Putting the Car Before the Horse: The Diffusion of the Automobile and the Rise of Technocratic Primacy

Cameron Elliott Gordon *

Posted Date: 14 October 2024

doi: 10.20944/preprints202410.1038.v1

Keywords: technology; diffusion; automobile; car; transport; technical change; technology and culture

Article

Putting The Car Before the Horse: The Diffusion of the Automobile and the Rise of Technocratic Primacy

Cameron Elliott Gordon

Australian National University; cameron.gordon@anu.edu.au

Abstract: This paper reviews the social dimensions of the rolling out and utilization of the automobile in the United States over the past one hundred years, starting with the early days steeped largely (but not exclusively) in technological idealism; moving through an age of car-ascendancy with its peak in the 1950s and 1960 (with the birth of a literal "car culture"); and into the present day of automobile dependency in the midst of a profound changes in auto technology that have unclear societal implications. This review generally indicates that the machine, rather than the human operator, was from early on the center of the creation of a car-based system in America which effectively made the human being and society a reactor to technical progress rather than the other way around. The technological and mechanical aspects of automobiles remain impressive. But the history reviewed here shows that while technical advances are good, these should be guided and channeled into the pursuit of and service to more enlightened and humanist applications, and that such guiding did not happen naturally with the automobile.

Keywords: technology; diffusion; automobile; car; transport; technical change; technology and culture

1. Introduction

The conception of a non-human, non-animal powered transport mode is actually an ancient one. Moving from one point to another without any effort expended by man or beast is obviously an attractive and, from a purely physical point of view, a desirable one. But it would take advances in technology to make the notion feasible, beginning with an early steam-powered vehicle of a French inventor in 1769 and continuing with the gasoline powered machines that arose in the latter half of the nineteenth century (Eckermann, 2001).

Although some hold that technical invention is neutral, in fact technology arises from, and simultaneously affects, the society from which it springs (Ceruzzi 2005; Kranzberg 1986). In the case of major innovations, like the automobile, these social impacts are profound. Yet they are rarely planned for in advance, and the vast uncontrolled socio-technical experiments that follow generally deliver mixed social results that are impossible to undo after the fact.

This paper reviews the social dimensions of the rolling out and utilization of the automobile in the United States over the past one hundred years, starting with the early days steeped largely (but not exclusively) in technological idealism; moving through an age of car-ascendancy peaking in the 1950s and 1960s (with the birth of a literal "car culture"); and into the present day of automobile dependency with profound changes in auto technology that have unclear societal implications. This review generally indicates that the machine, rather than the human operator, was from early on the centre of the creation of a car-based system in America which effectively made the human being and society a reactor to technical progress rather than the other way around.

It is clear that the same broad technological orientation still prevails in its assumptions that new technologies will create a brighter and more progressive society automatically (no pun intended). This orientation had its reasons for being, and its outcomes are both positive and negative. It will be argued that the historical development of the automobile shows that the human being needs to be put back in the centre of the transportation system and that reliance on mere technical innovation,

 doi:10.20944/preprints202410.1038.v1

impressive as it is, will not guarantee that outcome. If past experience is any guide, we will end up with a more sophisticated and even more machine-based world, with unknown but certainly significant negative societal consequences.

2. Phase 1: 1890–1920—The Rise of the American automobile

Initially the invention of the car provided a luxury item for a few enthusiasts. However the transition to mass adoption was rather quick, especially in the US: there were a mere 8,000 registered vehicles in 1900; but after this elitist phase, American motor vehicle registrations rose to almost 500,000 in 1910 (Foster 1979). Much of this increase in passenger car registrations occurred 1907 and 1910, tripling from 140,000 to 458,000, and then further rising to 1.2 million in 1913 and to 3.4 million in 1916 (McCarthy 2001, p. 61).

The appeal of the automobile was considerable for many reasons, especially after it became affordable enough for the middle-class household, a development that mass production, perfected (though not invented) by Henry Ford, brought quickly. There were transportation alternatives to be sure, with intercity railroads and urban streetcars the dominant modes as the automobile began its rise. By 1917 urban streetcars were actually reaching their peak usage of 14.5 billion passengers carried that year, simultaneous with exploding automobile ownership and use (Foster 1979, p. 368). Travel between cities was meanwhile still dominated by rail.

