends will begin to emerge over time”

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How can a smart city benefit from these new sources of data?

Vik Bhide Today's roadways generate a

lot of data from both public and private entities which can be leveraged to enhance services and promote a better mobility system. For example, data from traffic sensors; mobility providers like e-scooter, rideshare, bike-share, transit; and weather can be fused to create a user-focussed mobility marketplace that also minimises congestion and fuel emissions. This allows government agencies to manage the entire eco-system and not just parts of it while maintaining full transparency. Smart buildings will also generate a lot of data, like fire sensors, energy monitoring etc.

This data can be fused with public safety agencies to facilitate rapid, proactive response to fires, emergencies, etc. You can imagine a fire department reviewing BIMs and developing a sound response strategy to a fire based on sensor data even prior to reaching the site. We're not too far from that reality..

Richard Barlow Hardware sensors traditionally used by cities to collect data provide a snapshot of vehicle movement at a fixed location, such as an intersection or junction. Naturally, the output is limited by the frequency of data capture and location. This is where connected car data comes into its own and enhances the effectiveness of traditional sources of data collection. Vehicle data, both real-time and historic, tells a

story of how people are moving through and around a city, and beyond. This data can tell us anything from how many passengers are in the car to when and where harsh braking occurred, enabling cities to build a 360° view of vehicle movement and driver behaviour across a city's entire network of roads.

The evolution from single to multi-source data, incorporating both traditional and new data collection techniques, builds a rich data set that supports predictive rather than reactive strategies. As cities integrate with newer, more dynamic data sources, trends will begin to emerge over time. Think of a



major sporting event as an example. Building a historic picture of how vehicles move and drivers behave when travelling to the event venue will enable city operators to implement a more effective transport strategy based on real-life road usage that benefits sports fans as well as the wider city community.

Data sets are often tied back to an individual's devices, allowing intelligent planning of direct-to-user propositions. This could include automated tolling and parking for drivers, reducing the need for investment in toll booths and parking meters.

The pace at which this data can be ingested will support cities in becoming proactive. Having a real-time, dynamic view of traffic flow and driver behaviour empowers cities to create evidence-based policies and monitor the impact of those policy-led changes. It enables cities to easily implement a test and learn approach to policy making, that's pro-driver, pro-community and pro-city.

Donna M. Huey One of the most important benefits is simply the real time nature of this new data. And, the reduced cost of data acquisition. Historically most user-based or consumer data had to be sourced through labour-intensive and expensive surveys. Typically you would only get a sampling and you wouldn't be able to afford to update it frequently. So this current more holistic view obtained at a fraction of the cost of those previous manual methods allows cities

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to analyse options and optimise planning functions to improve levels of service.

Q Can these data sources replace physical sensors?

RB The key is integration. Where physical sensors provide detailed insight into road activity at a fixed location, real-time vehicle insights, for example, can provide detail and context. Combining traditional and new data collection methods provides a richer data set that paints a vivid picture of how people are travelling through and around a city.

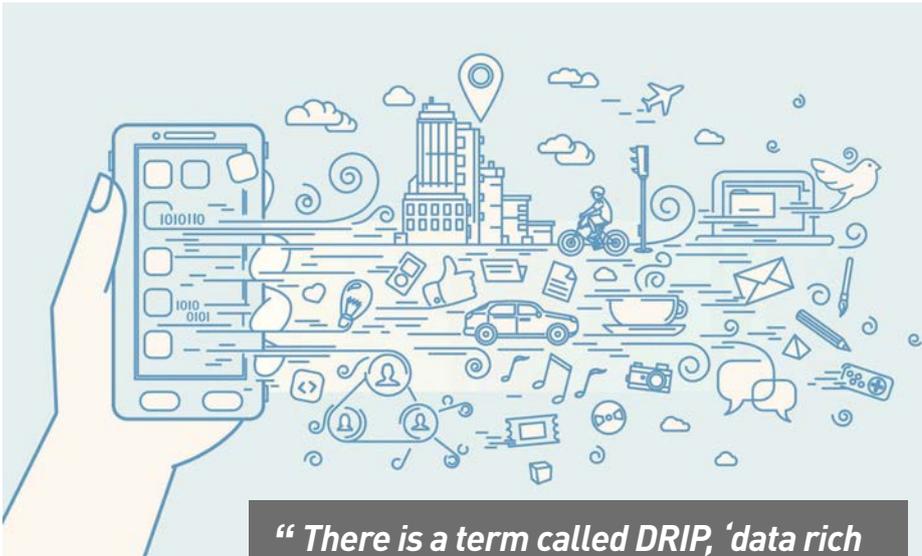
There are, of course, many benefits to utilising new data sources, from the speed and frequency of capture to the richness of the insight. But what's really exciting is how physical sensors and in-vehicle data can inform one another. An example of this is using real-time data to intelligently identify the optimum location of physical sensors. It's not about replacing physical sensors, it's about more intelligent replacement to improve efficiency and cost effectiveness.

