THE DISPATCHER

IN THIS ISSUE

This is the London Eye ferris wheel in front of the Greater London Council. I took the photo on a recent trip to the city with my Swedish family. A ferris wheel in Sweden is referred to as a 'pariserhjul', meaning 'Parisian wheel'. When I explained to my Swedish nephews and grand nephews the irony of that term, I was met with a blank stare. The contraption is named after its designer, George Ferris, Jr., and it was intended to be the 1893 Chicago World Columbian Exposition's answer to the 1889 Paris Exposition's Eiffel Tower. The Eiffel Tower is also named for its designer, Gustave Eiffel, and not referred to as the Chicago Tower, neither in Sweden nor America. I think it looks like a giant bicycle wheel, which was surely the inspiration for George Ferris when he designed it 125 years ago.

THE DISPATCHER

TELEMATICS INDUSTRY INSIGHTS BY MICHAEL L. SENA

September 2018 – Volume 5, Issue 11

Data Control Is the Key to the Future of Transport

1. In their book, **Radical Markets: Uprooting Capitalism and Democracy for a Just Cause** (Princeton University Press – 2018), Eric A. Posner and E. Glen Weyl argue that the term 'artificial intelligence' is a misnomer and should be replaced by 'collective Intelligence'. I agree.

This is not a large hot dog being carried by a car, even though that's what it looks like. It is a car shaped like a hot dog sitting in a bun.

WHOEVER CONTROLS OUR PERSONAL DATA, and determines where and how it is stored and used, will control the future of transport in the age of collective intelligence. Will it be the state or business or ourselves who exercise this control? Will there be one, global approach or different regional, national or local solutions? How we move will depend on the answers to these questions.

Let's look first at what I mean by the age of collective intelligence. Why have I chosen to use the term 'collective intelligence' instead of the more commonly accepted term 'artificial intelligence'?[1] The answer to that question should have been obvious since the first day the term 'artificial intelligence' saw the light of day in 1956. It was at a computer conference in Hanover, New Hampshire at Dartmouth College that John McCarthy presented the term with his definition: *The science and engineering of making intelligent machines.* Someone should have stood up and reminded Professor McCarthy that you make machines 'intelligent' by teaching them what we humans know, and this is done by programming them so that they know how and where to find information that we have stored.

A machine (i.e., computer) cannot look up the answer to who was the first person to utter the term 'artificial intelligence' if that fact exists only in a book in a library. The answer to that question or any other question that could possibly be asked on the TV show JEOPARDY must be stored somewhere digitally, and there must be some way to connect the machine looking for the answer to that information. The Internet eventually provided the connections, and Google's effort to digitize every book on Earth (which was never completed for legal reasons) eventually led to most facts being on line. However, even with all facts stored and accessible, a machine cannot know that the Oscar Meyer *Wienermobile* pictured at left is not actually a large hot dog in a bun on wheels unless we humans pro-

vide clues to help the machine determine the correct answer. This is precisely where the use of the term 'artificial' becomes problematic.

Not only does the term 'artificial' inaccurately describe what machine learning is all about; it diminishes or eliminates the role of humans in the process. 'Artificial' means 'man (i.e., human) made', as opposed to natural. That's fine if one is describing a type of sweetener that substitutes for sugar or a synthetic limb that replaces a natural one. But human knowledge is acquired by learning. It does not pre-exist in nature like a sugar beet to be refined into sugar. It is not a cotton ball or a silk worm's cocoon to be spun into cloth. It is not synthesized or manufactured or fabricated. It is we humans who have made, and continue to make, our knowledge available for machines to use.

Collectively, either willingly and consciously, or unconsciously by having our knowledge surreptitiously acquired as we use our personal computing devices, we are contributing to the expanding body of knowledge that machines will use in the future to perform many of the tasks that humans perform today, including driving our cars, trucks and buses.[2] In addition, a huge industry is developing employing hordes of humans in the task of tagging images. *This is a dog. This is a car. This is a car shaped like a giant hot dog*. They have even invented a name for people doing this work: *clickworker*.

Confucius, Locke and Hayek

Where and how the data will be processed, stored and used will follow the normative principles guiding such decisions in the three major countries/regions in the world: the United States of America, the People's Republic of China and the European Union. The other countries of North America, Asia and Europe along with South America, Africa and Australia will follow one of the approaches or a hybrid of them, depending on how closely the individual country's own normative principles are to one of the major three. Based on current principles, personal data will be controlled by the state in China, by business in the U.S. and by the individual in the EU.

Let's take China first because it is the least complex. China has been a

2. Mighty Ai, Appen, Cloud Factory, Samasource and Scale are a few of the companies employing a combination of human data labelers and machine learning algorithms to sort through raw, unlabled streams to produce datasets for automated vehicle software.
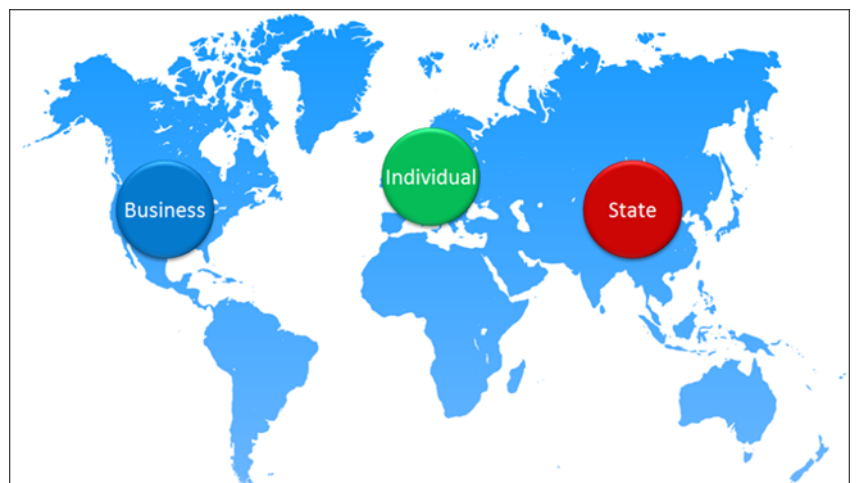
united country since 221 B.C. when the Qin kingdom conquered the other six kingdoms and King Zheng proclaimed himself the First Emperor of the Qin Dynasty. In spite of internal rebellions and even external invasions, mainland China, what is called the People's Republic of China, has remained intact to this day. The constitution of the PRC states that China "is a socialist state under the people's democratic dictatorship led by the working class and based on the alliance of workers and peasants," and that the state organs "apply the principle of democratic capitalism" to be ruled "under the leadership of the Communist Party of China."

Throughout China's united history, including up to this day, Confucianism has guided both government and society. Confucian philosophy holds that there is a basic order in the universe and a natural harmony linking man, nature and the cosmos. The family unit is the primary social unit and the state has its model in the family. The ruler of the government is at once the Son of Heaven and the father of the people. Both social and political relations are hierarchical based on clearly defined duties and mutual responsibility between subordinate and superior. The state is the guarantor of the people's welfare. Therefore, putting government in charge of technology has one big advantage: the state can distribute the fruits of connected intelligence, which would otherwise go to the owners of algorithms.[3]

3. From THE ECONOMIST *Special Report: Fixing the Internet*, June 20th 2018. China: The ultimate walled garden. In this article there is also a quote from Feng Ziang of Tsinghua University. He is reputedly one of China's most prominent legal scholars. "If AI remains under the control of market forces, it will inexorably result in a super-rich oligopoly of data billionaires who reap the wealth created by robots that displace human labour, leaving massive unemployment in their wake."

