Cities are constantly evolving with mobility technology. Today we approach another reimagining of our streets and cities through recent and emerging new mobility technologies (NMTs). These technologies affect the vehicles on our streets as well as the services and ways we travel, such as ride-hailing services, bike share, electric vehicles, automated vehicles, and hyperloop. Across the world you see the bones of cities shaped by the primary transportation mode during its development. This ranges from walking and horses to streetcars, rail, and the automobile. It can be seen in the differences between historic walkable European cities like Paris and London as well as America’s New York and Philadelphia versus the auto-centric, post-World War II cities like Houston, Los Angeles, and Nashville. The transportation skeleton of these cities – right-of-way widths, gridded structure, block lengths, modal priorities – define the age from which they grew up and reflect the priorities from which they were born. It is by maintaining its core purpose while adopting technology as a tool that cities survive and are resilient to changes past, present, and future. Past mobility revolutions, like the introduction of the automobile, and how cities responded are vital to understanding the impending change we face today and how cities must prepare to adapt.

Automobile Revolution

The automobile revolution can be categorized into two phases – the invention of new technology and early adoption, followed by public response in the reinvention of cities. It’s important to distinguish the two as many of the failures in cities since the automobile’s inception are not due to the technology itself but rather the subsequent response and idolization of it.

Early Days of Automobiles

Henry Ford’s 1908 Model T typically marks the introduction of the automobile, as it should, because it brought the technology to the masses, but automobile technology was developed through the late 19th Century. This development included many references to transportation heritage of the time, including steam engines like those of a train and vehicle forms that were merely motorized horse carriages. Terminology even reflected the past in their original characterization as “horseless carriages,” much like today’s “driverless cars.” Engine technologies, such as steam-powered, electric-powered, and the combustion engine, also competed for dominance in the marketplace to guide what would become mass marketed.

This trial-and-error method with incremental steps away from the known parallel the steps we see today in the development of automated vehicles. Utilizing form factors and body styles in which people are accustomed, automated vehicle developers mimic the vehicle types we have today, both inside and out. The array of startups and broad variations in technology, like automated vehicle manufacturers and software
packages or bike share styles from docked to dockless to semi-dockless, also parallels the glut of automobile manufacturers at the start of the 20th Century. The progression toward stabilization of automobile technology, brought about by standardization, cemented them in American daily life and allowed cities to respond accordingly.

**Rather than cities shaping the technology, technology shaped cities.**

By the late 1920s and 1930s, much of the innovation in automobile technology and construction was complete. The significant leaps in technology, like the combustion engine, low-pressure rubber tires, and hydraulic brakes, slowed to cosmetic and incremental advancements. The leveling out of the technology as it matured after a rapid pace of development brought a stability to this new mobility technology which allowed cities to build policies and infrastructure around their capabilities and needs. Until this time, the understanding of how automobiles would operate were speculative – would they be individually owned or shared between families? How would large volumes operate on roadways? What additional features would be needed in the right-of-way to support them? What impact would their speed have? Certainty in these answers would only come through the proliferation of the technology in its maturation. The response by cities to the technology’s potential would intensify post-World War II in a great optimism to reshape American cities as they were known.

**America’s Response**

America is built on the backs of innovators and risk-takers. Whether it’s a new form of governing through democracy, settlers traveling west into the unknown, or inventions like the electric light bulb or airplane, America’s heritage is deep-rooted in an unfettered hope in and adoption of new ideas. The automobile was no different. The rapid development, adoption, and subsequent reshaping of cities in America is important to understand as we prepare for the next technology. Major shifts like the automobile are not just a transportation issue but an everything issue. The widespread adoption of automobiles changed the allocation of space in the public right-of-way, the workforce landscape, and land use development patterns. The important theme to note as the public realm changed is that cities sacrificed people-oriented design for technology dominance. Rather than cities shaping the technology, technology shaped cities. Rather than automobiles being a tool in the toolbox of mobility, they became the only tool.

“[B]efore the city street could be physically reconstructed to accommodate motor vehicles, it had first to be socially reconstructed as a motor thoroughfare.”

