



# The Rogue Wave in the Sea of Mobility



# Introduction

Senior management needs to make capital intensive decisions today that must be commercially viable 15 to 20 years into the future, even though that future is far from certain. As such, decision makers are often grappling with multiple ideological pathways bounded perhaps by: 1) Spending capital and investing in a future whose expected future returns are based on a continuation of past performance and trends? Or 2) Shifting investment towards a different trajectory influenced by evolving societal, political, or market forces that are unlike anything in their experience? In discussions with the leaders and internal advisors of our client companies there is no consensus about which is the better strategy, or how to make the choice.

Because of the complexity of multiple market drivers, companies and industries often don't 'see' or realize potentially significant or disruptive changes are coming until they are already upon them. Many of the critical forcing factors can be out of the line of site of management and strategic planners. Management may also believe a change in direction will be too risky or they may even be in denial of an alternative future even though the signs of looming change are becoming clear. Consequently, rapid and substantial change is often missed or ignored until it is too late.

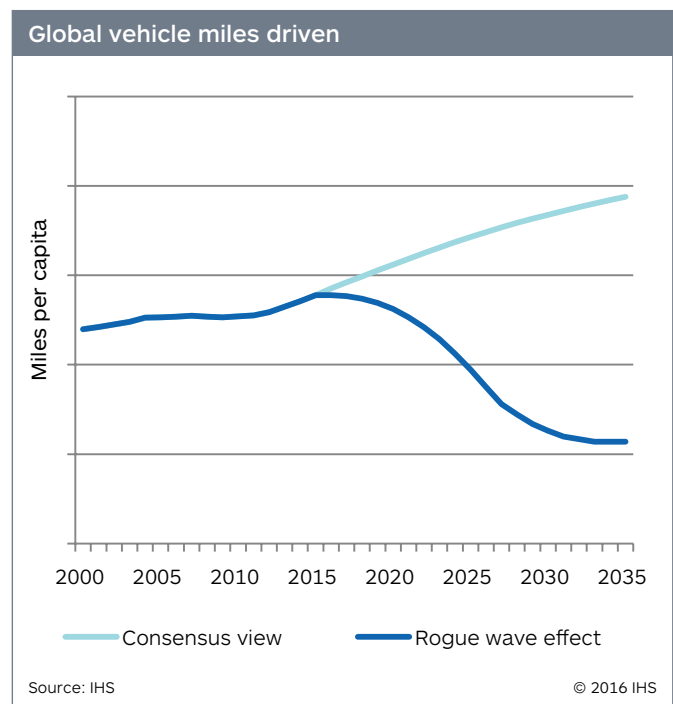
In the mobility space, one thing is becoming increasingly clear: change is coming and it's just a matter of how fast and how disruptive it will be. In most cases, change occurs a little at a time, much as the waves in a normal sea toss around a boat, the corporate ship can manage the rise and fall of the market. At this point in time, however, we believe that the seas of change are combining much as "normal" ocean waves gather to suddenly create a rogue wave in a rough but otherwise manageable ocean storm. Certainly change will come from customers who seek to take advantage of new goods and services coming from traditional and nontraditional sources and support the creation of new mobility value propositions. Understanding the customer's evolving total mobility picture will be critical to successful decision-making. When planning today for the future, decisions makers need to know their growing array of target customers, their lifestyles and how they will take advantage of the expanding range of mobility options before them. The business environment that could be emerging in the

mobility space may reward highly flexible first movers handsomely and ensure their long-term survival. Conversely, those that do not move quickly risk becoming relics of an age gone by.