The European Union is a political and economic association of (at present) twenty-eight independent and sovereign countries that was formed in the aftermath of World War II, initially to create a single market ensuring the free movement of goods, services, capital and people. It has subsequently extended its powers through the creation of a Parliament that passes laws (known as directives and regulations) which apply to all countries within the EU, and the establishment of a monetary union with nineteen of the countries participating and with the Euro as its currency. Countries within the EU are called Member States.

Normative policies that have been incorporated into the EU's approach toward business and individual rights were formed during the Age of Enlightenment, beginning in the late 17th century, but trace their roots back to the Reformation in the 16th century, when the hierarchical power of the Catholic Church was replaced in northern European countries by a social order based on the individual's faith. John Locke, an English philosopher and physician, was the most influential in arguing for the individual's rights over those of the state. He wrote that government's legitimacy and moral right to

use state power is only justified and lawful when consented to by the people or society over which that political power is exercised. Further, he wrote that property is a natural right and it is derived from labor.[4] Eventually, humanism, liberalism and secularism replaced formal religions as the basis for social, economic and political contracts.

It was not in reaction to outside forces that the EU established the *General Data Protection Regulation* (*GDPR*), but as part of the half of a millennium of Enlightenment theory and practice in which the individual is at the center. Although not all twenty-eight of the current Member States ascribe to the tenets of humanism, particularly not those who joined during the Eastern Europe expansion, the operative laws of the EU continue to be based on them.

The United States of America—America for short—is a young country, established in 1776 by declaring its independence from Great Britain and then fighting for seven more years to secure its sovereignty. It was the first country to obtain its independence from a European power. It is a federal republic, a federation of states, governed by elected representatives from those states and by an elected leader, a president. Power is distributed between the federal government and the state governments, which also have elected representatives and a leader, a governor. In 1959, the last two states, Alaska and Hawaii, were added to what then became fifty. The 20th century's World Wars that led to the formation of the EU were also instrumental in defining America's current position as the world's most dominant military and economic power.

Economic development in the U.S. can be likened to a constant tug of war between the monopolists[5] on one side and the trust busters on the other. The *Sherman Antitrust Act of 1890* was intended to curb the so-called 'robber barons' of the gilded age, such as Andrew Carnegie, the Vanderbilts and the Rockefellers, but today we have the new age barons who have created companies of unimaginable value based on the collection and processing of our personal data. The school of thought that says monopolies are good—so long as they can be challenged—is at the forefront today. It is at the University of Chicago that this thinking has its home, and it is Nobel Prize winner Friedrich Von Hayek with his theories of classical liberalism that provide its foundations. He said: "A government that is comparatively inactive but does the wrong things may do much more to cripple the forces of a market economy than one that is more concerned with economic affairs but confines itself to actions which assist the spontaneous forces of the economy." [6]

4. "Locke reasons that God gave us powers of reason and discipline so that we could most effectively go about the business of preserving ourselves. It follows that we ought to be 'Industrious and Rational'.

Tug of War

5. Economic theory says a monopolist earns premium profits by restricting output and raising prices. This only occurs after the monopolist prices out or legally restricts any competitor firms in the industry.

6. Current policy fails to recognize that it is not monopoly as such, or bigness, but only obstacles to entry into an industry or trade and certain other monopolistic practices that are harmful. Monopoly is certainly undesirable, but only in the same sense in which scarcity is undesirable; in neither case does this mean that we can avoid it. It is one of the unpleasant facts of life that certain capacities (and also certain advantages and traditions of particular organizations) cannot be duplicated, as it is a fact that certain goods are scarce.
Hayek, F.A.; The Constitution of Liberty (1960)

## The future of transport in the three major markets

Why, how and to where we travel is not a series of random events. As our activities—live, work, shop, recreate, educate, contemplate—are more and more determined as well as controlled by our personal data that is processed and delivered back to us individually and collectively, the more the way we move between these activities will be controlled. I am not saying that this is the way it should be, nor that the consequences are good or bad; I am saying that this is the direction in which we are headed.

In China, the state controls the data of every citizen. All of the apps that operate in China collect data from their users, and this data is absorbed into the collective intelligence machines. The result will be used to determine in which part of the country and in which of the thirteen major megalopolises its citizens will perform all of life's activities. It will also be used to manage the building of transport infrastructure and the flow of traffic.

Within the EU, individuals own their data. They will decide who will have access to it. Some individuals will decide that no one will be able to use their data, and this will reduce the total pool of data that will be available for collective intelligence. There will not be a large, centralized data processing center that will collect data from all citizens. There will be discussions about developing a marketplace for data where citizens can agree to have their anonymized data used for specific purposes. These discussions may result in the eventual creation of such a marketplace, but it is more likely that there will be city or regional solutions, rather than pan-European ones.

In the U.S., no one owns their data, but a few large companies, including Alphabet, Facebook and Amazon (or their successors), will gather the data from most of the citizens who use various apps and agree to have their data collected in return for receiving free information and services. Companies, like Alphabet's Sidewalk Labs, will enter the city and regional planning business using the data they collect to manage where activities are placed for optimum performance according to their rules of business, and how the flow of traffic should be organized to maximize their profits.

A recent NEW YORK TIMES MAGAZINE article titled *Losing Earth: The Decade We Almost Stopped Climate Change* (August 1, 2018) described how governments reacted to climate science during the 1980s to prevent actions that could have slowed or even stopped the progress of climate change. Thirty years from now—if we are still here—we should not be having a similar discussion about data.
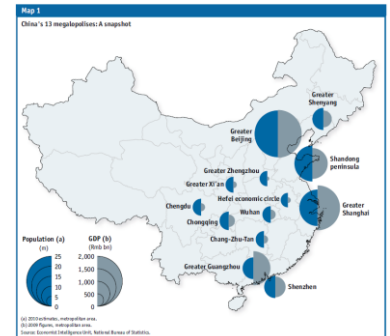
The number of China's megalopolises will grow from three in 2000 to thirteen in 2020.
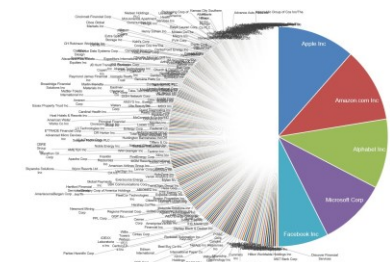
Enlarge the image and you will be able to read the names of the five companies that have a combined market capitalization equal to the market capitalization of the bottom 282 companies in the S&P 500

Bicycles: Are They Good or Bad for Cities?

This is the CARGOBIKE CLASSIC, designed in Sweden and sold in Scandinavia, the U.S., Australia and The Netherlands. It is a battery-aided to provide an extra push with heavier loads.

Dockless bike schemes can trace their roots back to the 1965 White Bike Plan in Amsterdam. Fifty bicycles were collected by the Provo (short for 'provocation') Group, painted while and left around the city for free use. They suffered the same fate as the much larger pile of abandoned bicycles in Xiamen, China.

APOSTASY! YOU SAY. It's obvious that getting people to use non-polluting forms of transport is better than encouraging them to use cars or even collective transport options, isn't it. Well, that's what I want to look at, especially because an increasing share of these two-and-three-wheelers are battery driven, and are being joined by electric kick-scooters, hoverboards and skateboards. Add to this the bike sharing trend, both dock-based (e.g. CitiBike, Santander) and dockless (e.g., Jump, Lime), that are adding millions of bicycles to cities around the world, and you have a phenomenon at which it is certainly worth having a closer look.

