Telematics Industry Insights by Michael L. Sena THE DISPATCHER

IN THIS ISSUE



<u>4th Annual Princeton</u> <u>SmartDrivingCar Summit</u> THIS JUNE ISSUE was going to be devoted to the **4th An**nual Princeton SmartDrivingCar Summit that was planned to be held on the 19th through the 21st of May on the campus of Princeton University in Princeton, New Jersey. The **Summit**, like almost all events that were scheduled for the late winter, spring and early summer of this year, had to be postponed or canceled due to the COVID-19 pandemic. A planned new date for the **Summit** has been set for the 20th through the 22nd of October 2020.

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Competing in a World Full of Electric Skateboards



1. This is a 'skateboard' developed by WM MOTOR TECHNOLOGY COM-PANY based in Shanghai. It is the underpinning of its *Weltmeister* automobiles.

LET US ASSUME the worst case scenario has come to pass. Western automotive OEMs' board room members continue in their bewildered stupor and management has no incentive to fight against what appears to be the inevitable move to battery electric vehicles (BEVs). Workers watch while their numbers dwindle as their companies move from internal combustion engine vehicles (ICEs) to BEVs. Those employees who remain to keep the robots humming are too few to effect any positive action. Governments in a post-COVID-19 environment attempt to help their industries rebuild with loans and see no reason to change their focus on providing incentives for BEVs and disincentives for ICEs. They remain transfixed on climate change and they cannot let go of the straw they grabbed at the urging of climate activists. Electric skateboards, like ones from WM MOTOR TECHNOLOGY COMPANY (see sidebar) begin arriving in the West from China, both in the form of completed vehicles, like WM MOTOR's Weltmeister (SIC), or as components to be incorporated into vehicles assembled in western workshops.¹

Will this mean that it is all over but the shouting for the western automotive OEMs? Is the end nigh; are they toast? In short, the answer is "Yes"—for most of them. For an explanation of why, please see the March and May 2020 issues of <u>The Dispatcher</u>. The March issue explains how and why the threat of battery electric vehicle platforms has developed. The May issue outlines how China has gotten to the position of being *The World's Factory* and how it will use that position to build cars for the world. It also includes an article on Clayton Christensen and his work on *disruptive innovation*, which helps to explain why legacy automotive companies will have difficulty maintaining their dominant positions.

In the March issue, I discussed the economics of electric skateboard-based vehicles and why CHINA INC. is determined to move the field of competition away from

ICEs to BEVs. Over the past twenty years, it has assembled a formidable ecosystem to deliver electric skateboards, which comprise 50% or more of the value of a BEV. Thus far, Chinese car makers have made zero impact on the western automotive market, but if western governments continue to favor BEVs over ICEs through both incentives and penalties, and BEVs become the dominant vehicle type, the companies that deliver the principal component of the BEV will generate the majority of the profits. So, rather than continuing to try to compete with the legacy car makers who have invested up to one hundred years in developing all the components of an ICE vehicle, CHINA INC. can simply leapfrog the GMs, Renaults, Fords and BMWs of the world and take home the profit prize.

For those companies that will emerge in the wake of the departing automotive OEMs—both those western companies that can resist being acquired by Chinese rivals and the Chinese companies that enter the global markets—how will they compete to gain a sufficient level of market share? Will there be any possibility for companies based outside of China to compete, or will the resulting situation resemble what has happened with HUAWEI or with Chinese steel companies that build bridges in China and deliver them to the rest of the world (also in the May issue of *THE DISPATCHER*)? Shall we take a magic carpet ride together and have a look into the future. I will prepare the takeoff with a summary of how we got to where we are today. If you would rather skip the intro, hop over to **Competing Tomorrow**.

Competing Yesterday and Today

From the time the automotive market began to really grow, in the early 1950s and up until the second half of the 1990s when the *dot.com* revolution was in full swing, every automobile brand sharpened its sword's competitive edge to do battle within the niche it shared with similar brands. They competed on price, performance, personality and trust, and they made money (or lost it) on how well (or poorly) they delivered on all four of these criteria. Buyers could stretch their budget by buying a used car or leasing if they really wanted a *BMW 5 Series* but could only afford to take a loan for a *Nissan Sentra*. Buyers did their best to match the personality of the car (e.g., sedate, aspiring, imperial) with their own or their alter ego. Peformance included everything from the number of horses powering the motor to whether there was plastic or real wood on the instrument panel, the number of speakers or the addition of a sun roof. In the late '60s, safety was



added to the performance list when Ralph Nader pointed out that there was plenty of room for improvement, and in the '70s, fuel economy became a necessity as a result of the U.S. and Europe deciding they did not want to be at the mercy of OPEC.

Those who had the will and the money paid a premium for a car with the maximum number of safety features available at the time, one with excellent road handling capabilities in all types of weather, one with a high level of interior and exterior finish and one with the highest level of dependability. They paid more again if they could afford it—if the company that manufactured the car and the dealers who sold them offered a premium service experience. A high resale value just added icing on the cake. Car buyers "did the math" in their heads when they bought a car. They decided which one of the four, price, performance, personality or trust, was most important, which was the least important and the degree they would be willing to compromise on the other two.

Starting in the mid-1990s, GENERAL MOTORS and FORD were changing the basis of competition and using both the Internet and mobile telephony to do it. GM introduced *OnStar*, both as an invehicle device and as a service, and made it part of GM's brand definition. Remote services were introduced to the automotive industry for the first time. If the *dot.com* bubble had not burst, and had Bill Ford not gotten cold feet and fired Jacques Nasser in 2001, connected services would have made even stronger inroads by the time the financial crisis hit in 2008, an event that halted new developments for several more years.

Concerning the other factors, price, performance and trust, they did not change. Cars continued to be sold as they had been sold for decades, through dealers. This was one of the problems with introducing new features: the dealer networks saw no benefits to selling features that might cause problems for users (e.g., quirky navigation databases and buttons that didn't work unless you paid extra to use them), that required more knowledge on the part of their sales staff and delivered very little if any additional profit.