The phenomenon that we are calling a 'rogue wave' could be global. But, the world is not uniform when it comes to acceptance of mobility solutions. The impact will likely vary from region to region and even city to city depending on the regulatory need, local conditions, personal wealth, stage of mobility development and unique customer tastes and preferences. Areas currently experiencing high rates of growth in car sales are likely to be impacted more than areas of low or no light vehicle sales growth. The speed of change could be relatively consistent, however, due to the common needs and solutions available to regulators and consumers globally. The common needs and drivers include:

- Congestion mitigation
- Emissions reductions both local air quality and greenhouse gas emissions
- Disposable income growth or preservation
- Lifestyle

Vehicle miles DRIVEN may decline, but personal miles travelled may not. The change is not in the need or desire to travel, but whether to do it in a personally owned car, or something else.





This paper provides an understanding of the underlying forces at play, and suggests that a disruptive change may be upon us in the not-too-distant future. A relatively sudden and disruptive change could occur due to the convergence of trends in consumer demand, new lower cost mobility solutions and local as well as federal government regulation. Many “new” mobility solutions are coming but are often perceived or dismissed as inconsequential. They are likened to the experience with mass transit, which has been with us for decades, but which has languished in comparison to the personal motor vehicle. What is different now is the increasing potential for a convergence of these technologies with new solutions and new mobility demands in a way that makes their historic interactions belie their future impact. To assess the potential of this rogue wave, this article explores the future of mobility by first developing a fundamental understanding of the drivers of the automotive market, assessing the impact of predetermined as well as uncertain enablers of change, and finally assessing the likely impact of those factors on the development of future opportunities for products and services in the ‘mobility basket’.

Past major inflection points in mobility have been driven largely by the automotive industry. The well-worn cliché of mass production, along with the ability to cast a complex engine block in one piece, dropped prices and made possible motoring for the masses. The self-starter, synchromesh gears and later the automatic transmission further lowered barriers to driving. As industry-driven vehicle technologies have made driving possible by virtually every able-bodied person, the market for most of the last 50 years has been driven largely by changes in population and per-household disposable income. Today the industry is still evolving on-vehicle technology at a rapid pace, but there are also the many changes in off-board mobility solutions. For the first time in its history, the automotive industry is being influenced by non-traditional market forces. Some of these driving forces, and signposts building momentum of the rogue wave can already be seen and include:

- Tightened global warming targets
- Continued migration to densely populated urban centers
- Restricted vehicle ownership and travel in a growing number of cities
- The increasing availability of mobile technology and personal connectivity
- Changing demographics
- Evolving social attitudes

Historically, personal mobility was largely the domain of planes, trains and automobiles with demand growth closely driven by increases in both population and personal income. The auto industry responded by not only producing a greater choice in cars, but also building cars that were safer, environmentally cleaner, longer lasting, more fun to drive and more dependable than their predecessors. Increased competition from new producers, technical advances, and productivity gains kept the cost of the average car constant in real dollar terms, despite the improvements and increased content, warnings to the contrary notwithstanding. Competition and technology within the industry offset the rising costs from regulatory effects and rising demand. As a result, cars remained a cost competitive way of meeting the demand for personal mobility compared to other options.

Demand for mobility has traditionally been strengthened as the combination of improved road infrastructure and ever safer, faster and more efficient vehicles reinforced consumer desire for better, more versatile and convenient mobility. Today, the demand for mobility continues to grow, but investments in infrastructure for alternative modes, connectivity-enabled shopping and travel management, traffic delays, changing demographics and the need to manage congestion in an increasingly urbanized world are all converging to drive consumers to alternative transportation solutions.