What's your relationship to bicycles? Do you own one? Do you ride it regularly? Do you wear a helmet, venture out on the streets into traffic or try to find bike trails for leisurely tours. How would you react to a massive pile of bicycles in your neighborhood like the one to the left in a Xiamen, Fujian province in China of unused shared bikes? This is one indication of just how popular bicycle riding in cities in general, and bike sharing in particular, has become. It is also one of the major issues that city governments and their transport authorities are grappling with as they attempt to meet their individual citizens' demands for increased personal mobility while accommodating all of the essential road-based transport (i.e., fire trucks, police cars, ambulances, refuse removal vehicles, delivery vehicles, buses and special-purpose vans).

Good for environment, but what about safety?

Bicycles are being promoted as the latest silver bullet to solve the multiple transport-related problems of cities, and those who ride bicycles are praised as heroes of the environment. Cycling promoters claim that if everyone cycled to work, to school, to shop or to get anywhere they would normally drive their cars or take a taxi or bus or underground, cities would have no pollution, no noise and

no accidents. Then, all the money cities spend on maintaining public transit systems and roads could be redirected into more productive uses, like maintaining parks, getting rid of graffiti, providing better educational opportunities for people of all ages and building and maintaining streets on which all the bicycles would be ridden.

I believe bicycle riders—those who ride bicycles without batteries—<u>are</u> heroes, but not because they are saving the planet. Every time a person on a bicycle wades into city traffic, they are risking their lives and also endangering the lives of others who are sharing those roads, including those on foot and those in and on other vehicles. I admit, my views are colored by my own experiences with riding bikes in cities. When and where I grew up in a city, no one ever rode a bicycle on the street. Streets were for cars, trucks and buses. Kids either walked or took the bus to school. When I worked in London, I borrowed a friend's bike to tour a part of the city that was not really walkable at that time, the Isle of Dogs. I was lucky to leave with my life after the front wheel began to wobble while a truck passed and I fell, thankfully away from the truck. Undaunted, the following year, during my first year in Boston, I bought a bike from a co-worker. It was a ten-speed racing bike. I rode it back home to Cambridge from Boston during rush hour, a six kilometer journey, and that was the last time that bicycle—or any other— carried me on a big city street. It was the most unnerving experience I had ever had. Boston is still not a bike-friendly town, but in 1974 it was absolutely suicidal to try to share a street with a car, truck or bus.
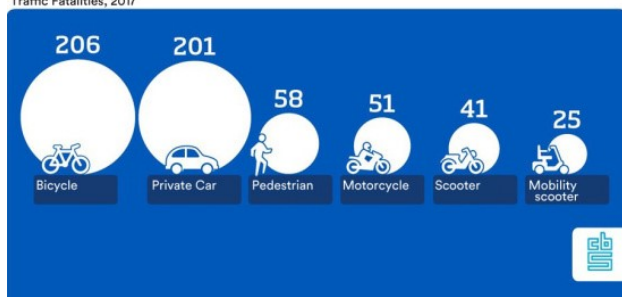
In The Netherlands, where more people ride bicycles than drive cars, the number of fatalities in 2017 was higher for bicycle riders than for private car drivers, 206 versus 201.[7] The death toll for men riding an electric bike went from 20 in 2016 to 38 in 2017, and 31 of these 38 men were over the age of 65. One-half of all cycling-related deaths were the result of a cyclist colliding with a car; the remainder were caused by collisions between cyclists, with stationary objects or simply losing control of the bike. In the U.K. in 2016, 94 adults and 8 children died in cycling accidents, and a total of 3,397 were seriously injured.[8] Males accounted for 81% of the cycling accidents in the U.K., so it seems that either more

On this pedestrian street in Vadstena, Sweden, bicycles are forbidden, but summer tourists ignore the signs.

Götgatan in Stockholm is the busiest cycle path in the city. It is also the most dangerous. Of the city's 500 cycle-related accidents in 2014, 58 were on this stretch. Note: With one exception, pedestrians are the ones not wearing helmets.

On August 20th, Sweden's main newspaper had a two-page story on the dangers of cycling in Stockholm. Accidents involving cyclists were up 17% for the first half year from the year before. Main reason: more cyclists causing more congestion and people taking more risks to get to where they want to go.

7. Statistics Netherlands - https://nltimes.nl/tags/statistics-netherlands. Two-thirds of the cycle deaths are people over 65 years of age, while they only ride 3% of the total distance and the number of casualties on e-bikes almost doubled in one year, making the deaths on the e-bike a quarter of the total cycle fatalities.

8. The Royal Society for the Prevention of Accidents (Nov. 2017)

males cycle or they are taking more risks. The higher the speed limit, the greater the number of accidents.

Then there is the issue of bike lanes suddenly disappearing, either in a building site or as the result of a car or truck deciding that the bike lane is a perfect place to double park. That line on the street demarcating a bike lane is easily driven over, both by the cyclist and the vehicle driver.

Rather than giving medals to those who take this risk and encouraging them to ride more and putting themselves and pedestrians in harm's way, it seems that cities should place a moratorium on increased bicycle usage on city streets while further studies are made to determine whether the mixing of cycles and vehicles should be allowed. Firm separation of bikes, cars and trucks, buses **and** pedestrians is surely the safest route, as in Göteborg (below).

Flexible boundaries on the bike lane in Stockholm (top) and London (above) encourage encroachment.

Why aren't they taking the bus?

The answer to that question for central London is readily apparent. You reduce the width of a road that is already narrow by adding a bicycle path and then you let the buses compete for the space remaining with official taxis, phantom cabs (e.g., Uber), private cars, trucks and rickshaws (see photo right). Rickshaws are a real problem because they are slow.[9] The result is buses moving at a crawl. Another answer is the age-old fixed route problem: the bus (trolley or underground) doesn't take you from your starting point or to your destination. If getting to the bus stop or underground station requires a fifteen minute walk, you can probably get there in five with a bike. A rickshaw may take longer. Taking your own bike on the train or underground is not really very convenient. Wouldn't it be great if there was a bike waiting for you when you got to the end of your commuter journey?

Bike rentals of the docked variety were the solution to this problem. You emerge from the tube stop or exit the train station, release a bike from its stand by paying the fee, and off you go. The difficulty

9. The one time we took a taxi during a recent visit to London, we got sandwiched in behind a rickshaw and a line of buses, and could move only as fast as the rickshaw.

with this solution is that there may not be a stand near your destination and some of these rental bikes do not come with locks. So you end up storing it somewhere safe until you make the return journey—or you pay for the bike if it's stolen. Another problem is that the rental bikes tend to end up in popular destinations, ones to where many people travel and they need to be moved to the empty stands. That is what is happening in the photo to the right, taken in front of the Victoria and Albert Museum in London at the height of the summer tourist season.

Dockless bikes schemes are intended to address the concentration problem while allowing users to leave the bikes anywhere. Bikes are rented, unlocked and locked with an app. The bikes are equipped with a GPS receiver and a communications device, so they are found by using the mobile app where they are displayed on a map.

Where do we put all those bikes?