After the car companies picked themselves up and shook themselves off following the beating they took during the financial crisis, they had a very different focus. It was China. GEELY had acquired VOLVO CARS for a song. All of the OEMs were setting up joint ventures with Chinese companies in order to sell cars into what became the largest car market in 2010. Some thought China



Connectivity is a Three-sided Coin

Vehicle connectivity has three facets. Two of them are of interest to vehicle OEMs and their suppliers. One of them is of interest to traffic management authorities and service providers. The two that are the focus of OEMs are vehicle-specific, such as emergency notification and over-the-air updating, and customer-specific, such as music streaming and service booking. Traffic management authorities have been concentrating on vehicle-to-infrastructure and vehicleto-vehicle communication and service providers have been pushing for a standard way to receive data from all vehicles. This third facet is not a competitive factor that will distinguish one OEM from another. If they are legislated, everyone will have to include it. The functions will add cost without commensurate income, like EU eCall. I am making no judgment on the value of these functions; I am simply saying they are not a competitive factor.

would only hold this position for a year or two, until the U.S. and Europe ramped up again, but it kept adding a million cars a year.

The trust factor morphed into flexibility as the car companies were now more dependent for growth in a market where there were no traditional players and where there was no such thing as trust between customer and supplier. Car OEMs began experimenting with ideas that appeared to be attractive in China involving heavy dependence on mobile apps and Internet services. This is when OEMs began the move away from their dealers and toward a direct relationship with customers. Even companies with driver-centric focus, like BMW, started labeling themselves 'mobility service providers'. They established business units like GM's *Maven* (now defunct) and Daimler's *Car2Go* (merged with BMW's *ReachNow* to form *FreeNow*). They started to offer subscription services, like *Care by Volvo*, which was viewed by dealers as an attempt to bypass them.²

Where we are today in a COVID-19 world

Today, the established car OEMs that sell primarily ICE vehicles, which is every car company except TESLA, continue to compete on price, performance, personality with connectivity and flexibility. They still make money (or lose it) on how well (or poorly) they deliver on all four of these criteria. TESLA does not make ICE vehicles, and, except for performance, it does not compete on the same factors as the rest of the industry. It makes BEV vehicles and it competes on total cost of ownership, constant connectivity and promises. For many of its die-hard owners, it is the promise of being part of a new future that is the main attraction. It's similar to the Apple Mac vs. the world that Steve Jobs offered. It's working. The company has a share price of \$819.42 (closing 8 May 2020)³ and a market cap of \$152 billion, versus a share price for GM of \$23.93 and market cap of \$35 billion. Globally, TESLA sold 367,500 cars in 2019 while GM sold 7.71 million, but share price is a judgment of what a company is worth to those who are buying the shares, and most of the legacy car companies, with the exception of TOYOTA, are just not judged to be worth very much.

This may change. We do not yet know whether the majority of people (i.e., those who cannot afford to indulge their desire to own a TESLA and be part of a new world order) who need to get from one place to another today and into the foreseeable future—until a reliable vaccine against COVID-19 and its likely successors is widely available—will care about performance or promises as much as they care about being safe and secure, about



2. In January 2019, trade group representing California car and truck dealerships filed a petition with the state's New Motor Vehicle Board to stop VOLVO CARS from offering cars on a subscription model. In August, the California Division of Motor Vehicles launched a probe of the service. It does not appear that a judgment has been reached.



3. TESLA's share price shot up on the 8th of May after it announced it had secured a \$565 million loan from the INDUSTRIAL AND COMMERCIAL BANK OF CHINA LTD to pay for expenditures at its Shanghai plant. The loan will be used only for expenditures related to production at the Shanghai plant, the filing said. The factory is TESLA's first car manufacturing site outside the United States and is the centerpiece of its ambitions to boost sales in the world's biggest auto market and to avoid higher import tariffs imposed on U.S.-made cars.

the reliability of the journey, of not having to wait for hours to charge their car, and about the ability to have vital information services available along the way in case of an emergency. They aren't thinking about ADAS or car-to-car communication or driverless functions (see next paragraph). They still have to care about the price they are paying for making their journeys and for having access to a vehicle in which to make those journeys.

According to J.D. Power, consumers in the West are out of sync with both their governments, that are promoting electric cars, as well as the OEMs, that are promoting technology while at the same time having to invest in electrification to avoid heavy penalties.⁴ This means that consumers are going to get both more electric cars and more technology whether they want them or not. This does not mean that all companies selling cars will be able to compete in tomorrow's market.

Competing Tomorrow

Of one thing we can be certain: when the skateboards start arriving from China, everyone who thinks they have the formula for being the next TESLA will make a pitch to investors to set up shop. They will try to develop business models that are similar to the electric scooter and electric bicycle businesses. Governments have done a terrible job of regulating these companies, but COVID-19 managed to sort out which ones would survive. The difference with cars is that there are strict regulations that determine whether a car is roadworthy—even though it seems that TELSA has managed to finesse its way around these laws in some cases. While it was selling a handful of cars, TESLA was able to stay under the regulartors' radar, but if most new cars driving onto the roads are BEVs, the regulations will surely have to quickly catch up.

Competitive factors will change, but there is one objective both the skateboard providers and the OEMs selling finished vehicles have in common: they both want to sell as many units as possible. For the OEMs, 'sell' many not be the same as in the current model of getting paid a one-time fee for a vehicle that rolls off the production line. It could mean being paid for the use of a vehicle during its lifetime. But if the basis of generating revenue and the resulting profits are based on the total number of people using your vehicles, and each vehicle you produce has limited capacity (as opposed to a Jumbo Jet or a super ocean liner), then the number of units you sell matters a lot.

4. There is a wide gap between what people who actually buy and drive cars say they want and what car companies' research departments and people who are being given money by investors are developing, according to J.D. Power, which is one of the most evidencebased companies working in the automotive sector. It recently released its Q1 2020 Mobility Confidence Index Study of U.S. and Canadian Car Buyers, just before the effects of COVID-19 began to be felt. Here's what Kristin Kolodge, Executive Director of Driver Interaction and Human Machine Interface Research at J.D. Power, said of the results: "Frankly, we're concerned for automakers. They're pushing forward with technology that consumers seem to have little interest in. Nor are they making the strides needed to change people's minds. Especially now, automakers need to re-evaluate where they're spending money. They are investing billions in these technologies but they need to also invest in educating consumers. Lack of knowledge is a huge roadblock for future adoption."