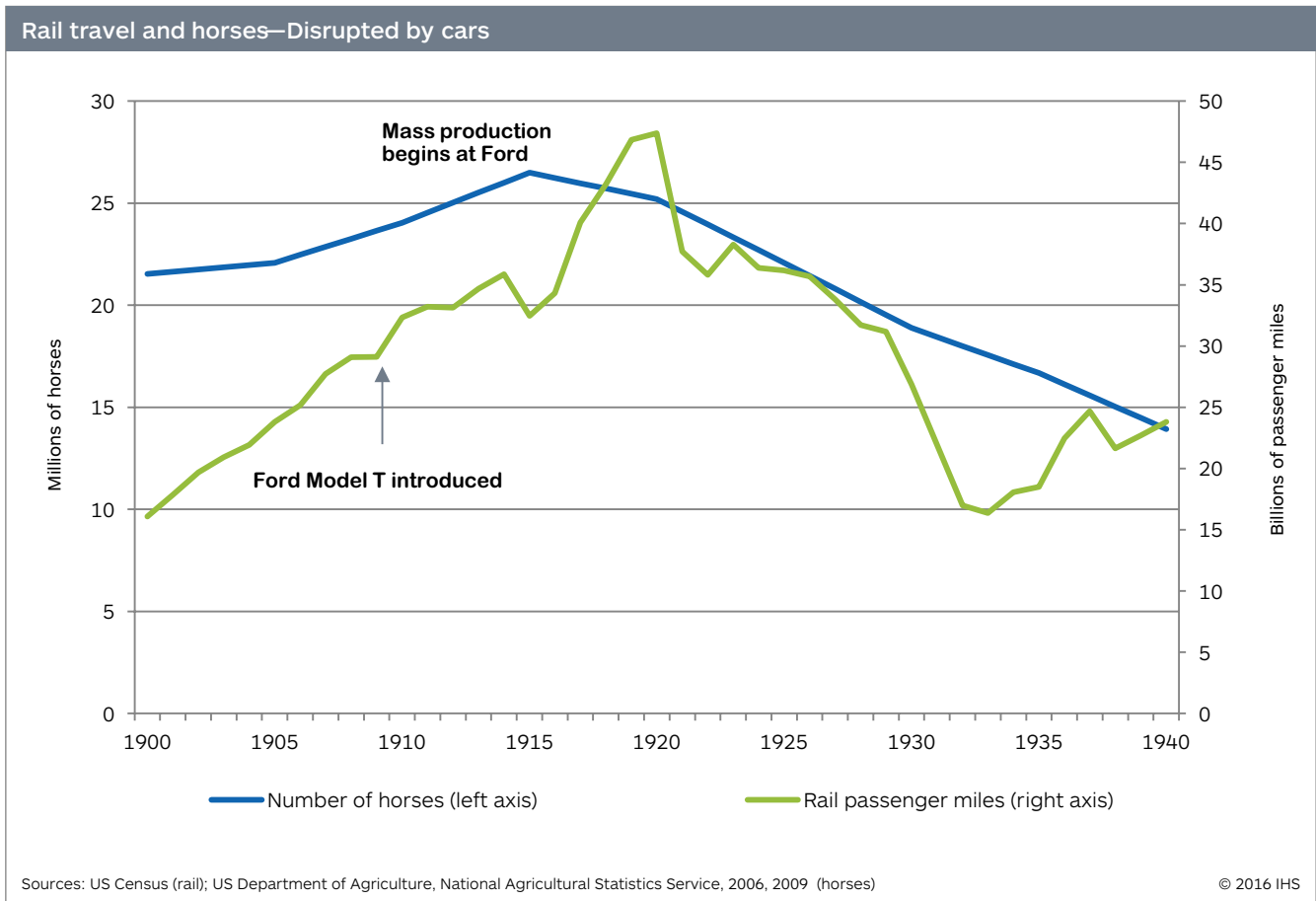
The result could be that an increasing number of consumers will see car ownership move from a necessity to a discretionary purchase or just one among many choices of mobility solutions. It is important to note that people will not accept a perception of decreased mobility or decreased convenience and they will not pay more for mobility; mobility is increasingly seen as a right or personal freedom to be met at lower total cost.

# Disruptive change would not be unprecedented

Disruptive change in mobility solutions would not be 'new'. In fact, the car was the instrument for the rapid undoing of two major forms of mobility early in the 20th century. The advent of the car brought new freedom and greater mobility to the consumer while causing a rapid drop in the ownership of horses and passenger travel on trains. In the US, use of these modes peaked between 1915 and 1920. Within 10 years horse ownership rates fell nearly 30 percent and rail travel fell by over 45 percent. Both of these modes of transportation were considered necessary, entrenched, and part of the country's culture even as they were in decline.