These "common carriage" modes had obvious advantages in efficiencies in load capacity, delivering riders to their destinations at a much lower average cost per passenger/mile. But the streetcar "traction trusts" and the rapacious railway companies earned bad names by seeking to squeeze passengers and local governments (which contracted out the operating franchises) with high fares in return for less than optimal service (Foster 1979; Barrett & Rose 1999). Even without this factor, streetcars and railroads ran on fixed networks, requiring passengers to adapt their travel to the carrier's requirements.

Still, for the first couple of decades of the century, these unevenly managed fixed networks were generally more affordable than automobile travel, particularly within metropolitan areas, because of the extensive networks in place reaping significant economies of scale. However the personal, individualized carriage of the automobile was obviously very attractive to potential users, and in less urban areas where transit was sparse or non-existent, the car was the only viable mechanised alternative, even with relatively primitive rural roads a limiting factor for ease of travel.

The other main competing mode at this time was the horse-drawn carriage. This technology was also potentially point-to-point like the car. Horses also did not need smooth roads, a definite advantage when travelling in the country. But the horse was much slower in speed, and buying and maintaining a horse was expensive, generally out of reach for the middle-class household, much less the working class one. It was for this reason that in cities, passenger horse travel was generally conducted by common carriers as well, especially the omnibus in the mid 19th century, a forerunner to the mechanised trams that would later replace them. Just as mechanisation drove out horse-led mass transit, as cars fell in price they soon edged out the horse even as a mode of individual travel for all but nice operations (Morris 2007).

In addition to this, a collective crisis of manure disposal in cities was mounting in the late 1800s as urban populations around the world grew larger and denser and their travel needs grew exponentially. The first-ever international urban planning conference held in New York City in 1898 focused on the ever increasing manure piles in cities that created noxious smells, serious removal burdens and the possibility of fly-borne disease (though this last hazard turned out to be a relatively low risk). There were also associated problems with horse urine smell and the need to dispose of horse carcasses (horses generally had a working lifespan of 3 to 5 years) (Morris 2007). This gathering of planners could come up with no solution to this growing and vexing problem (Sovacool 2009). The invention of the automobile fortuitously "solved" that collective problem, though no thought was given to what new problems might now arise.

American urban populations had been relatively fortunate in terms of transport options, whatever the mode choice. Rural communities were often completely cut off from the larger society,

 doi:10.20944/preprints202410.1038.v1

typically distant from rail stations, and with farm households often unable to afford the high fares or gain much from limited service. They were also much more dispersed, and thus with no mass transit at all. The coming of the car was thus seen as an unalloyed godsend for rural America, which, in many ways, it was (Sovacool 2009). The car definitively helped break a long era of social isolation and economic underdevelopment in the American countryside.

Practicalities aside, the mere technological prowess and flashiness of cars meant that they had their boosters from the very beginning, and prodigious and enthusiastic ones at that. The first major American press coverage of the car was of a Paris-Bordeaux auto race in 1895, with many major races to follow, events that were designed with the sole purpose of promoting the speed and efficiency of the new invention. A tight and hyper-positive car community arose, consisting of inventors, innovators and committed early adopters who became influential proponents of the rapid adoption and diffusion of this new technology. Edison, for example, called it the "coming wonder" and his employee, Henry Ford, would soon branch out on his own mass production of affordable autos for the masses who adopted it in their millions (McCarthy 2001, p.47).

However, even in these early days, problems associated with automobiles were well known, including their greater demand on scarce road and street space, their noise, and the dangers that their greater speed posed to non-motorized travellers (Foster 1979). Despite the limited knowledge and foresight of the late 19th and early 20th centuries, it was possible to see the car as something other than an unhindered social good or technological panacea, if one cared to look for its dark side.

Those that did care to included the wild and woolly – and fragmented – film industry of the 1900s and 1910s. The first film companies were small entrepreneurial outfits, making short reels at cheap prices, aiming to appeal to their largely working-class city audiences who were most directly affected by the social and economic tensions of the day. The effect of the automobile on the urban fabric (rural situations were much less well represented in film generally) was of particular interest (Sloan 1988). "Chase" scenes, involving all modes but focusing on cars, were an early comedic staple of the pioneering film comedians Buster Keaton and Harold Lloyd, among others (McCaffrey 1964).

Car crashes were an even more dramatic – and popular – filmic focus, and not always presented comedically (Beckham 2010). The film, *How it feels to be run over*, produced in 1900, showed the present dangers of the automobile and was followed up by the *Explosion of a Motor Car* (1900), as well as *The "?" Motorist* (1903), the latter depicting a policeman being carelessly driven down (though in true movie fashion he gets right back up to apprehend the perpetrators) (Cahill 2008).