Those legacy companies that remain, some of which produce their

own skateboards (e.g., TESLA, TOYOTA and VW), will compete with local start-ups that put bodies on Chinese skateboards and Chinese companies that integrate their own skateboards. They will compete on the basis of a new set of competitive factors, and the winners will be the ones that are able to achieve the best performance in all of the areas. Price will be replaced by <u>total cost</u> <u>of operation</u> (not ownership). Performance will be replaced by <u>adaptability</u>. Trust and flexibility will be replaced by <u>certainty</u>. Personality with connectivity will be replaced by <u>communication</u> <u>with community</u>.

Total cost of operation

There are those who purchase new cars, even though they know that they are going to lose at least 10% of what they paid for the car as soon as they drive it off the lot. I am one of this crowd. Why? Because after I purchased my first three cars, which were previously owned, and then sold them to equally unsuspecting buyers, I felt I needed to do penance for the rest of my life. I bought someone else's problems and they bought mine. After that, I decided I would pay the price, use the warranty period to fix what was wrong, and then keep the car for ten-to-fifteen years. After that, I would give it away. So far, I have never bought a diesel or a hybrid and certainly not a BEV. If I do not have a choice the next time I'm in the market (i.e., if I cannot buy anything except a BEV because that is what is allowed), I know I will have to look at total cost of operation (not ownership, because I may not decide to own) to decide which option is best for me. Will it be an outright purchase, or a lease, a subscription or a car share?

Those companies that will win will be the ones which are able to prove they can provide the lowest cost of operation and deliver on the other three factors. I have read the material that is produced by OEMs who are currently selling a BEV or two, and what they write would hardly qualify as proof and it is so full of promises on one side and qualifications on the other that it is useless for making a decision. I have read material that is aimed at consumers who are thinking about buying a BEV. The material is either produced by someone who works for an electric utility or a home charging company. How much am I going to pay to charge the car per month versus how much would I have had to paid to fill it up? This varies quite a bit with respect to the temperature, the distance I travel, the topography of the terrain over which I will drive, where I will have to charge it and other factors. How much am I going to pay for regular service and for assistance if I





have a problem? This will vary depending on whether the seller has its own workshop network or has done a deal with a workshop chain. What is the car's residual value if I trade it in? What are the true cost differences between purchasing, leasing or subscribing?

I will buy or lease or subscribe from the company that puts the numbers down and stands by them. That gets us to the next factor, *certainty*.

Certainty

It may seem odd that *certainty* will replace *flexibility* and *trust* as competitive factors, but if we think a moment about who will be the next generation of consumers it will make sense. Trust is 'assured reliance on the character, ability, strength, or truth of someone or something, or the 'dependence on something in the future'. It is similar to 'hope'. ⁵ Does the next generation of car users have the same sense of hope that the Baby Boomers had? Hardly. Millennials believe that their predecessors ruined the climate and the economy and they have inherited a mess they will not have to sort out. Do we believe they will put their trust in companies that promise their products will have positive effects on the climate or their users' pocketbooks unless those promises are backed up by iron-clad evidence.

Certainty is 'the quality of being known or proved to be true, indisputable.' Millennials may have grown up with Montessoriinfluenced, postmondernist, relativistic social concepts, but with heavy debt left over from their college education (at least in the U.S.) and heavy debt to pay for over-priced condos, they are going to be looking for facts, evidence that what they are going to pay for their car or rides in it will be what they sign up for. There won't be any surprises when it is time to turn in the leased car. There won't be any fine print when it's time to have a repair on the skateboard. There won't be any *force majeure* claim when the car blows up in the garage.

With the debt and the guilt⁶ they feel for their climate footprints, millennials probably are not going to be able to afford or wish to be seen owning, multiple cars. That does not mean they will not have the same problems that multiple cars solves for families today. They will need vehicles that work in ways that today's vehicles do not. They will need *adaptability*.

Adaptability

Performance will be transformed into adaptability. It's rare that our cars match the functionality we require during the many types

5. Definition by Merriam-Webster.

6. VOLVO'S subsidiary, POLESTAR, is advertising 'vegan cabin materials are standard' on its *Polestar 2* BEV. I wonder if you can get standard cabin materials, for meat lovers, as an option. of trips we take in them, especially when we are driving solo. If I were lucky enough to own the *Jaguar XK* in the photo to the right it would get me to my fishing club river lickety-split, and it would be a dream to drive, but I would have to add a trailer to the *Jag* to carry the gear I would need for a couple of days of fishing. But if could afford an *XK*, I would probably have a *Range Rover* parked in the next bay in my three-car garage, and that could carry enough gear for a real fishing party.

How can one car manage to perform the multiple duties we ask of our mechanical horses today? Car OEMs pushing subscriptions today are essentially suggesting that we should do the equivalent of dropping off the *Jag* and picking up the *Range Rover* when we need a bigger car. Doing that once a day or even once a week would be one huge pain, especially moving our stuff from one car to the other. Why not take a cue from the skateboard model of the cars we will (have to) be driving. My old roller skates let me adjust the size of the skates to my shoes and could expand as my feet grew. We can do the same with our cars.

The *Pro-litium 3100*, shown right, is an example of a vehicle that can take many forms by adding different modules to the driver's 'tractor' in the front. It has a top speed of 30 km/hr (18 miles/hr), but there have to be some trade-offs.

Most of the adaptability should come from software modifying the manuevering and cruising performance of the vehicles. True over-the-air software and firmware updating, the kind that Tesla delivers today, will be the key. So we come to ultimate connectivity, *communication with community*.