London got its first delivery of 400 OBIKES in July, 2017 when the city's bikeless program was initiated. According to The Guardian (12 July 2017) OBIKE would be putting "hundreds" of the bikes into service <u>per day</u>! It was 2017 that dockless bike programs exploded onto the scene, principally in China. Dozens of companies were started and soon millions of bikes were available. Unfortunately, there were not millions of ready renters. Riders parked the bikes everywhere and soon city authorities began creating piles of abandoned or broken bikes, like the one on the first page of this article, just to get them off the streets. Adding dockless scooters into the mix is not going to make the problem of finding space any less difficult to solve, and if you have been attacked from behind by one of them zooming along a walkway, you know they are not going to help lower the accident statistics.

It's a conundrum. On the one hand, squeezing out private cars by flooding the streets with bikes seems to be the right direction to take, but those bikes also squeeze out buses, which is a form of collective mobility that serves a large section of the population who would not prefer, or are unable, to cycle. They could potentially lower speeds, but if you see them on their bike lane super-highways, they move faster than cars. I must also admit that I also have difficulty with taking a natural bike that emits no harmful emissions and adding a battery to it. Even if the battery is recharged during cycling (like a hybrid vehicle), it seems like a needless use of resources. More gears can make peddling effortless. Maybe there are more positives than minuses, but this jury is still out.

Santander Cycles (formerly Barclays Cycle Hire) is a public bicycle hire scheme in London, United Kingdom. The scheme's bicycles are popularly known as Boris Bikes, after Boris Johnson, who was the Mayor of London when the scheme was launched. The operation of the scheme is contracted by Transport for London to Serco. Bikes and docking stations are provided by 8D Technologies. The scheme is sponsored, with Santander UK being the main sponsor from April 2015. Barclays Bank was the first sponsor, from 2010 to March 2015.


Young women ride shared electric scooters in Santa Monica, California, on July 13, 2018. Cities across the U.S. are grappling with the growing trend of electric scooters which users can unlock with a smartphone.

GABE KLEIN, CITYFI
(August 1, 2018)

<u>Full disclosure</u>: I own two bikes and keep them in two places. When we are in one of those places, I ride my bike every day to perform errands. When we are in the other place, which is more urban, I ride my bike less regularly. I wear a helmet. I try to use cycle paths wherever possible.
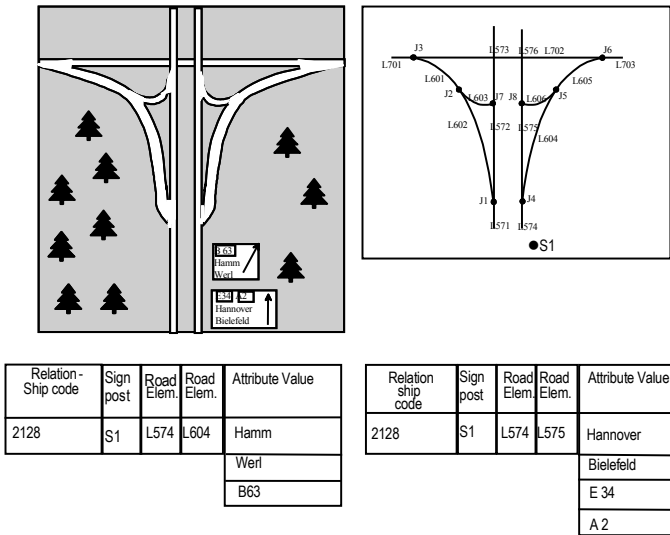
Robot Drivers Need to Navigate More Like Humans
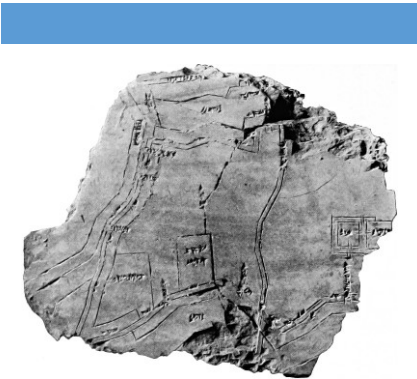
This clay tablet map was found in 1930 near Kirkuk in Iraq. It dates from 1400 B.C. and shows a river valley between two hills. Cuneiform characters label features on the map.

Our current navigation systems represent the best we could do with non-seeing machines. They do an adequate job of directing drivers to a specified destination, but they do not model the way humans find their way. If robots with vision sensors are to take over the full driving and wayfinding functions, we need to find a new and better navigation paradigm, both for the maps and the guidance methods used.

LIKE OTHER LIFE FORMS, humans don't have a natural propensity to navigate with maps. During our first two hundred thousand years, to find our way we used all of our senses and were aided by the relative positions of the sun, moon and planets, the direction and force of the winds, and the locations of landmarks, both natural and those we made ourselves. Before we settled down to farm around twelve thousand years ago, we followed our food sources by walking along the trails they made, and then these trails became ours. We drew them on the walls of our cave dwellings, in the sand and clay to show others in our bands where we had been, and these became our first maps.

Relation-Ship code	Sign post	Road Elem.	Road Elem.	Attribute Value
2128	S1	L574	L604	Hamm
				Werl
				B63

Relation ship code	Sign post	Road Elem.	Road Elem.	Attribute Value
2128	S1	L574	L575	Hannover
				Bielefeld
				E 34
				A 2

10. Network topology – The structure of a network (e.g., a road network) modeled as nodes (intersections) and the connections between these nodes as links (road sections). It is an application of graph theory, which is the basis for geographic information systems (GIS). Diagram from GDF 4.0, ISO TC/204 WG3.

In the 1950s, cartographers, those clever people who draw maps as a profession, set aside their pens and inks that had served them so well for several centuries and took up the scribing tools and peel coat developed during the war years to produce maps quickly in the field. Twenty years later we had begun to convert our paper maps to digital form by digitizing and annotating, creating computerized databases from which all manner of printed maps could be produced, but not those maps needed for allowing machines without vision to guide us to our destinations. For this new invention—later to be known (incorrectly) as a GPS—a network topology structure of the data was required.[10]

The paradigm chosen for navigation with these machines was to follow a pre-calculated path from origin to destination. These origins and destinations needed to be associated to a location on a link, usually a street address, or attached to a node. Using dead reckoning and gyroscopes,

and GPS location data, the non-sighted systems could provide a good approximation of where the vehicle was on the stored map data. We were instructed to *Turn left*; *Make a U-turn if possible*; etc. And that is still the way we are using these systems today.

A* was born

Databases for navigation systems that have been in use for the past twenty-two years have become more positionally accurate, more easily updated, richer in the amount of real-world data they contain, but the way the navigation systems work today is essentially the same as the way they worked when they were first introduced in the mid-1990s. You use your current location, a specified point of interest or a street address as your origin, specify another point of interest or street address as your destination and then let the **A*** (pronounced A star) algorithm find the optimum route between the two.[11] You can decide if you want to travel on motorways, take the shortest or fastest route or make stops along the way. This is supposed to mimic a co-pilot sitting next to you in the passenger's seat who either knows the way or is using a map while watching for signs. What the current navigation systems lack is the 'watching for signs' part. Once you push the *Calculate Route* button, you are simply following orders, and if the reality you see does not match the data that is stored on board or on a remote server which was used to calculate the route and deliver instructions, tough luck.

Humans have a sense of place

Even with the additional data on number and location of lanes, speed limits and other signage accurately geo-referenced to the underlying data, the databases in current navigation systems still contain an extremely limited amount of information that humans can use to find our way. Before navigation systems dulled our way-finding abilities, we were reasonably good at not getting lost since for most of the time we have been humans our lives depended on this skill. We created mental maps using the part of the brain called the hippocampus. London taxi drivers—the ones who have passed 'The Knowledge' test—have a bigger and thicker hippocampus than the average person.[12]

Three researchers shared the *2014 Nobel Prize in Physiology and Medicine* for their discoveries of cells that constitute a positioning system in the brain. In its explanation of why the prize was awarded, the Nobel Assembly at *Karolinska Institutet*, the body responsible for awarding this particular prize, stated the following: *"How do we know where we are? How can we find the way from*

11. The A* algorithm was first published in 1968 by mathematicians at the Standford Research Institute. It is an extension of Edsger Dijkstra's 1959 algorithm.