The dramatic reduction in these two transportation modes created massive alterations in the supply chains, the land and infrastructure that supported them, as well as the vehicles themselves. For example, the land required to supply hay to the number of horses removed from the census between 1915/1920 and 1930 was on the order of 19 million acres – roughly equivalent to the combined areas of the states of New Hampshire and Vermont. By 1930 agriculture was well on its way from being a food/fuel industry to 'only' a food industry.

The multitude of low cost mobility solutions combined with the desire to reduce urban traffic congestion now emerging simultaneously with changing demographics are beginning to precipitate another change in mobility solutions. Many consumers are able to satisfy their demand for mobility without owning a car. If the rate of convergence and interaction of these factors and trends is just right, a sudden and dramatic shift in how consumers meet their needs for personal mobility could result.



# Demographics

The workforce in many countries has begun to decline or soon will. Basic economic theory shows that economic growth is driven by capital, labor, and other factors such as government. The average of the working age population is increasing in most of the world's major markets. In addition, fertility rates are falling to levels at or below replacement all over the world.

Maturing work forces imply the cost of labor will begin to increase. Put another way, the value of time for the average worker will increase. As the cost of labor increases, employers will seek to increase the productivity of employees. Some of this productivity increase could come from reducing or eliminating commuting and the stress of commuting for larger numbers of workers. Employers already offer work at home options. As the cost of labor rises, more companies are likely to find ways to offer these options to more workers. And workers will want to increase the value of their time, not just worktime, but non-work time.

- Time spent doing things perceived as unproductive, such as time spent driving will be increasingly considered unnecessary.
- Alternatively consumers will be looking for ways to increase the perceived value of time spent traveling. Ride sharing and autonomous cars allow consumers to increase the value of time spent riding in a car or reduce the amount of time spent moving

Eventually, an increase in the number of consumers with other mobility options could begin to realize that the high cost a personal vehicle ownership no longer makes economic sense when there are lower cost ways of satisfying mobility requirements.

An aging population also suggests a growing number of people who have enjoyed the freedom of personal mobility, but who are now too old to drive. This is a “new” group of mobility consumers who would embrace ride sharing, autonomous vehicles, accessible mass transit and other post-driving age solutions.

In some OECD countries, young people are opting to avoid or delay obtaining a driver's license. This development is relatively recent. Past experience has been that virtually all young people get driver's licenses as soon as they are old enough. Today in some markets, fewer are getting licenses (see UMTRI<sup>1)</sup>). The reasons for this emerging trend are likely many and vary from country to country, but the overall trend could be a harbinger or weak signal of a larger future trend. Some of the factors that are driving this phenomena could include:

- Increase use of technology to replace driving require less distance per trip
- Student loan debt in the US is also a factor that is delaying vehicle purchases and/or causing young drivers to adopt lower cost alternatives to the car.
- Congestion created by increasing urbanization
- Stagnation of incomes at the lower end of the distribution
- Rise of the alternatives, such as Uber, Maven and others
- Greater reliance on social media for interpersonal interaction – virtual mobility versus physical mobility
- E-commerce reducing the need to travel to shop
- Anti-car experiences during their impressionable years (see box article) including:
  - Changing cultural values: this generation of young drivers is the vanguard of students whose entire educational experience has occurred since the 1992 Rio Conference on Climate Change which could be seen as a turning point in consumer attitudes. Their perceptions and attitudes of vehicle ownership may be ‘shaped’ differently than past generations.
  - Drivers ranging from helicopter parents to licensed friends willing to drive adolescents everywhere – why should they learn to drive if someone else will do it for them and they can sit in the back seat and text with their friends!
  - Cramped car seats with restrictive seat belts made their growing-up experience with cars negative. Car use for impressionable youngsters has become restrictive rather than fun.