These films were partly voyeuristic, representing the fascination of the public with the new automobile technology. But they also captured the fears and real issues created by cars in cities. These early depictions of car problems rather quickly developed into a genre of urban techno-dystopia movies, such as Fritz Lang's 1927 *Metropolis*, which projects out technological and urban trends into an imagined but plausible urban future of shining edifices towering over conditions of social and economic inequality. (*Mad Max* and *Blade Runner* are much later and more gruesome examples of the genre).

The societal downsides of the car, especially the dangers they presented to pedestrians on what were still largely unregulated streets, were thus already a concern to the masses at this early age, dread and fear mixed in with fascination and appreciation. But lest one think that more enlightened experts were more sanguine, even the automobile industry of the time saw some of the environmental downsides of its product. Once the gasoline-powered car ultimately won out over the initially dominant electric vehicle (EV) – more on that below – a number of concerns took hold.

The gasoline engine had always raised concerns about fuel availability, a nagging issue discussed early on in the car sector's premier technical magazine, *Horseless Age*. Mass production heightened such initial concerns, though improvements in oil refining and discovery of new supplies ultimately made this particular issue recede in importance. Not so easy to dismiss was the gasoline engine's production of smoke, with automakers concerned about public regulation of this legal "nuisance" (the larger health issues surrounding emissions not yet being fully understood) (McCarthy 2001, p. 54). Although obscured by the fact that manure odours were a problem too, there

 doi:10.20944/preprints202410.1038.v1

was some understanding that the smell of engine fumes was different and likely more noxious, both subjectively and objectively.

Thus even with American car-enthusiasm, its first decades of uptake revealed potential and actual social problems that were of concern to both expert and person-in-the-street. Although the invention unquestionably offered a lot of technical and social advantages over the status quo, the question still arises: why didn't these known (if nascent) concerns at least temper, if not moderate, the adoption and diffusion of the new technology (in the US at least)?

3. Phase 2: 1920 – 1930 - the Bias Towards Technological Progress and Panacea

The early 20th century was a particularly technological age in the industrialising West and the US was a particularly technologically oriented society. For Americans, this was a turbulent era of simultaneous change in science, society and politics which ended up creating some unique conditions that played up the technical dimensions of the auto, while minimizing planning for and managing its social consequences. The rapidity of the uptake in car production and consumption created a further bias towards adapting existing systems to the automobile rather than the other way around.

The Progressive movement in the US was a reformist impulse developed in response to the challenges that rapid economic and technological change posed to social and political stability. American Progressives were proponents of the idea that social issues – all issues in fact – could be addressed with rational, scientific, and technical methods. Social problems could thus be reduced to technical ones, with technical means of redress being considered most effective. As individuals, Progressives were mostly drawn from urban and/or upper class elites. Largely identified with the Republican Party, they were opposed to the Democratic Party machines that dominated most US cities. These machines had heavy working class and immigrant support, and were much more purely political in their approach to social problems, often corrupt in practice, but offering a patronage-based contract with the urban masses, providing municipal jobs and services in return for regular voting majorities during election time (McGerr 2005).

Urban planning was a new emerging field during this time, as was, obviously, highway engineering, both being dominated by educated elites with technical predilections, and thus tinged with Progressive political thinking. The notion of professional planning itself was a Progressive innovation. The immediate challenge of the urban car, namely its demand on scarce road space and its safety challenges posed by fast vehicles interacting with slow pedestrians had long been presented as a technical rather than social problem by road engineers, with engineering fixes favoured.

As the 1920s began millions now owned and drove cars and a new problem of road congestion became as or even more pressing. Mass urban car travel not only clogged urban downtowns. It also accelerated the movement of people to outlying areas, a phenomenon that soon became known as suburbanization. Entrenched downtown business interests saw both of these developments as threatening, and were now faced with new urban periphery real estate development interests that were becoming increasingly powerful (Brown 2006).

Urban business interests came together with the relatively new cadres of highway engineers and urban planners to devise a technical solution to congestion that explicitly gave primacy to accommodating the auto: grade- and traffic-separated freeways giving more urban space and mobility to the car. The aim was to speed car travel while making it safer for pedestrians.

Safety in a coarse sense was indeed improved by these measures, since pedestrians were removed entirely from areas where cars travel fastest, and thus entirely removed from any interaction with fast cars. But congestion proved to be a vexing problem that was not so easily solved. And suburbanization was increased not decreased by this relatively simplistic fix. The shape of the urban social and spatial fabric and human scale and community were things left to sort themselves out as they adapted to the auto-centric systems that were validated and increasingly implemented on a wide scale (Barrett & Rose 1999; Brown 2006; Foster 1979).