VB Technically all data is produced by some sort a sensor, what is changing is the ubiquity of sensors and availability of faster networks

and processors to share the data in real time. This will likely be a force multiplier and reduce the need for some types of sensors. Think GPS and telematics data from vehicles providing better insight into roadway performance, potentially requiring fewer sensors by the roadway agency. We are testing this in Tampa with Waycare's smart mobility platform which leverages fleet and crowd-sourced (Waze) data to provide insights on roadways that we had no real time information from.

DMH This is an interesting question and I would have to say yes, more than likely, but in time. As we have seen with most technological change the people change and even more complicated, the policy and regulatory change is far slower. So it will take some time to prove out the accuracy, repeatability and defensibility as compared to those trusty physical sensors and then update and approve new regulatory frameworks to respond to this change.

Q Can there be such a thing a data overload? In the past we



“ There is a term called DRIP, ‘data rich information poor’ - that’s where many highway agencies are today ”

◀ **struggled to get any meaningful data, now there is so much of it that it may be difficult to work out what is the most useful?**

DMH Yes, most definitely. Not only do you need experts to decipher and analyse these big data sets, you also need to understand new methods of data storage and management. Most cities aren’t equipped with these speciality capabilities and they are hard to source in the market and when you do, they’re a bit expensive. So, we continue to find ourselves advising our city clients to not get lost in the data or be too mesmerised by it, but instead keep focus on the question or issue at hand and work backward from that to be sure the proverbial tail isn’t wagging the dog. By heeding to this advice, you can isolate and prioritise the most useful and beneficial uses of these new and more expansive data sets.

VB There is a term called DRIP, ‘data rich information poor’ - that’s where many highway agencies are today. It is important to plan for data usage prior to installing sensors. Also, data has varied applications, so what may not be of interest from an Operations standpoint may be useful to Planning or Economic Development.

RB Data overload is a real thing! You can have a rich data set, but what makes that data set truly valuable is planning. Planning is at the very core of data science, it’s the ability to handle lots of data from lots of different sources. Before we’re able to write algorithms to extract insight from the data, we need to plan to understand which data points are the most valuable for our objectives.

Historically, data was only captured for

specific uses; now we’re able to capture much richer data sets. We no longer think about what data we can get, but what data we need and how we plan to get it. There is of course value in collecting as much data as possible, but that value is only realised when there are processes in place to handle the volume and complexity when challenged with meaningful objectives to integrate and refine the data with. Data science should support decision makers in companies across the network that supports smart cities.

Q Does this mean we need to look at our business model and commercial agreements? (Moving from capital investment to service-based arrangements)

VB Absolutely. As we move from lump sum to SaaS based models, governments must adapt to this reality. A Smart City begins not with technology but partnerships first. These partnerships need to be across public and private entities; and require policy modifications.

RB Evaluation of business models and commercial agreements are already ongoing on a global scale across sectors. As the technology becomes more readily available and therefore more cost-effective, there is a mass migration occurring from physical infrastructure to service-based arrangements. Even looking back 20 years, companies hosted their own servers and hardware, now most companies use cloud-based hosting environments. Smart cities are inevitably doing the same. It may be that there are more commercial agreements in place, but this is a natural evolution as smart cities begin to collaborate with more companies that support this future shift.