Communication with community

I have been working with vehicle connectivity for the past thirty years, principally to ensure that there are services at the end of the wireless connection that are useful for the customer, the OEM paying for the kit and society in general. Initially, the services were fairly simple: automatic and manual crash notification; pushing a button to request roadside assistance; signaling a vehicle break-in; triggering a stolen vehicle tracking; sending travel times along stretches of roads (floating car data); receiving pickup orders and reporting on orders delivered; remotely starting the heater air conditioner; unlocking the vehicle for deliveries. As time passed and the Internet expanded the capabilities of wireless connectivity, a whole new range of services became possible: music streaming; travel time reporting; real-time delivery of







points of interest and routes; location-based notification and offers. The most important and most recent one is over-the-air (OTA) updating of in-vehicle data, software and firmware.

The kit for all of these services was basically the same. It included a wireless modem (analog, 2G, 3G, 4G and now 5G), a SIMcard/SIM-chip, a GNSS device (e.g., GPS, GLONASS), speaker and microphone, connections to the vehicle's network and sensors, and a secure method of sending and receiving messages. What makes connectivity work is gateway between the message sent from the vehicle and the eventual service points. We called it a telematics service provider (TSP) twenty years ago when the first one was developed by WirelessCar. Many OEMs have brought the TSP function in-house, but it services the same purpose.

One thing I have witnessed during my work with the many OEMs I have assisted is that they have their own, unique views on why they are implementing connectivity and how they intend to benefit from spending the time, effort and money integrating the systems into their vehicles and building a service ecosystem. Some of them started with the idea that it enhanced their safety image. Some believed they would be able to use the data they collected for developing completely new services. Some saw it as a way to deliver a better driving experience. Today, most OEMs understand that an unconnected car is a lost opportunity for adding value to both the customer and to their own business.

It has taken over twenty-five years, but almost all new cars now include a factory-fit connectivity system as either an option or as standard equipment. It is not only the OEMs who are pushing for connectivity. Governments are attempting to insert themselves into the service chain by promoting vehicle-to-vehicle and vehicle-to-infrastructure communication. They have concentrated on short-range communication techniques and some countries support the installation of roadside units to send and receive data from passing vehicles. This is not where the competitive battle will be fought between electric skateboards.

Here is a clip from a POLESTAR ad for its new car, the *Polestar 2*:

VOLVO'S POLESTAR brand is touting <u>driving dynamics</u> and <u>connectivity</u> as two ways that its first full-electric car can win converts from fans of TESLA. The China-built Polestar 2 sedan will go on sale in June as a rival to Europe's top-selling electric car, the Tesla Model 3, joining the brand's only



- 1. SIM-Card reader connection
- 2. GSM antenna
- 3. Main power
- 4. MOST connection
- 5. GPS antenna

vehicle currently on sale, the Polestar 1 plug-in hybrid coupe.

What Polestar has chosen to highlight is its infotainment system:

The Polestar 2 takes a big leap forward in <u>connectivity</u> with the first use in a production car of Google's Android Automotive for its infotainment system. Unlike Android Auto and Apple Car Phone, which mirror a smartphone's display onto the dashboard display, Android Automotive does not rely on an external device to operate. Because it is embedded into the car it offers advanced digital features. For example, if you use Google Maps for directions, it can tell you not just the route but also if you will need to charge the battery along the way. Its maps app has an offline mode to use for route-finding where there is no Internet connectivity.

POLESTAR has gotten part of the communications message right, the part that says connectivity is important to win converts to their brand. It is highlighting what is important in the China market, infotainment. Like almost all of the OEMs, with TESLA as the principal exception, they are not telling customers about the real value of connectivity: OTA. If they have any thoughts of competing with TESLA, OTA must be the jewel in the crown, not the joker in the back of the room. BEVs (as well as plug-in hybrids) have a big advantage over ICE vehicles, and that is they can be 'on' for lengthy periods of time to allow software updates to be performed. ICE vehicles depend on their engines running to allow updates to occur. Managing the 'on' cycles for ICE vehicles, which tend to be too short to allow the complete downloading of software and firmware updates, is problematical. The downloaded date must be cached until all data is on-board, and then the vehicle must be stationary while the replacement of the old data with the new is made. This problem basically disappears if a vehicle sits plugged in overnight.

Monitoring the status of the vehicle, being able to predict when problems will occur and fixing them when they do will be the main competitive factor with BEVs, especially with the next generation of car users who are not going to change a flat tire on the side of the road, even if they knew how to do it and even if there were a spare tire in the trunk. Using the data to constantly improve the vehicle for the individual user and communicating with a community of service providers are the keys to success.

Only Non-essentials Get to Give Commuting a Rest



Michael L. Sena

MY LITTLE BOOK, Beating Traffic: Time to Get Unstuck, was never a best seller. For the first few years after it was published in 2006 I used to receive quarterly royalty cheques from the publisher, AUTHOR HOUSE. The cheques were in British Pounds and were usually never more than £2.00. That meant they sold three or four books during the quarter. It would have cost me at least ten times more to cash them than their face value, so I just saved them. The cheques stopped coming when AUTHOR HOUSE asked me for a direct deposit account. That would have been really expensive. I gave away quite a few copies from my first free batch. Some of my current readers received one. Finally, I decided to put it on my own web site so that anyone who cared to could download it themselves. The cover shown in the sidebar graced the final page in THE DIS-PATCHER from July 2016 until this issue.

Every now and then I return to the book to read what I had written almost twenty years ago. One of the chapters in the book is titled *Give Commuting a Rest*. The chapter is mainly focused on ways to avoid rush hour traffic by using the peak travel time curves to plan when you leave home and work. It also makes a pitch for mixing in the use of public transport if that option exists. I finally get around to saying that we should "...use every opportunity to work from home, and mix in vacation days, if you can, to ease the congestion load on the week. This is the ultimate way to beat traffic, by just not getting into it. This may sound like the ultimate cop out, or even a call for early retirement. I would say it's more a matter of pacing yourself to be able to stay the course and finish the race, rather than crashing and burning along the way."⁷

SKYPE and GOTOMEETING were relatively new when I wrote these words, and working remotely meant phone calls with individual colleagues or clients, performing research and writing reports. Depending on the distractions (e.g. small children running around the house) you might even use the time in semi-solitude thinking. Maybe you could convince your company to agree to let you work from home once a week or once a month. My nephew, who has worked for the U.S. National Institutes of Health for the

7.

http://www.michaellsena.com/wp -content/uploads/Books/Traffic_Book_6AU9.pdf Page 124. past fifteen years, has been working one day per week from home since he started, unless you worked for a government agency.