There were some dissenters in the urban planning field that wanted to inhibit the car and give preference to the pedestrian on urban streets. But these were greatly outnumbered, hindered in their influence by hostility from established interests, since road engineering solutions benefitted

 doi:10.20944/preprints202410.1038.v1

downtown and urban fringe interests alike with plenty of economic growth to go around, something that was threatened if the car were impeded. Additionally, since cars were now becoming a true mass instrument of travel, any policy offering that hampered them was seen as being against the desires of the general populace. (Barrett & Rose 1999; Foster 1979). Views that divorced modern social and political problems from technological advance and instead saw technology as a wonderful panacea that would sort everything out, became deeply entrenched, at least with respect to cars and cities (Sovacool 2009, p. 421).

This growing auto challenge would nonetheless remain very expensive to address, even in mere technical terms. Pre-car cities were transit, horse and pedestrian dependent, and these modes, whatever their problems, required more modest infrastructure and less land space than the car. The infrastructure required for cars was much more costly. At the turn of the century the "Garden City" and "City Beautiful" planning movements were dominant, emphasizing stately and grand thoroughfares, parks and civic monuments (Brown 2005; Fishman, 1998). These were elitist in the best and worst senses of that word, proffering beautiful public spaces, nice urban amenities, and gilded throughways. But they were always high cost to municipal budgets, doing little to address the growing problems of decrepit housing, crowding and poverty of the masses (Barrett & Rose 1999; Brown 2005). And they relied on a relatively large amount of shared space for public use. This was fine for horses, trams and walkers that made relatively little demand on outside of existing streets and rail-lines. It was not so good for cars.

Thus as the automobile became a mass phenomenon urban planning that emphasized urban amenity and public space became an anachronism. There were simply too many vehicles crowding into too little street space to be accommodated by grand leisurely parkways, and there were increasing numbers of cars that needed to be parked somewhere as well. The rise of auto-driven suburbanization further increased required investments in the roads were now taking up space in ex-urban fringes. Besides which, car-owners were now a growing consumer and interest group in their own right, whose interests had to be contended with and addressed.

Thus a "City Practical" or "City Functional" movement arose among urban planners, emphasizing economical rather than beautiful planning solutions to ameliorate the immediate challenges of the auto (Brown 2006). Meanwhile the highway engineers, already biased towards technical means with the primary aim of moving traffic faster, developed new data and new models that were very compelling when compared against the older heuristic narratives of the "City Beautiful" tradition and the more narrative-based methods of most urban planners of the day (Foster 1979; Barrett & Rose 1999). By the 1930s urban planning and traffic planning had largely converged into the contours and concepts still with us today: origin-destination pairs, levels-of-service, and highway capacity – all of which implicitly were about cars taking primacy over the human dimensions of city (and increasingly suburban) life (Foster 1979).

Certainly the car offered clear technical improvements to existing transport means of the time and had some social advantages besides, not least individual mobility for everybody, increased land development opportunities and the breaking down of rural isolation. These real advantages of the car were widely diffused though advances in production technology that lowered vehicle price making its purchase by individuals more compelling than ever.

But the equally clear and immediate problems of the car were seen in very biased ways that focused on technical issues, favouring narrow technical solutions that by definition, but implicitly, required widespread adaptation of human society to the automobile, ignoring the possibility of any negative social consequence (apart from the artistic imagination that created dystopian visions extrapolating from such possibilities).

4. Phase 3—1930–1945 —Consolidation and Entrenchment

By the 1940s, car-based development was already entrenched both intellectually and economically. Government policy was already firmly aligned with the automobility. The change in orientation in urban planning put economic development firmly in line with the rapid diffusion of the car. The uptake gasoline-powered version had already been helped prodigiously by the American

 doi:10.20944/preprints202410.1038.v1

mobilization for World War 1, with masses of vehicles needed quickly for the war effort and with the petrol engines more efficient and readily available than their electric vehicle competitors. After the War ended, there were now many trained car and truck operators who could slot right back into the peacetime domestic economy, thus creating a new boost in demand for their own automobiles. Woodrow Wilson had also used the war effort as a justification for a big expansion in domestic road building, providing both demand for trucks and new competition for the railways in intercity freight carriage (Sovacool 2009, p. 417).