<sup>1)</sup> Schoettle and Sivak, Recent Changes in the Age Composition of Drivers in 15 Countries, University of Michigan Transportation Research Institute UMTRI-2011-43, and Schoettle and Sivak, Recent Decreases in the Proportion of Persons With A Driver's License Across All Age Groups, University of Michigan Transportation Research Institute UMTRI-2016-4

Anthropologists understand that the core values which strongly influence behavior and preferences for a consumer's lifetime are formed by the growing-up experiences of people from ages of about 5 to 20<sup>2)</sup>. Direct and indirect experiences during those formative years as well as the interpretation of those experiences by parents, teachers and peers create a value system that lasts a lifetime. The Rio conference raised awareness and discussion of climate change, making it a high priority social value among many. Prior to the 1980, children generally had free roam of the car while it was underway.

Going for a ride in the car was fun, albeit frighteningly dangerous by today's standards. In recent years, a child's ride in a car requires being nearly immobile in a confining seat and five-point harness – not so much fun. To keep children amused, parents often install video systems of give even very young children a mobile tablet. These and similar growing-up experiences of the post-Baby Boomer generations are believed to be contributing to the rising ambivalence many young people have to the car compared to the experience of their parents.

<sup>2)</sup> Dr. Morris Massey, What You Are Is Where You Were When... Again!, Enterprise Media, 2006

## Government

Personal vehicle ownership and/or use is increasingly influenced by government economic/environmental/climate change related regulations designed to reduce congestion and emissions. These have a direct impact on driving and vehicle ownership in urban areas<sup>3)</sup>. Examples of measures taken by national as well as local regulators include:

- Taxes, fees and incentives
  - Urban governments are increasing the cost of vehicle ownership and making travel by personal car less convenient to ensure sustainable economic and environmental viability of the cities through various means including:
    - Higher licensing and registration fees in urban areas
    - Fuel taxes
    - Congestion, Access and Use charges
    - Reduced available parking (policies to reduce parking spaces within cities)
    - Restricted access, either by registration characteristics and/or limitations, vehicle emissions and/or fuel type, time of day constraints, etc.
- Efficiency/emissions standards which increase the cost of the vehicle and fuels
- Investment in and/or indirect support for alternative transport modes (bus rapid transit, car sharing, bicycle and pedestrian-only areas, etc.)
- Adoption of connected technologies enabling convenient and on-schedule multi-modal trips

<sup>3)</sup> The Impact of New Urban Mobility on Automotive Markets and Industry, IHS and Groupe Futuribles, November 2013.

## Technology

Smart phones and virtual mobility (telecommuting and e-commerce) have increased the reach of virtual mobility and make physical mobility much more efficient and potentially lower in cost, contributing significantly to the rogue wave. Technology is and will continue to impact personal mobility directly or indirectly from several 'directions', but the one thing that all of the technology factors have in common is the potential to reduce the cost of personal mobility and create a new customer value proposition virtually across the socioeconomic spectrum.

The uncertainties and time needed to use mass transit can be reduced to levels far below the vagaries of personal vehicle travel in dense urban traffic. Multi-modal system information can be coordinated and real-time performance taken in to account for trip planning. Travel modes can be predicted in advance based on typical traffic patterns and time-of-day congestion. Bus Rapid Transit can be combined with ITS to give priority at intersections to buses in preferred lanes, thus allowing them the same schedule-based performance once attributed to light rail, but at an order of magnitude lower in cost.