Not everyone can work from home

In early May, as I thought about what I wrote more than fifteen years ago, I and most of the people with whom I have regular contact were staying close to home, either because we were forced to by government-enforced lockdowns (as in France) or because we had been requested to work from home by our employers (as in Sweden). Repeating those words, *Give commuting a rest*, <u>I had</u> <u>an epiphany</u>. I realized that when I wrote them I left out group of people who are now called **'essential workers'**. They are the people who cannot work from home.

Essential workers include all of the doctors and nurses and aides who are caring for patients who have the severest form of COVID-19 must show up at the hospitals. Of course they must be there for all the other patients as well. All the support staff who prepare the food, clean the rooms and equipment and keep the facilities operating have to travel to work every day to do their jobs. The people picking up the waste and delivering the essential supplies to those hospitals can't perform their jobs from a desk. Visiting nurses must visit. Elderly care facilities require care givers and all the same type of support that is required in hospitals but on a smaller scale. Employees of grocery stores, pharmacies, computer supply stores, warehouses, not to mention the people who need to work the machines that produce the vital supplies to keep people from being infected and help fight the virus if they become ill. In some countries, like Sweden, nursery schools and grade schools have remained open so that the parents of the children attending those schools can leave home and go to work. The teachers need to get to work. Then, of course, there are the bus drivers and train engineers who keep public transport running. How are all of these people getting to their jobs?

I had also left out another large group of workers. In normal times, that is, when people are not forced to stay home, there are many other jobs that require people to be on-site. Museum guides, restaurant cooks, waiters and washer-uppers, shop owners and their staff, car mechanics, hotel personnel, men and women who manufacturer cars⁸ and many, many more. Who's left? All of the socalled *'business and professional services'* workers who toil at a computer all day, who used to have an office, then a cubicle and now either a fixed desk or an opportunity to fight for a place in an office landscape to sit down and connect up. They are all of us 8. TESLA CEO Elon Musk underplayed the pandemic in emails to his various companies. He said in one that he thinks "the risk of dying from COVID-19 is vastly less than the risk of death from driving your car home," adding that there are "about 36 thousand automotive deaths per year, as compared to 36 so far this year for C19." (As of May 8th, there were 2,678.) He also said his "frank opinion remains that the harm from the coronavirus panic far exceeds that of the virus itself."

TESLA's human resources head Valerie Workman reportedly told employees in an email that she believed TESLA would be considered an "essential business" and therefore would be exempt from the order to close.

As it turned out, TESLA was not exempt from the San Francisco Bay Area's new coronavirus shelter-inplace order, and was told to suspend normal operations at its Fremont, California factory for three weeks, according to county officials and the local sheriff's office. This came after TESLA kept its factory open and running on the first day that the new order was in place.

When Elon Must announced that it was time to re-open the Fremont, California factory, but was told by the Alameda County health department on the 9th of May that it had to remain closed, he tweeted: "Frankly, this is the final straw. Tesla will now move its headquarters and future programs to Texas/Nevada immediately. If we even retain Fremont manufacturing activity at all, it will be dependent on how Tesla is treated in the future." who can have our breakfast at a café and then sit there for the rest of the day, conducting our meetings and writing reports or program code in between. Depending on where we live, that group is either a majority or a minority.

It turns out that in the U.S. only approximately one-third of the people who are working have jobs that would potentially allow them to work from home. I read through the U.S. Bureau of Labor Statistics⁹ and noted down which workers could perform their work remotely and which jobs could only be performed on site. It was an interesting exercise. Of the total number of 157.537 million U.S. workers employed in January 2020 (i.e., before the massive unemployment caused by COVID-19) only 54.534 million (35%) could potentially work from home. The most essential workers, who are classified as Service (healthcare, police and prison personnel, emergency services, etc.) total 17%. These are the essential-essential workers. Depending on which country we talk about, the definition of 'essential workers' changes and the number of non-essential workers who are allowed to work varies as well, but I'm not sure that the differences would be that great, on average, amongst western countries.

During this emergency situation, when all essential-essential workers have to be at work, how are these people making their commute? They are either taking public transport, driving, walking or biking. We know that ridership of all forms of public transport in most western countries is down by significant amounts, and we have seen photos of empty roads from Los Angeles to Ljubljana. If they are taking public transport in lockdown countries, they are the only ones riding. In non-lockdown countries, like Sweden, which is extremely well covered by public transport both in and outside of its cities, average ridership in the entire country on all buses and commuter trains is down 63%. In some regions, like the one in which we live west of Stockholm, ridership is down by over 80%.¹⁰

What's happening with car travel? Sweden's regional road administrations report reductions in traffic of between 15% and 25%. Why isn't it also down over 60% like public transport? One possible explanation is that many of the public transport trips are made by high school and university students and these schools were closed until after the Easter break. When they re-opened, ridership kicked up several percentage points. Non-essential workers who have been temporarily laid off, such as waiters and shop attendants, are also more likely to ride a bus or tram to work. So 9. https://www.bls.gov/cps/cpsaat1 1.htm

<u>10. https://www.trafa.se/globalas-</u> sets/statis-

tik/resvanor/2016/rvu_sverige_2016-reviderad-7-juli.pdf?

Sweden adopted a nationwide universal voucher program in 1992 as part of a series of reforms designed to give more control over education to towns and schools. Families can choose any school, public or private: Taxpayer money follows the student. This means that students can and do decide to attend schools that are not within walking or cycling distance from their homes. High school students are heavy users of public transport, and younger children are often driven to school by their parents. perhaps many of the essential workers are continuing to drive, some others who have taken public transport have moved over to cars and the 15-25% reduction comprises the non-essential workers who can work from home. This is speculation because right now there are no solid studies to confirm what is happening.