Street Rivals: Jaywalking and the Invention of the Motor Age Street

---

[Image and text from the image]
Learning from our Past
(continued)

Allocating Space

Prior to the automobile, and even through its early days, city streets were public space for pedestrians. The space was shared by people walking, children playing, horse-drawn carriages, vendors, and streetcars. “In the early days of the automobile, it was drivers’ job to avoid you, not your job to avoid them,” says Peter Norton, a historian at the University of Virginia and author of *Fighting Traffic: The Dawn of the Motor Age in the American City*. The proliferation of the automobile redefined this relationship over time.

Vehicle speeds within the city were very low prior to the advent of the automobile which allowed for the shared space by all users. But the advantage of the automobile was speed, putting it at odds with other users. As traffic fatalities increased, especially for vulnerable users, public outrage pushed for change. Two competing views framed the change. In 1923, 42,000 Cincinnati residents signed petitions for a local ordinance that would require all cars to have a governor limiting them to 25 miles per hour. In contrast, led by automotive interests, marketing campaigns pushed for a reimagining of city streets for free flow of automobiles with new terminology like “jaywalker”, deriding people who cross in front of automobile traffic, and campaigns that crushed initiatives like that in Cincinnati.

The response to automobiles varied around the world with different paths to accommodate this technology and blend it with previous transportation modes. America’s campaign and legal framework for “jaywalking” contrasts with the Netherlands focus on shared spaces for all modes. While America worked to increase vehicular speeds and thus separate pedestrians for safety, the Netherlands slowed vehicular speeds in the cities to create an environment where all users and modes could operate safely. In the middle of this spectrum was the United Kingdom where allocation of street space was never legally defined but rather left to a social contract for users to navigate.

Today we see the outcome of this battle for our city streets in America – defined pedestrian areas, designated crosswalks, and jaywalking laws. Street space, once equitably allocated to all users and shared, is now separated by user type with space allocated primarily to the automobile. The street was redefined, both
Learning from our Past
(continued)

As new mobility technologies approach our current age, it’s important to clearly define the purpose of the street and public spaces to have a foundation guiding change. Interest groups will lobby for change, but cities must be proactive and prepared for the social and physical constructs that must be maintained for the sustainability and vibrancy of the community.

Shifting Workforce

Transportation expenses remain the second highest expense in American households. With these transportation expenditures come many supporting jobs, so a significant portion of the workforce relies on the predominant transportation technology, whether directly or indirectly. A shift in the leading transportation technology would impact the employment landscape, both removing jobs and fields of employment as well as creating new industries.

Looking back at the 19th Century, you will see a workforce supporting the horse and carriage – blacksmiths, stables, groomsmen, and farmers producing feed. The transition to the automobile era shifted this workforce, with some jobs transferrable and others in completely new industries. Chicago’s Hotel La Salle built the first multi-story parking garage in 1918. It parallels the storage function of stables in the horse-drawn era, with the need for blacksmiths and groomsmen being replaced with other skills and services. We see these new industries in the proliferation of gas stations, car repair shops, car washes, tire production, and auto sales centers. Also relevant is the secondary industry growth in oil and gas, and trucking. The workforce needs changed in the market, reducing the need for some jobs and shifting the focus of others; but by transitioning the workforce, society as a whole became more productive.

The continued automation of the world, including automation of vehicles, presents both a burden and opportunity. McKinsey Global Institute’s report Jobs Lost, Jobs Gained:
Learning from our Past (continued)

Technology creates more jobs than it destroys over time

Example: Personal Computers

Workforce Transitions in a Time of Automation estimates that, “As many as 375 million workers globally (14 percent of the global workforce) will likely need to transition to new occupational categories and learn new skills, in the even of rapid automation adoption.” The reeducation and adaption of the workforce is vital as automation improves productivity for a smooth transition without rising unemployment or income inequality.

Development Patterns
The post-World War II exodus out of urban cores cannot be attributed to the rise of the automobile alone. The suburbanization of America was the result of many federal and local policies and regulations, but only made possible through the use of the new technology in the automobile. President Eisenhower’s 1956 Federal Highway Act began the interstate highway system, federal housing policy and mortgage backing, as well as local zoning regulations changed the landscape of our cities.