An important advantage the personal vehicle has had over other modes of transportation has been availability on immediate demand. Mobile technology is changing this from several different points:

- New entrants; Atzuche, Bollere, others, offer potentially new and/or different customer value propositions

- Car sharing (Zip Car) and ride sharing – Uber, Maven and the like:
  - Availability on demand eliminates the need for low utilization personal cars
  - Low cost compared to vehicle ownership
  - Self-driving cars or autonomous cars, if successfully developed could be:
    - More convenient – available on demand
    - Alternative to other modes of mass transportation
    - Expand the market to people without drivers licenses
- Emergence of drones — could further reduce the need to make short errands by car

New technologies and lifestyles are changing attitudes about car ownership. As autonomous capabilities reduce the need for people to interact with their cars, it is likely that their emotional links to a particular vehicle and its ownership will decline as well. As congestion makes driving less pleasurable, even those with human-driven cars will take less and less pleasure in the ownership experience. In either case, the option of more social time spent with other people instead of interfacing with a car is likely to reduce the propensity of consumers to buy their first, or next, car. The basis of competition will increasingly embrace “fun-to-ride” as well as, or indeed instead of, “fun-to-drive.”

Some numbers to support the arguments:

- In 2015, AAA reported that the annual cost of owning a car was \$8,698 or \$0.58/mile for an average sedan
- If we assume the average Uber ride costs \$30,
  - The cost of owning a car could also buy 290 Uber trips per year
- Zip Car rates in Boston are \$7/month plus \$7.75/hr and \$79/day
  - For the annual cost of owning a car, Zip Car could be rented for about 110 days or 1,122 hours
  - Assuming the average commute is 1.5 hours per day, the cost of owning a car for a year could also buy 748 days of commuting.
- An added cost savings for urban travelers is no longer needing to park a personal vehicle which is expensive both in terms of the monetary cost and the cost in time spent searching for parking
- Smart phones and calling plans <\$100/month
- Telecommuting home office set up <\$2,500

- Developers are creating village-like environments in suburbs, making it unnecessary to own a car to access the daily necessities of life, offering instead the opportunity stroll to the store, school or theater with neighbors and friends <sup>4)</sup>. Some hamlets in Germany especially have been car-free for many years already.

<sup>4)</sup> Leigh Gallagher, *The End of the Suburbs*, Penguin Group, 2013

## Implications

There is a very real and growing possibility that in just a few short years today’s fuels and vehicle industries could look a lot like the hay, horse and passenger rail industries of the 1920s and 30s. A sudden and permanent shift in the customer value proposition or basket of mobility related goods and services will have serious consequences for the established industries that provide the current goods and services. For example:

- Fewer vehicle miles travelled as the personal economic model shifts from “pay-to-own” over to “pay-per-use.” <sup>5)</sup>
- Petroleum and fuels: downward shift in transport fuels sales resulting in marginalization of manufacturing, distribution and marketing systems
- Automakers: rapid shift downward in sales or sales growth and increasing opportunities in mobility services and urban-specific vehicles
- Consumers: an increase in disposable income and ‘discretionary’ time available for other goods and services
- Government: reduced revenue from traditional mobility goods and services such as vehicle fees and fuel taxes offset by taxes gained from for more desirable business environments and personal lifestyles in high density urban areas.

<sup>5)</sup> Discussions with car share firms as well as car sharing colleagues indicates that on average car sharers drive far fewer (about half or less) miles than their car owning counterparts

In other words, a number of factors, each of which is observable, are converging together for the first time in modern history to change the way we move about or aspire to do so. The rogue wave of disruption is developing not from unforeseen factors, but from the summation of the impacts of many “weak signals”.

The opportunity is to seize upon the idea of that convergence, take a leading position in its creation, and ride the crest of the wave to a new mobility business model, whether it is to provide mobility as a service, new forms of individual or collective mobility, urban-specific vehicles or supporting those vehicles and services with new infrastructure, services and fuels or fueling systems.

By Kevin J. Lindemer and Philip G. Gott

For more critical insight on this discussion and related topics, please see:

- [www.ihs.com/products/automotive-light-vehicle-long-term-forecasts.html](http://www.ihs.com/products/automotive-light-vehicle-long-term-forecasts.html)
- [www.ihs.com/futuremobility](http://www.ihs.com/futuremobility)
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