While it may seem we have solved the congestion problem and the climate problem simultaneously, this will all change when the lockdowns—both the total and partial ones—are lifted and people return to work.

Maybe some people should always stay home

In the first few weeks of May, countries began to discuss how they would get people out of their isolation and back to their jobs. For some countries like Spain and Italy, the number of returners will be around 65% of the workforce (since all but essential-essential workers had to stay home), while for Sweden it will be closer to 50% (the total number of non-essential-essential workers and the others who were not able to continue working, like Volvo and Scania employees). In Sweden, will the 63% who left public transport return, or will some or all of them shun it because they feel it is unsafe? We do not know. If riders do not return, public transport operators are going to be looking for heavier subsidies¹¹ than they have already or they will be cutting services. If those former public transport do not return and begin driving instead, we will be looking at even more congestion on our roads.

Should those who can work from home continue to do so? Perhaps instead of having a one-day-per-week at home, those who can could have one-day-per-week in the office. I am not recommending that we do this. I am suggesting that we thoroughly study the options and together try to reach workable solutions.

As with most problems in life, they create opportunities. This pandemic provides us with an opportunity to study the relationships between transport options and transport needs in a way that we have not been able to do it before. <u>We don't need conjecture or</u> <u>articles by armchair experts promoting their pet theories; we</u> <u>need rigorous analyses of facts gathered from the field in all</u> <u>types of contexts, not just Manhattan or London or Stockholm.</u> We need serious discussion of the facts amongst both politicians and business representatives to determine whether there are ways to address both congestion on our roads and harmful emissions in our air. We need more evidenced-based decision-making. 11. Around one-half of public transport's costs in Sweden are covered by passenger fares, so the severe drop in ridership means the transport operators need government support as much as all other businesses to keep their vehicles running.

Some companies, like the makers of cars and trucks, sent all of their manufacturing and assembly workers home in early March. Certain companies, like TESLA, had to be forced to do so by the authorities. Some, like GM, FCA and Ford, were strongly encouraged to do so by the unions. These workers cannot do their job from the comfort of their den. Their job can be done in one and only one place, and that is on the plant floor. They are not essential now, but just like the 'essentials' they need to travel every day, or night if they are shift workers like many are, to the place where they work.

Musings of a Dispatcher: Driverless Cars



Evaluating the Evidence for a Need

Do WE NEED driverless cars? I have chosen the words in this sentence carefully. 'Do' is different from 'will'. In this interrogative sentence, 'do' is an auxiliary verb used with the infinitive without the preposition 'to' to form the present tense. 'Will' is a modal auxiliary verb, where it describes an action that is expected to take place in the future. I am talking about the present, not the future. Maybe at some point in the future we *will* need driverless cars, for example, if governments pass laws prohibiting humans from driving personal motorized road vehicles. We are not there yet.

'We' is a pronoun of the first person plural. It includes me and you and others of all ages, sex and gender. It is not just 'I' or 'you' or 'he' or she'. It's the collective 'us' for the people living everywhere. It's meant to include everyone who is driving a car today and has the intention of driving a car in the future. What about non-drivers, like people who are not old enough to have a driver's license, people who never got a driver's license or who have had to give up their driver's license because of age, infirmity or breaking the law, or people who cannot afford to own or use a car? They are in the 'we' as well.

'Need' in this sentence is a transitive verb meaning 'to require'. 'Require' means 'to demand as necessary or essential'. I did not require a mobile phone until all the public telephone booths were removed, until all the methods of paying for parking were eliminated except using an SMS on a mobile phone, and until the only method available to me for entering my bank account on the Internet required confirmation with my mobile phone. I may enjoy the convenience of having a phone booth in my pocket, but I don't feel that I have a choice today of <u>not having</u> a mobile phone even though I may not want one.

I include 'driverless cars', not 'driverless vehicles'. I am talking about personal forms of transport, not earth movers or long-haul trucks or buses. By 'driverless' I mean cars that are driven by a combination of software and sensors, and I use the term robot-driven cars to distinguish them from human-driven cars. Why am I asking this question? Well, it seems like a fair question to ask when one looks at all of the money being spent on developing and testing driverless car technology; the amount of time being devoted by regulatory bodies on discussing whether they should or should not be regulated, and, if so, how; the quantity of reports being written about them; and, the number of video debates debating them.

Driverless cars on the hierarchy of needs scale

Maybe you are going to think I am a bit pedantic, but 'need' isn't like an adjustable baseball cap where one size fits all. There are needs and then there are NEEDS! Maslow's hierarchy of needs gives us a good description of the different levels of needs, from the most basic physiological ones, like oxygen, water and food, up to the need to make full use of one's talents and potential.¹² The need for transport, irrespective of who or what is doing the driving, falls mainly into the safety and security bracket, which includes the need for "some degree of control over matters concerning oneself". To meet your physiological needs, you need money, and, for most people, obtaining money means having a job. If you have a job, you need to be able to get to it on time each day.¹³ If it's too far to walk, you need transport. What type of transport you use is often based on how much money you have to pay for it. Some people living in Manhattan who could afford to own a car and pay for a chauffeur take the subway to their office. They are not a majority. Safety and security also includes the need for protection from physical harm, so safe and secure transport is as much a part of the need as the ability to be transported.

The need for transport also falls into the *self-esteem* and *self-actualization* brackets. Your self-esteem and self-actualization will probably depend on having and keeping a job which you feel is self-fulfilling. Being able to pay for developing your capabilities and talents, and traveling to places where you can practice your skills or learn new ones, is often a very important part of achieving your goals.

Perhaps if Maslow were working today he would have given us a hint on where he would place having a FACEBOOK or UBER account on his *Hierarchy of Needs* scale or explain why owning a smartphone is now an essential need in every single one of the brackets. "There's an app for that!" really is now true for everything, including the physiological needs. But he does not even mention transport among the needs on his scale. I have filled



Hierarchy of Needs 12. Abraham Harold Maslow (1908-1970) was an American psychologist who was best known for creating Maslow's hierarchy of needs, a theory of psychological health predicated on fulfilling innate human needs in priority, culminating in self-actualization.