12. London Taxi and Private Hire (LTPH) oversees the test of prospective taxi drivers, which it summarizes in the Blue Book, like this:

"To achieve the required standard to be licensed as an "All London" taxi driver you will need a thorough knowledge, primarily, of the area within a six-mile radius of Charing Cross. You will need to know: all the streets; housing estates; parks and open spaces; government offices and departments; financial and commercial centres; diplomatic premises; town halls; registry offices; hospitals; places of worship; sports stadiums and leisure centres; airline offices; stations; hotels; clubs; theatres; cinemas; museums; art galleries; schools; colleges and universities; police stations and headquarters buildings; civil, criminal and coroner's courts; prisons; and places of interest to tourists. In fact, anywhere a taxi passenger might ask to be taken."

one place to another? And how can we store this information in such a way that we can immediately find the way the next time we trace the same path? This year's Nobel Laureates have discovered a positioning system, an "inner GPS" in the brain that makes it possible to orient ourselves in space, demonstrating a cellular basis for higher cognitive function."[13]

In 1971, John O'Keefe discovered the 'place' component of this positioning system. He found that a type of nerve cell in the hippocampus that was always activated when a rat was at a certain place in a room. Other nerve cells were activated when the rat was at other places. O'Keefe concluded that these "place cells" formed a map of the room. In 2005, May-Britt and Edvard Moser discovered the space component of the brain's positioning system. They identified another type of nerve cell, which they called "grid cells", that generate a coordinate system and allow for precise positioning and pathfinding in space. Their subsequent research showed how place and grid cells make it possible to determine position and to navigate.

Place and space cell research has continued with brain imaging techniques. There is evidence that these cells exist in humans, and when diseases such as Alzheimer's cause damage to the hippocampus and the entorhinal cortex, individuals lose their way and cannot recognize their environment. We are beginning to understand the brain's positioning systems and how groups of specialized cells work together to execute higher cognitive functions. The discoveries of John O'Keefe, May-Britt Moser and Edvard Moser have solved a problem that has occupied philosophers and scientists for centuries – how does the brain create a map of the space surrounding us and how can we navigate our way through a complex environment. The sense of place and the ability to navigate are fundamental to our existence. The sense of place gives a perception of position in the environment. During navigation, it is interlinked with a sense of distance that is based on motion and knowledge of previous positions.

It's time for a proper new paradigm

Display maps in vehicles have always been a distraction, and the initial systems were not designed to have them for safety reasons. They became a must-have because the timing of instructions did not always match the location of the vehicle due to inherent inaccuracies of map matching and the digitized sources. Robots will not need to have displays, but if there are to be humans in the vehicles (some humanless-driving vehicles are being developed for tasks

13. John O'Keefe (U.S. and British); May-Britt Moser and Edvard Moser (Norwegian).

that do not include transporting passengers), it seems advisable that the methods used by the systems to both drive the vehicle and navigate be similar to how these tasks would be performed by humans to the maximum extent possible in order for the riders to feel comfortable and secure. The HERE extensions are a good start, but they are still just addressing the mechanical driving function, not navigation. [14]
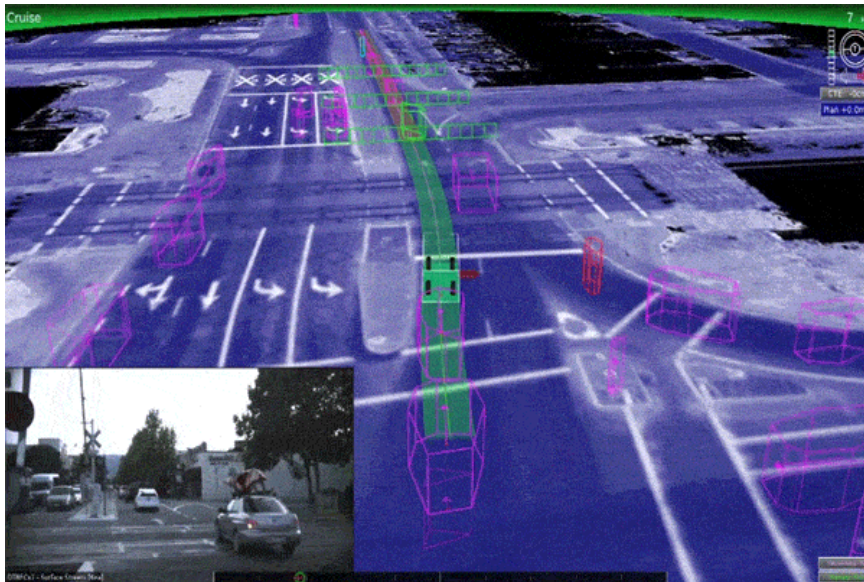
Current driverless systems are based on developments that began with the DARPA Urban Challenges starting in 2004 and have more

in common with video games, like *Streets of Sim City* (image left), than with navigating in a real environment, urban, suburban or rural. Google hired the heads of the DARPA Challenge 2005 and 2007 winners, Sebastian Thun and Chris Urmson, and their approach, which involves creating videos of streets and then using LiDAR images in real time overlaid on these scenes, has been adopted by most of those working on the problem (image from Waymo above).

It's not too late to add human-centric navigation to the work programs for improving vehicle safety and performance, including the driverless car initiatives. There is no rush to bring driverless cars to market: buyers are not clamoring for them.[15] However, improvements to vehicle navigation systems that align them more closely to how humans find their way will benefit human drivers in the short term and ease a transition to a time when robots take on more of the driving task.

14. HERE Humanized Driving for autonomous cars.

- Some people like to drive fast while others don't. A family car might by default have a "normal" speed profile and follow it accordingly. A sports car, on the other hand, might have a faster speed profile, with more rapid acceleration and deceleration.
- Weather conditions affect how fast people drive so we create different profiles for dry sunny weather and for rainstorms.
- When a traffic light causes many vehicles to stop and many others to drive with a mid-speed value we use some maths to exclude irrelevant data.
- Sometimes a vehicle in front limits another vehicle's speed to the point they are driving well below road regulations; in this case a speed profile isn't relevant.

15. A 2018 Cox Automotive Evolution Mobility Study found that 84% of those surveyed "wanted to have the option to drive themselves even if the vehicle were equipped with self-driving capabilities, while only 16% would feel comfortable letting the autonomous vehicle drive them without an option to be able to take control." Further, the number of survey respondents who believe roadways would be safer if all vehicles where "autonomous" versus operated by people has decreased 18% during the past two years since the previous survey. https://www.automotiveworld.com/news-releases/autonomous-vehicle-awareness-rising-acceptance-declining-according-to-cox-automotive-mobility-study/

SOCRATES 2.0: Interactive Traffic Management

SOCRATES[2.0] is a pan-European project that brings together road authorities, service providers and car manufacturers. Together they set new standards to share and integrate traffic information. This enables effective traffic management and opens the door to innovative traffic information and navigation services. It will make traffic smoother, safer and more sustainable. Hence our pay-off: fast, safe and green. SOCRATES[2.0] also provides the essential building blocks to prepare Europe for the future of self-driving cars.