In a feedback loop between suburbanization and horizontal growth and optimizing for the automobile, the ways cities operated were reshaped. In urban cities, mass transit was disinvested or completely removed, pedestrian infrastructure was narrowed to allow wider roadways, and neighborhoods were bisected to construct new urban freeways. In the new cities, suburbanization designed transportation almost exclusively for the new technology of automobiles — sidewalks and pedestrian infrastructure were often dismissed, and land-use planning focused on siloed uses, dividing residential areas from retail and office space. New development patterns emerged with highway-oriented businesses, such as gas stations, restaurants, and motels at freeway exits.

With automobiles, cities were reshaped to the technology rather than the technology serving the needs of the city. The way cities were developed — incrementally, at a pedestrian scale — adapted to the needs of the automobile instead of automobile use adapting to the needs of the city. No longer was live, work, play all found in one area, but was separated with a vehicle trip to connect them. No longer were all areas of the city accessible to all users, but rather to those able to own and drive a vehicle. The social cohesiveness of cities also began to degrade as face-to-face interaction walking down the street or on the streetcar was replaced with driving between garages. This is especially impactful today as America experiences an aging population with longer lifespan but still limited driving capabilities. With 51% of people age 75 and older living alone, according to AARP, the National Council on Aging found that, “One in six seniors living along in the United States faces physical, cultural, and/or geographical barriers that isolate them from their peers and communities.”
Despite the negative effects at the neighborhood-level, the highway age brought great economic growth and furthered independent mobility. The automobile brought many middle-class jobs at the start through manufacturing and maintenance. Combined with the interstate system, long-haul freight shipping via automobiles grew throughout America in the 20th Century. The privately-owned vehicle also allowed families the freedom to travel further recreationally giving rise to more tourism in many places.

Like the original incarnation of the automobile, the further automation and evolution in other vehicle form factors, such as seatless models for delivery or mobile retail, presents the possibility of new development patterns. Will automated vehicles serve to increase density in cities? Or will the automation be used to allow further horizontal growth patterns with longer commute lengths? The future landscape of cities is determined by the feedback loop of policy and regulations, both federally and locally. Development patterns will respond to new technology, often in ways that cannot be predicted, with both positive and negative externalities. It is up to federal and local policy to establish the principles of land-use patterns that remain despite changing technologies for the good of the people in the community.

What’s Next?

Today we face a shifting landscape in transportation as the emergence of many new types of mobility enter the marketplace. We see the testing of automated vehicles, rise in electric vehicles, proliferation of ride hailing in urban areas and introduction to new vehicle types, such as electric bicycles, scooters, and various delivery drone concepts. Each of these has the potential to impact cities for the better with more choice and access for all users, but they also present many unknowns. Like the advent of the automobile, there’s much excitement with technologies and a discounting of the unknown negative side effects.
New mobility technologies bring more than just a replacement to the conventional automobile. They also bring the potential to shift ownership models, user travel preferences, supporting business dependency, and the culture around how we view streets. Mobility-as-a-Service (Maas) could be a major shift in the way people move within our cities, shifting from personal ownership of vehicles toward mobility services, like ride hailing, public transit, and bike share. We look to the introduction of the automobile because it too brought these shifts and we can learn from the past.

These new mobility technologies are just that, a technology. They are a tool in the toolbox for meeting a greater goal and vision for the community. They will bring great opportunities as well as new challenges and issues. We cannot see them as a silver bullet to solve the ills facing our cities today, but rather use them intelligently in tandem with other policies, regulations, and tools to bring a better quality of life and economic vitality to our cities.

It is these goals for community betterment, constant through history, that we will discuss in the next section. The first step in a proactive approach to future change is a right understanding of the things that should stay the same and shape this future change. Managing the mobility transition and its complications is vital to a successful end product.

Stay tuned for the next entry on New Mobility Technologies

For more information contact
Daniel Herrig, P.E. daniel.herrig@freese.com
Chris Bosco, P.E. cb@freese.com