13. There are many people working from home during the COVID-19 lockdown, but according to the U.S. Bureau of Labor Statistics, only 29 percent of Americans can work from home, including one in 20 service workers and more than half of information workers. The nonmanufacturing portion of the technology sector has effectively gone remote. Amazon, Apple, Google and Twitter have all asked at least some of their employees to stay away from the office. But 71% of workers still need to get to their jobs.

in that gap with my own projections. Where would he place having twenty-four-hour access to a car with a chauffeur that picks us up (i.e., me and you and everyone else) and takes us to wherever and we want to go, and did that for the price of a bus ticket? I believe he would have said that transport is a means to help us fulfil our needs, our goals and our dreams and that if someone could offer such a service at that price to everyone, then everyone would come to depend on it. It would become a <u>need</u> after it eliminated all other competing transport options. I believe we can all agree that we are not there yet, where 'there' is driverless cars for everyone at the price of a bus ticket.

Lives, Money, Time, Climate

Let us, for a moment, put asside the irritating question of whether we <u>should</u> (as in, 'ought to, be obliged to, be expected to') go there. Let's just look at the <u>evidence</u> for how driverless cars are presented as a desirable evolution of the currently available transport options. Justifications for developing driverless cars fall into four categories: saving lives; saving money; saving time; and saving humans from the perils of climate change. We'll start with saving lives.

Saving lives

An example of ignoring evidence or making it up is the claim that cars driven by robots instead of humans will save 95% of the two million lives lost globally each year to traffic accidents. This is because someone somewhere made the bogus claim that 95% of road accidents are caused by human drivers' errors. As the deductive argument goes, if the human driver can be removed from the equation, at least 95% of accidents will never happen. This is a red herring on several counts.¹⁴

First, it is not possible to take a global figure of two million deaths per year and generalize from that number. Of the two million vehicle-related deaths that occur globally each year, under 5% (around 80,000) of them are in North America and the EU countries. The large majority of the rest occur in developing countries with poor roads, poor cars and poor regulations that are poorly enforced. The people in these countries are not going to be served by robot-chauffeured vehicles in the foreseeable future, especially not at the cost of a bus ride.

Fully 30% of road fatalities in the U.S. are caused by alcohol-impaired drivers. In the EU, it is fully 62% of fatalities that are alcohol- or drugs-related. These are average and vary by country or

14. According to the Oxford English Dictionary, a red herring is something that "misleads or distracts from a relevant or important question." It may be either a logical fallacy or a literary device that leads readers or audiences toward a false conclusion. A red herring may be used intentionally, as in mystery fiction or as part of rhetorical strategies (e.g., in politics), or may be used in argumentation inadvertently. The term was popularized in 1807 by English polemicist William Cobbett, who told a story of having used a kipper (a strong-smelling smoked fish) to divert hounds from chasing a hare.

state. In the State of Connecticut, 84% of traffic deaths are alcohol-related. With motorcycles, almost 40% of deaths are alcoholrelated. 80% of drunk driving fatalities occur between 8 p.m. and 8 a.m. If alcohol locks were made mandatory for cars, trucks and motorcycles, drunk drivers would never have been on the road to cause their own deaths or the deaths of others. Even if the law applied only to the period between 8 p.m. and 8 a.m., most of the deaths would be avoided. If we take an average of 45% for the EU and the U.S. of deaths that could be eliminated vehicles from being driven by people who are affected by alcohol or drugs, we are now down to 44,000 deaths that could be prevented by other means (80,000 x 55%).

In the richest countries, less than 50% of fatalities involve car occupants, either drivers or passengers. Of the remaining 50%, 25% are pedestrians, 20% are motorcyclists, and 5% and are bicyclists. These fatalities may or may not be preventable by ensuring that drivers are more attentive. Unless we turn all pedestrians, motorcyclists and bicyclists into robots as well, we cannot claim that they will be avoided. So we are down to 22,000.

Close to 60% of fatal accidents occur on rural roads, 36% on urban roads and only 6% on motorways. While we might be able to substitute robots for human drivers on motorways at some point in the foreseeable future, it will take much longer to do so on rural and urban roads. This brings us down to 1,320 lives that could potentially be saved versus the claim of saving 1.9 million lives.

Another major cause of deaths is running red lights. The AMERICAN AUTOMOBILE ASSOCIATION concluded that two people die each day in

the U.S. because a driver has not stopped at a red light. This is about 2% of the total. If cars were made to stop at red lights, these deaths could be avoided. A robot does not need to be driving for a vehicle to be prevented from stopping at a red light or stop signs.

If saving lives in rich countries where driverless cars would be first introduced is the goal, addressing road accidents is not the priority, as the chart to the right shows. It does not even show up among the top ten



causes of deaths, according to WHO. There are more important areas of research where bright minds and venture money could make a bigger impact.

Saving money

How about saving money? Consumers are not going be saving money, otherwise, investors would not be investing. Venture capitalists and their clients are interested in monetary returns, not in practicing unselfish altruism. Consumers will not be spending their money in the same way, but they will spend their money nevertheless. It will be the transport operators that will save money. There are 2 million bus drivers and 500,000 taxi drivers in the E.U. and U.S. earning around \$40,000 per year. If we use a fully burdened cost per driver (including taxes, benefits, insurance and a portion of overhead) the total cost of those drivers is around \$100,000 each and a total of \$250 billion in cost per year for all current bus and taxi drivers.

If all buses and private cars disappear and every person in the E.U. and U.S. has to use a driverless car service to make a trip, how much money would that generate and how many driverless cars would be needed. If all 1 billion of us, took one round trip per day over the course of a year, and paid the equivalent of a round trip bus ride of, say \$5.00, that generates revenue of \$1.8 trillion. Two billion trips per day (one round trip per person) results in 730 billion trips per year? The number of cars needed depends on many factors, including the length of the trip, the times of day when most trips are required, how many people will agree to ride together, how long a single car can remain in service (which will vary with how long it takes to charge if it is electric or how dependable it is). Assume a single car makes 30 trips per day with two people in each vehicle at all times, that means we would need 33 million cars in operation at all times, so we might be able to get away with double that number, say 70 million. Those cars will cost around \$6,000 per year to own and operate, or \$420 billion per year. It could be less, but it will probably be more considering insurance costs. That's just for the cars. Add to that the cost of running the businesses that operate those cars, including the service personnel, administrative personnel, parking spaces, office space, and we are probably closer to \$1 trillion.