Description from SOCRATES[2.0] website (https://socrates2.org/)

I LEARNED ABOUT the SOCRATES[2.0] project in May of this year during the process of being selected to its Advisory Board. I read the project description and felt that it was addressing the important issues of mobility and road traffic management for both the current conditions that prevail and possible future conditions as vehicle systems become more automated. The first task of the Advisory Board was to review the SOCRATES[2.0] proposed concept, what is called the strategic level of cooperation (Activity 2), and offer advice on the strategic long-term feasibility of this concept. Activity 2 provides the guidelines for the operational and tactical activities that will occur in subsequent project Activities.

What the project partners are trying to achieve

The stated goal of SOCRATES[2.0] is "to develop and test an optimal framework of cooperation between the public and private partners as a basis for European deployment of Interactive Traffic Management." The idea is that by cooperating and sharing information, new and better services can be created for road users, and these services will lead to faster, greener and safer traffic. Four pilot regions have been selected to test the framework developed in Activity 2. These are Amsterdam, Antwerp, Copenhagen and Munich. A set of designs and specifications will be prepared that attempts to incorporate the needs and interests of all stakeholders. This challenge is approached by the partners first defining a common ground for cooperation on a strategic level with an agreed vision: move from 'managing and influencing traffic' to 'supporting people on their travel from A to B'.
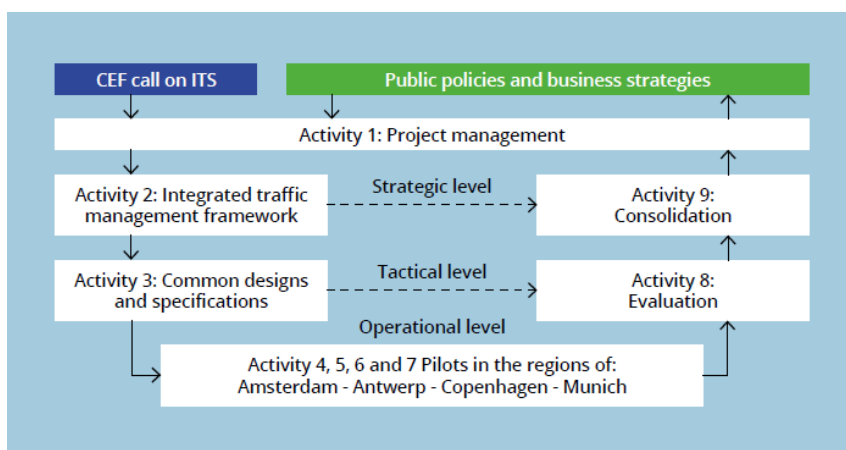
16. V-Model is a graphical representation of a systems development lifecycle used to produce rigorous development lifecycle models and project management models.

In the above diagram the nine project activities are shown in the V-model used for organizing and managing the project.[16] Results of the Pilots will be evaluated in Activity 8 and then will be used to update the Framework.

At the foundation of the SOCRATES[2.0] work is the TM2.0 initiative. Managed by ERTICO (ITS Europe), TM2.0 is a discussion forum focused on interactive traffic management with members from the Intelligent Transport Systems (ITS) sectors. Its mission is to "bridge the innovative developments in the vehicle (OEMs, in-vehicle systems and services suppliers) with innovations in the traffic management sector in order to achieve convergence of mobility services and traffic management. This concept has thus far guided the work of the SOCRATES[2.0] team.

Customer, Community, Technology, Cooperation

These four elements were identified by the project team as the essential components necessary for achieving the desired objectives. Each element was given a description in the form of a 'slogan', as shown in the illustration to the right. In order to examine and then evaluate how these elements should best interact, three use cases were defined:

1. Smart routing
   - Optimising network traffic flow
   - Individual routing towards public event locations
2. Actual speed and lane advice
   - Lane information
3. Local information and hazardous warnings.
   - Road works warning
   - Environmental/areal information and constraints.

BMW is the sole vehicle OEM in both the SOCRATES[2.0] and TM2.0 initiatives. SOCRATES[2.0] will address this shortcoming by engaging with ACEA, the European Automobile Manufacturing Association. As with all EU-funded projects, once the scope, deliverables and partners are defined and approved, it is very difficult to change them. It would have been ideal to include in the project all of the stakeholders responsible for decisions that lead to traffic congestion, including the public policy makers, commercial, industrial and residential real estate developers, and educational authorities. This, however, would have greatly expanded the scope of the project. At this stage it will be valuable to test the concept of public/private cooperation and to determine how private business models can be aligned with the achievement of increased road safety, reduced vehicular congestion and a healthier environment.

If you will be visiting the ITS World Congress in Copenhagen this September, there will be presentations by SOCRATES[2.0] partners in the congress program.

Dispatch Central
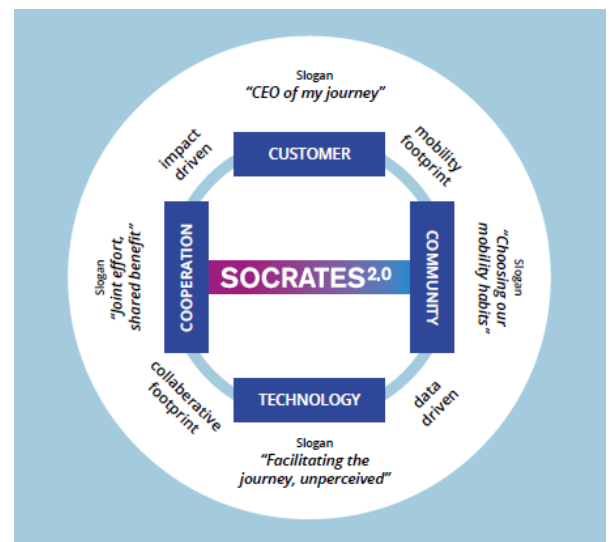
17. According to people at the Association for Unmanned Vehicle Systems International with whom I have discussed the issue of air space say that the FAA claims it controls (but does not own) airspace three inches off the ground. However, in the U.S., state law, not federal law, determines property rights.
https://diydrones.com/profiles/blogs/where-does-private-land-end-and-public-airspace-begin

Rather than building their own trucks, Otto decided to produce hardware kits for existing truck models that would either be factory-fit, dealer-fit or installed by aftermarket service providers. Volvo Trucks was an early tester. Otto had hopes to work with all truck manufacturers.

FAA: It's My Ball so I Make the Rules of the Game

THE U.S. FEDERAL AVIATION ADMINISTRATION issued a statement on Friday, July 20th. The purpose of the statement was to publicly reinforce its jurisdiction of the national airspace. "Congress has provided the FAA with exclusive authority to regulate aviation safety, the efficiency of the navigable airspace, and air traffic control, among other things," the FAA statement said. "State and local governments are **not permitted** to regulate any type of aircraft operations, such as flight paths or altitudes, or the navigable airspace."[17] The statement also said the recently announced *Integration Pilot Program* will provide the FAA with insight on how to best integrate Unmanned Aircraft Systems (UAS, aka 'drones') into the airspace while addressing concerns about their operations by local communities. Oregon, California (of course) and other states had begun to introduce their own regulations, so it was time for the FAA to put its legal foot down and stake its claim. This issue of jurisdiction between federal and state governments is the same for humanless-driven vehicles, but the corresponding federal agency, NHTSA, has so far declined to take a hard stance.