There are two major elements that will change, those are pace and success. To address pace first, providing a city’s processes are set up to facilitate receiving information more dynamically, internal processes then have to evolve to facilitate implementing action from those insights. Receiving data in



The dawn of 5G networks will disrupt how we move about and drive down costs

real-time allows cities to become more agile in their approach to change implementation by enabling different scenarios and outcomes to be modelled out. Pace again impacts the decision-making process directly; as cities progress from long interval data insights to more regular updates. Cities could be receiving a pollution report once a year and implement changes off the back of those insights once a year, but if cities are receiving pollution insights every month, that can impact the pace of change.

Turning next to success, the evolution of business models will support cities in not only reaching the best solution quicker, but also measuring the success of that solution more effectively and iteratively.

DMH Data is definitely shaping new commercial models. One of the early movers in this space was the lighting industry when three or four years ago we saw a major shift with large companies such as Philips offering to sell the “use” of the light while they retained the ownership of the infrastructure. This began to force the early challenge of needing to convince cities to shift capital funds to operations and maintenance funds to be able to apply the monies differently to take advantage of these “infrastructure as a service” type contracts. This means educating stakeholders and building out the business case for the investment shift as we look at circular economies where we are seeking to minimise waste and maximise sustainability.

Q Do you anticipate major technology changes that will further disrupt the market?

DMH Major technology changes are inevitable and we should anticipate increased frequency of change, however, I think what will shape the market even more so near term is how we manage and protect the data – data governance and data privacy are big issues and they are personal and sensitive issues. Part of me does wonder however if these sensitivities are temporary – or should I say generational.

I suspect the next generation may be perhaps desensitised and the big hoopla today over data privacy becomes the crumpled up story on tomorrow’s news room floor. To come back for a moment to those technology changes though, I am intrigued by the impact of digital mesh and quantum computing for the next horizon. The seamless connection of sensors, services, and connectivity that serves as the digital mesh combined with investment



“ New sources of data can drive tangible benefits across the value chain, from enabling cost efficiencies during procurement to driving better outcomes for users ”

in making quantum computing a closer reality will be revolutionary. Together the artificial intelligence capabilities that would emerge are both exciting and also a little scary.

RB It would be almost impossible to talk about disruptive technology changes without mentioning autonomous vehicles. But whilst motor manufacturers progress through the levels of connectivity on the production line, smart cities will start to look at how those vehicles can integrate directly with the city.

The technology, although in its infancy, is already there. It’s now in the hands of smart city operators to collaborate with auto manufacturers and data exchange providers, like wejo, to effect that change. To take that a step further, the way in which vehicles interact with the city will likely change too. From drivers owning the route taken from point A to point B, as autonomy increases, the city could optimise and inform the route that vehicles take to and from their destinations. This is a really exciting concept and one that’s already becoming a reality through intelligent parking and smart tolls that are improving efficiency for drivers within a city.

Outside of autonomy, one of the other major changes will be how we use public transport. Data sharing between public transport systems and users of those systems will make travel more efficient, particularly within inner city areas. It could be anything from integrating vehicles with public transport systems to incentivise park and rides, as well as to improve convenience and efficiency.

VB Mobility as a Service in its full expression assisted by unified payment platforms, automated vehicles and 5G networks will significantly disrupt how we move about and bring down end-user cost/mile for transport. It’s going to be quite the journey to get there.

Q What is the one thing you hope for as a result of the development of these new sources of data?

RB Having a whole-world view of drivers’ use of a city has the potential for phenomenal impact across road safety, congestion, pollution and mobility. Adopting and integrating richer data sources into current processes will not only improve the driver experience, but also the experience of the residents of the city. Improving the quality of life of those that live and work in a city increases its value, creating a boom by making that city environment more attractive to new talent and businesses.

DMH Safer and more reliable transportation. At the end of the day it is how these changes improve quality of life and provide opportunity to greater numbers of people. So far it feels like all technology has done has made us have to work faster, make decisions quicker – this expectation of rapid response – when we can actually leverage technology to appreciate a higher quality of life that will be the best outcome. That is what I hope for.

VB Transit-centric MaaS!

Lee says...

I am thankful we have experts like these in the world bringing their perspectives together. It strikes me we are now at a tipping point where these new sources of data can drive tangible benefits across the value chain, from enabling cost efficiencies during procurement to driving better outcomes for users with confidence and that this data is robustness enough to start to remove our reliance on ‘point based’ physical sensors.

It is an exciting time to be involved in smart cities and developing new ways of working that make us safer, greener and quicker as we go about our daily tasks. ■