What if I want to take more than one round trip per year, or what if I want to take the family on a Sunday afternoon drive up to Kennebunkport, Maine for a lobster basket lunch? Who decides how many drive coupons I receive? The more rides we need, the more cars we need or the more we need to ration rides. Maybe at some point someone says: "I want to own my own car so I can go where I want when I want!" What happens then? I guess the businesses making all the money on running our transport will have something to say about that.

Saving time

What about saving time? One of the main reasons people buy cars is to be able to use their time more efficiently. For all but those <u>not</u> living in small, isolated towns where everything is within walking distance or in large, high density communities with ubiquitous public transport, obtaining a driver's license and eventually buying a car provides the transport to help meet all of one's needs. <u>Transport is equal to car</u>. Having access to a car when transport is necessary not only makes life easier, it often makes life possible. Walking a few kilometers to wait for a bus that takes you to a train that takes you to a place where you can take another bus that takes you to a bus stop from where you can walk another few kilometers to your job is not the same as hopping in your car and driving to a parking lot outside your factory. In many places, there are no transit options at all.

In some countries (e.g., Sweden), transport for certain reasons and for certain people is considered a right because without it a person would be at an extreme disadvantage. Someone who is physically or mentally handicapped, who cannot take themselves anywhere without assistance, has the right to transport. Where I live in Sweden, all taxis are used during the morning to take physically and mentally handicapped children to schools. During the day, they ferry handicapped and elderly people to places they must visit. If you need to use a taxi to get to the train station during the morning rush hour, you would be well advised to book it well in advance and make it either very early or after the school run it over. This transport is heavily subsidized by the government, and is often free for the user. It is the tax payers who have accepted that it is a cost we shall bear. The fact that it is also providing jobs for the drivers is an added benefit.^T

Saving humanity from climate change

There are three lessons we have learned about climate change as a result of the COVID-19 pandemic. If we want to reduce CO₂ emissions, we should shut down all of China's coal-burning electricity generation plants, close all of the world's factories and force everyone to stay home. Trying to make a case for driverless

T. Transport as a Right

There are many places where there are no buses or trams or any form of public transit. When the only transport options someone has are either a car or motorcycle, a vehicle that requires his or her own physical power to move, such as a bicycle, or a horse or donkey. Those who cannot afford to own a car or motorcycle, cannot use a bike or who cannot keep an animal are at a severe disadvantage in being able to find work and perform life's daily tasks. What should be done?

In many European countries, public transport is considered a right. There may not be the same level of bus or train service in rural areas as in urban centers and their surrounding regions, but service exists. All public transit services are subsidized. In the U.K. where some transport is run by private concessionaires, the subsidy is around 46%. In the U.S., subsidies for public transit are covered by a combination of local taxes and federal grants.

If there are regions or neighborhoods in a country that are not served by public transport it is the result of the lack of public support to finance such service. The citizens who live within the jurisdiction either do not have the money to pay the necessary fees to create and operate a public transport service, or those who decide how the jurisdiction's tax money will be used are insensitive to the needs of those who are not adequately served.

Does this change if a vehicle or vehicles can be provided that do not include the cost of a driver? Will the absence of a driver tip the balance to such a degree that a public transport option would become affordable? If people need transport to travel to their jobs, certainly one of the jobs could be driving the vehicle that takes them there. cars being more environmentally-friendly than human-driven cars is simply a waste of everyone's time.

Do we need driverless cars?

So, if we look at all the evidence, what do we conclude? Do we consumers need driverless cars? I don't believe we do. We can come up with countless alternatives to address each of the problems that the developers of and investors in driverless cars claim they will solve. There are much better ways to save lives. There are better ways to help people who need transport to obtain it without putting bus drivers and taxi drivers out of jobs and creating a monopoly of transport that is based on robotdriven cars. If people want to use their time more effectively, they don't need a robot-driven car to help them do it. And lastly, let's not try to conjure up the climate bogeyman to convince lawmakers that humans should be barred from driving—for our own sakes.

Having said all this, even if there is no current need for driverless cars, that does not mean that a need cannot be created. My maternal grandparents lived in a borough of Scranton only five miles away from the center of the city where we lived. It was semi-rural back in the 1950s. They raised a pig each year and chickens and had a big vegetable garden. They had an icebox, which was a refrigerator that cooled with block ice that was delivered by the iceman. They had a large, coal-burning stove in the kitchen. My mother had replaced her own coal-burning stove with a Hotpoint electric stove, and we had a modern Frigidaire refrigerator. My mother tried to convince my grandmother to do the same. My grandmother always smiled and said "Non abbiamo bisogno", "We have no need." One day, the iceman stopped making deliveries because the ice house closed and my grandmother decided she would have to buy an electric refrigerator. The electric stove was a gift from all four of their children after my grandparents' arthritis made it difficult for them to haul in the coal for the stove.

My grandmother was never pleased with how these new appliances performed compared to the ones they replaced, but all her wishing wasn't going to bring the old ones back. The moral of this story, and the ultimate answer to whether we need driverless cars, is that you can't always keep what you want, and someone else may decide what you need.



The iceman filled Nonna Rosa's icebox once a week.

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of vehicle telematics. He has not just studied the technologies and analyzed the services, he has developed and implemented them. He has shaped visions and followed through to delivering them. What drives him—why he does what he does—is his desire to move the industry forward: to see accident statistics fall because of safety improvements related to advanced driver assistance systems; to see congestion on all roads reduced because of better traffic information and improved route selection; to see global emissions from transport eliminated because of designing the most fuel efficient vehicles.

This newsletter touches on the principal themes of the industry, highlighting what, how and why developments are occurring so that you can develop your own strategies for the future.



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