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Uber Autonomous Truck Project: Otto-ejected

IT WAS STAR-CROSSED from the beginning. It was two years ago, August 2018, when UBER's then-CEO, Travis Kalanick, announced that it was acquiring the self-driving truck startup OTTO. The price paid by UBER for OTTO was 1 percent of UBER's valuation, which at that time was $68 billion. Anthony Lewandowski, one of Otto's four co-founders—all of whom worked in Alphabet's (Google's, Waymo's) self-driving car program—was chosen to be the leader of the new UBER entity. Then all the stuff hit the fan. Waymo filed suit against UBER in February 2017, claiming that OTTO and UBER were using elements of its (Waymo's) self-driving technology related to its customer, in-house LiDAR sensors, alleging that Lewandowski had downloaded more than 14,000 highly confidential and proprietary files. Lewandowski eventually was fired, Kalanick was ousted by his board and UBER and Waymo settled for $245 million of UBER stock-with no admission of guilt by UBER. In July, UBER announced that it was closing the self-driving truck effort to focus on cars. Its UBER FREIGHT initiative, which focuses on matching truckers with loads, will continue under Lior Ron, another former OTTO co-founder.

### ...and will Uber sell its self-driving car division?

As of this writing, UBER management is wrestling with a strong request from some investors to sell or close its autonomous car unit. The unit is burning through $125-to-$200 million per quarter while the company reported on the 16th of August overall losses in its 2018 second quarter of $891 million on revenue of $2.8 billion. UBER is between a rock and a hard place. Its investors want it to go public so they can cash out on the investments. Its valuation, fluctuating between $48 and $72 billion, is mouth-watering, but it is not based on operating a taxi business in the U.S. and Europe, the markets where it is still operating. UBER has over sold its future as an operator of self-driving cars with a completely different business model than the one that made it what it is today, a platform operator that connects people with cars who are ready to drive for a fee with people without cars who need a ride and will pay for one. Toyota's just-announced $500 million investment to partner with UBER on self-driving car technology would seem to answer the question. To be continued.

Volvo Cars Announces It Will List on Stockholm Exchange

ON THE 17TH of August, VOLVO CARS announced plans for a Stockholm Stock Market flotation worth €3.95 billion, which would take place by the end of 2018. This would value the company at £35 billion and represent approximately 15% of Volvo's ownership, with the remainder staying in the hands of its current owner, Zhejiang Geely Holding Group. In December 2016, three Swedish pension funds, AMF, Första AP-fondon and Folksam, bought preference shares in Volvo Cars for €514 million. At an eventual IPO, these shares can be converted to stock. Geely acquired Volvo Cars from Ford in 2010 for around €1.6 billion, so if all goes as planned, Geely's and Volvo Car's management teams and staffs deserve a big round of applause for taking the company back from the brink during the past eight years.

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As I rode my bike to buy the morning paper, I passed a parking area for overnight guests staying at the local college dormitories. The evening before there had been a classic car show, and this *'68 Rover 3500* and *2016 Lotus Elise 220 Sport* were just waiting for me. Together, they tell a story. When I was at university, a classmate, who came from a very wealthy family (black tie for dinner every evening) owned a *'68 Rover*, but half of the time he was driving an older model or another brand that was on hand at the repair shop. *Rovers*, like all British cars at that time, were simply unreliable. (I have first-hand experience of this, albeit with a less expensive brand. I made the mistake of buying a new *1970 Ford Cortina Estate*.) One day, my classmate showed up with a brand new yellow *Lotus Elan*, along with *Mazzoleni* leather driving gloves and *Brevetto Car Shoe* driving shoes. "Isn't this a bit like jumping from the frying pan into the fire?" we said. His reply was perfect: "Yes, but at least for the 50% of the time I'll be able to drive the Lotus, I'll really be enjoying the experience." Lotus lives on under the ownership of Geely, while Rover is but a memory.
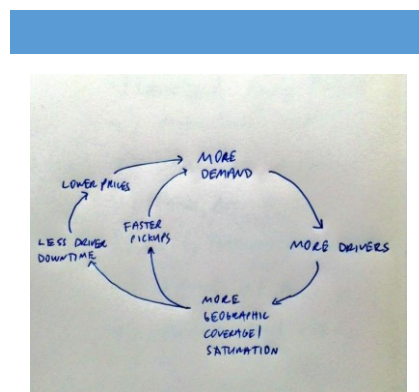
This is a back-of-a-napkin sketch of Uber's business model drawing by David Oliver Sacks, investor. It is for Uber as a ride brokering platform company. There is no place here for purchasing and maintaining costly self-driving vehicles. That calls for another business model.

Serendipity is the newspaper editor's strongest ally. I happened upon this 1968 Rover and a 2016 Lotus snuggling up to one another during a summer overnighter in a field in Vadstena, Sweden, and it took me back to a car story thay played out many years ago when the Rover model above was brand new.

Musings of a Dispatcher: Car Company Leadership

Sergio Marchionne, in his signature black cashmere sweater and plaid shirt, didn't look the part of an Italian car company executive.

18. The Agnelli family owns a controlling stake of nearly 50% of the voting power of FCA through its Netherlands-based holding company Exor. John Elkann is the son of Margherita Agnelli and Alain Elkann, and the grandson of Gianni Agnelli. He took over control of Fiat upon his grandfather's death in 2003 and great uncle Umberto's death in 2004.

FCA LOST ITS LEADER on the 25th of July 2018. Sergio Marchionne had been replaced as the CEO of the company on the previous Saturday when it was learned he was gravely ill following surgery in a Zurich hospital. At first, the surgery was said to be routine to fix a problem with his shoulder, but when it was clear that he would be unable to return to work anytime soon and that he had lapsed into a coma, it was reported that the surgery was actually much more invasive, intended to combat an unspecified but aggressively infectious disease that had been recently diagnosed. His death was reported to the press by John Elkann, FCA Chairman and a member of the Agnelli family, which holds a controlling interest in FCA. "Unfortunately, what we feared has come to pass. Sergio Marchionne, man and friend, is gone," said Elkann.[18]

When I read that Sergio Marchionne was named CEO of FIAT S.P.A. in 2004, my first thought was: "Who's he?" He had joined the Board of Directors of FIAT the year before when he was CEO and Managing Director of SGS S.A., a multinational company headquartered in Geneva, Switzerland which provides inspection, verification, testing and certification services. The connection at the time to the automotive world in general and to FIAT in particular was the Agnelli family, which owned a 15% stake in SGS. (Marchionne continued as Chairman of SGS after becoming CEO of FIAT, even after the Agnelli's sold their 15% share in the company to finance the merger with Chrysler in 2013.) What was it that the Agnellis saw in Marchionne that led them to appoint him as the leader of their prize possession?

Marchionne the Fixer

FIAT was in a shambles when Marchionne became its CEO. It had lost a cumulative $8 billion during the previous two years. It was about to be acquired by the banks that had provided the loans that kept it running. FIAT, which is an abbreviation of *Fabbrica Italiana Automobili do Torino*, had done everything it possible could to earn its alternative meaning for its acronym: *Fix It Again, Tony*. Maybe Gianni or his brother Umberto, who took over when his brother died, saw something in the Italian-Canadian that led them to believe he would be a good person to have in place when Elkann took the lead for the family. Elkann was only twenty-eight when both Agnelli brothers had died.