Of course the automobile industry itself encouraged consumption of its product and perfected techniques for doing so. Mass marketing and distribution were corresponding features of all industries of the time, pairing mass production with mass consumption. The annual auto show, alliances with financial intermediaries to provide easy financing, automobile insurance, comfortable dealer premises with the new concept of a "test drive": all these were standard features by the 1920s, which, combined with continually falling vehicle prices, created a well-oiled and growing car market (Sovacool 2009, pp. 418-419).

There was also clever promotional positioning, a sort of private sector social engineering that defined the car as a social status symbol that put mechanism over corporeality (i.e. the motor versus the horse) and individual carriage over common carriage (i.e. the car as individual travel mode on demand versus the fixed schedules and crowded carriages of the train), making it more than just a means of travel but a "lifestyle" and a sign of prestige (Sachs 1992). Technological advantage was now enhanced with an imagined social advantage.

Some have pointed to these developments as the real reason that the car took over America (so to speak), a sort of "con-job" by moulders of mass opinion combined with car-biased public policy, leading to the car-based world we now live in. There can be a conspiratorial air to this, such as the claim that automobile companies bought up streetcar lines so that they could decommission them and replace them with buses (Foster 1979).

All of which is true to a point, for all of these things, including purchase of streetcar lines by automakers which then offered their own makes of buses as replacements, did happen. But once again the car did actually offer definite improvements over existing transportation alternatives and these were not just technological. The streetcar companies, for example, were in big trouble by the 1920s, hurt even more by the fall in fare revenues caused by the Great Depression (while also being tied to fixed-fare franchise agreements and high-cost maintenance of existing networks during that same period). Urban decentralization made transit networks, trolley or otherwise, less effective. And the companies themselves proved to be lethargic and short-sighted in responding to their modal challenger, acting more like the private monopolies they were rather than nimble private providers responsive to consumer needs (Foster 1979). As for automobile marketing, much hype was obviously involved but it was hype of some genuinely attractive features.

Having said all of that, the world we have now was definitely not an inevitable outcome. Particular biases of thought, institutions, and government policy embedded the car into the foundation of American society. And once embedded, this car-primacy took on a momentum of its own.

5. Phase 4: 1945 – 2019 – Social planning by automobile

After World War 2 American government policy shifted completely to very strong and unequivocal advocacy of the automobile over most anything else. Once more, war played a pivotal role, with the US Congress, in 1944, approving $500 million per year in highway building and authorizing (but not appropriating funds for) an Interstate Highway System. The privations of the Depression and war had crimped the growth of automobile usage and production, but it came back with a vengeance, as masses of demobilized troops flocked to the suburbs with their nuclear families. Auto registrations skyrocketed, and 209,000 miles of new road were added between 1946 and 1950 (though total highway mileage actually fell as older roads were decommissioned) (Rose 2003, p. 216).

Of course, the national seismic movement in American road building came with the passage of the Federal-Aid Highway Act of 1956, which established the Interstate Highway System and the

 doi:10.20944/preprints202410.1038.v1

federal highway financing mechanisms that in a fundamental way remain in place in the US today. The key compromise was the idea of a broadly based financing scheme tied indirectly to highway usage – a tax on automobile fuel, the "gas tax" as colloquially known – together with the creation of a dedicated trust fund to ensure that the revenues raised would go back into the roads system (Rose 2003; Weingroff 1996). This trust fund not only made the infrastructure finance burden almost invisible to drivers; it also reduced the burden to truckers sufficiently to get their buy-in to the legislation. And the creation of a trust fund itself, although in actuality just an accounting fiction, nonetheless created a credible policy commitment against which promises could be leveraged, especially cost-shared federal financing for new urban roads that would normally be a local responsibility and which thus brought urban governments on board with what was now primarily a suburban and rural network expansion (Rose 2003). Social problems, especially declining downtowns and urban poverty, continued to be seen as technical problems that could be solved by easier highway access to and through city centres, a "solution" that simultaneously eliminated costly congestion and "slum" neighbourhoods.

The post-war boom in car usage, road building, suburbanization, and urban "renewal" is a well-known tale not to be repeated in detail here (Blas 2010; Dunn 2010; Seiler 2009). But a few points are salient. Even by 1956, the automobile and car-dependent development was not yet completely entrenched. Railroads and urban transit were in decline, as were urban cores, but there was still potential to balance car-based development with the existing older residential, commercial and transportation forms. "Car dependency" was growing, but not yet completely dominant. The die was not yet fully cast, the Rubicon not completely crossed.