Maybe they saw the LL.M. (Masters of Law) MBA, CPA number cruncher as the best person for the job of breaking up the company and delivering something of value of what was left of their family's life's work.
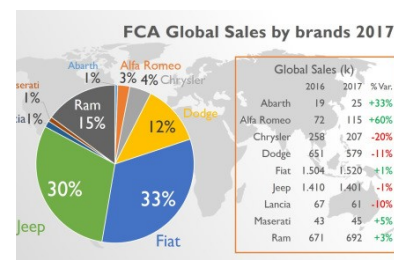
Well, Sergio delivered on taking a sow's ear and turning it into a silk purse, that's for sure. He is reported to have said at the time of his appointment as FIAT's CEO: "I like to fix things and, to be blunt, FIAT needs a fix right now." First, he negotiated a reversal of a strategic alliance with General Motors and even got GM to pay $2 billion in the process by agreeing to not forcing GM to exercise the contractual option to purchase FIAT—a perfect judo move. That money helped to bring the company to profit by 2005. He opened a new Italian assembly line in 2006 and brought the cute FIAT 500 to an admiring public the following year. He was on a roll. But these moves were warmups to the main event. He wasn't in this to become a prodigal son returning to his place of birth, Italy (Abruzzo), from where he had emigrated with his parents to Toronto, Canada in 1966 when he was fourteen. He kept his Italian passport and, naturally, spoke Italian, but he was more Canadian than Italian. He gathered all of his degrees in Canada and began working in Switzerland in 1994. When he died he was officially a resident of Switzerland and that is where he paid his taxes.

FIAT Surges with Sergio

The main event was to make FIAT a global company, and he clearly understood that this was not going to happen as long as FIAT remained bound to Italy with effective control over the company by the Italian labor unions. He saw an opening in 2008 when Chrysler crashed in the Great Recession. The Bush and Obama administrations provided billions in loans to keep Chrysler afloat. It is reported that the Obama administration was considering liquidating the company when Marchionne proposed a deal. FIAT would acquire partial ownership (20%) and operating control of Chrysler in exchange for product help and distribution capability. Marchionne replaced Robert Nardelli as CEO. In August, 2014, FIAT and Chrysler officially merged. FIAT CHRYSLER AUTOMOBILES (FCA) would compete with the titans.

Marchionne saw the whittling down of the automotive industry to fewer and larger companies as an inevitability. Six million. That's the sales number a car company had to reach in order to be one of the survivors. He tried to get back into the GM door to pitch a merger to Mary Barra. "Fool me once, Sergio," was her reply. FCA reached 4.74 million units in 2017, with 45% of that coming from the U.S. and 13% from Italy, its second largest market. Jeep accounted for 30% of that total, and the other two Chrysler brands, Dodge and Ram, added another 27%.

In 1921, Massachusetts industrialist Arthur D. Little (who discovered acetate) obtained a glue made from the skin and gristle of pig's ears, and had it filtered and forced through a spinneret into a mixture of formaldehyde and acetone. The glue emerged as 16 fine, colorless streams that hardened and then combined to form a single composite fiber. Little soaked the fiber in dyed glycerin. Then he had the resulting thread woven into cloth on a handloom, and the cloth fashioned into an elegant purse.

FCA Global Sales Top 10 markets 2017 Volume & % Var

	Market	Volume	% Var
USA	2,07m	-8%
Italy	614k	+2%
Brazil	380k	+4%
Canada	267k	-4%
China	249k	+21%
Turkey	123k	+13%
Germany	123k	+5%
France	114k	+8%
Argentina	105k	+34%
Mexico	86k	-2%

FCA Global Sales by brands 2017

Global Sales (k)	2016	2017	% Var.
Abarth	19	25	+33%
Alfa Romeo	72	115	+60%
Chrysler	258	207	-20%
Dodge	651	579	-11%
Fiat	1,504	1,520	+1%
Jeep	1,410	1,401	-1%
Lancia	67	61	-10%
Maserati	43	45	+5%
Ram	671	692	+3%

The Not-so-little Engine That Could

Often seen hunched down behind a microphone on a lectern or sitting on a dais with a panel, he looked short. He wasn't, as the photo of him with President Obama shows. Chain smoking—he finally quit a year ago—seemed to be his substitute for exercise to hold his weight in check. He had a reputation for being extremely demanding of those who worked for him. If he detected even a whiff of bovine waste, you were out. But he was no less demanding of himself. He worked eight days a week. He made Elon Musk (another Canadian) look like a slacker. He wasn't "working fast and breaking things", like many of our current tranche of silicon CEOs. He knew he had to work fast because wolves were at the gates of all the car brands in his stable, but working fast did not mean being sloppy. As a lawyer, he crossed the 'Ts'; as an accountant, he quadruple-checked the numbers; as an MBA, he asked how a decision would result in making money. He had QUALIFICATIONS and he used them.

President Barack Obama (185 cm/6'1") and Sergio Marchionne confer.

Marchionne once wrote: "The true value of a leader is not measured by what he has gained during his career but rather by what he has given. It is not what you accomplish today, but the legacy you will leave behind." I don't know if Marchionne read the biographies of great leaders to gain inspiration and keep him going. Several of the quotes of one of the greatest leaders of all time, Sir Winston Churchill, could have guided him. I, for one, wish he had set aside some time to write down what was going through his mind during those fourteen years.

While it is difficult to say what he got out of all the hard work he put into saving FIAT and Chrysler from the junk heap of failed car companies, it is clear that he gave all he could. He was paid well, but he worked so hard he could hardly have had time to enjoy it. What is his legacy? I believe we will see that unfold in the coming year, and I also believe that it has as much to do with what Marchionne did not do as with what he did. He did not try to promote FCA as a mobility company. He did not tell the world that Jeeps and FIATS and Alpha Romeos would be zero emission, battery-driven vehicles in 2020. He was building up the companies to play by the current rules, the ones that will exist until they are all broken. If Waymo wanted to buy tens of thousands of Chrysler minivans, fine, but FCA wasn't going to promote itself as a self-driving car company. He probably knew that his illness would mean he would not be the person who would sell off the pieces to PSA, VW or Geely or to a Foxconn-like company that would deliver hardware to ride providers, but he left an organization in place that would be able to execute on that strategy. FIAT and Chrysler and the Agnelli family and the entire auto industry owe him a great debt of gratitude.

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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.
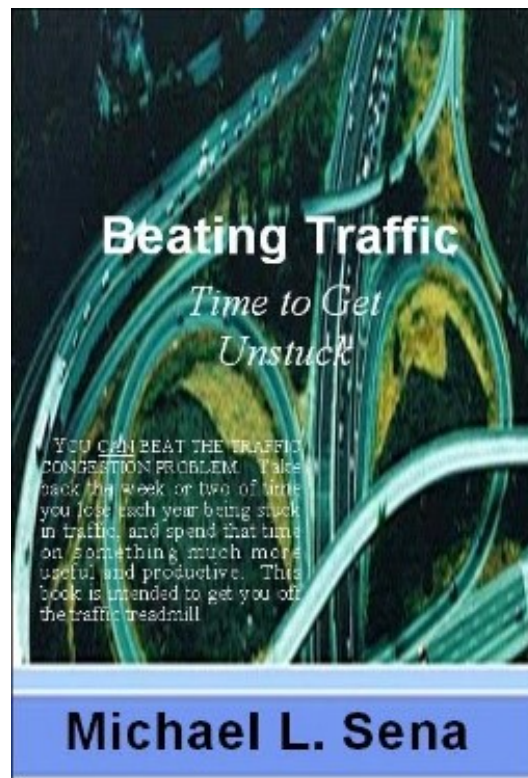
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