However nobody with real power was interested in other possibilities than car-oriented ones. Technical planning and development was the accepted paradigm well and truly by the mid 20th century and the happenings during the 1950s and 1960s merely accelerated those trends. The Cold War was on and once more war planning and national defence emphasized the supposed strategic benefits and outcomes of a particular technology and the infrastructure required to facilitate it (after all the other name for the Federal Aid act was the "National Interstate and Defense Highway Act"). Longer-term and more diffuse social benefits of transportation and infrastructure alternatives seemed unrelated to such "strategic" advantage, and were costly and uncertain besides. The suburbs were now the mecca for the nuclear family, something that highways and cars facilitated creation and expansion of, in turn requiring further dependence on the cars and roads, in a virtuous (or vicious) circle, depending on your point of view (Florida & Feldman 1988). The "iron triangles" of real estate developers, federal aid housing programs and local governments following federal grant money and developer imperatives now became self-propelling, aided by an urban and road planning profession that was now wholeheartedly based on the needs of the automobile (Checkoway et. al. 1980; Caro 1974). The "car culture" was well and truly born and blossoming (Flink 1975; 1988).

Cracks did appear in this edifice, especially once the rebellious spirit of the 1960s took hold. The most notorious example of a successful overthrow of the whole paradigm took place in New York City when Greenwich Village residents successfully opposed and reversed Robert Moses's plan to put an expressway through Washington Square, this defeat leading to the fall of Moses from power and inspiring further successful efforts elsewhere in New York and in other cities to stop federally funded urban renewal transportation projects from displacing existing communities (Caro 1974). This was a time of the birth of what could be called a new, neighbourhood-scaled "City Beautiful" movement, championed by one of the leaders of the revolt against Moses, Jane Jacobs. This philosophy brought back some older ideas of walkable city spaces with human-scaled community and amenity built in and maintained, rejecting mechanistic, engineering based frameworks built around the car (Jacobs 1993 (1961)).

It should be noted, though, that these developments were driven mainly by an inner city elite. The movement was led mostly by people who didn't drive at all or at least lived in urban core areas where they didn't need to. The broader working and middle classes remained more devoted to the automobile than ever, and needed to be since most livelihoods and lifestyle depended upon it (Flink 1975).

 doi:10.20944/preprints202410.1038.v1

This existing order was not uniformly "bad", as some reflexively anti-automobile thinkers argue. Garreau (1992) has pointed out that suburbanization created new urban forms that have some advantages over traditional ones and make full and best use of the continuing mobility edge that car travel offers. Urban mass transit in the US has made a relatively small but significant comeback and urban "infill" and Transit-Oriented Development (TOD) are now accepted progressive principles for existing urban cores (Hess & Lombardi 2004); while "Smart Growth" is the template for new development outside the core (Handy). All of these emphasize non-car-based living and working and these ideals have become fashionable once again (if not necessarily all that widely adopted in practice).

5. Planning for the future: civilized and uncivilized uses of the automobile

But a full return to the city and periphery patterns of the late 19th century, even if economically and technically feasible (which it obviously isn't) would not be fully desirable since those old urban spaces had as much dis-amenity for the mass of the population as they did amenity. For all the considerable social damage that untrammelled car adoption and development has done, it also did address and ameliorate older problems. Once only relatively privileged elites could afford houses of their own in the city or out in the country, and transport inaccessibility was a real problem outside many urban cores. Even those masses with transport access were beholden to the often rapacious operators of tram and railway companies, and as pedestrians had to navigate chaotic and dirty unregulated and poorly maintained streets (and horses were just as dangerous as cars from a pedestrian perspective (Morris 2007). The car and its associated infrastructure did ameliorate some of these problems objectively. And subjectively many now prefer travel by car than by other modes, even if the price might be car-dependency.

But, as noted already, social considerations have consistently taken a backseat to technological ones and many unintended consequences have arisen as a result. It is too late to undo what has been done and not all of it should be undone in any case. But future technical permutations of the automobile should not be automatically assumed to lead to a social optimum. Many claims being made today about driverless vehicles – that they will give everybody personal freedom, that congestion will end, that they will lead to more cohesive, connected and sustainable communities (e.g. Mitchell et. al. 2010) – represent the same techno-utopianism that accompanied the introduction of the automobile in the first place. The idea that technological advance will automatically lead to social advance is a patent falsehood, as the past experience of the automobile, and many other technologies, indicates (Segal 1994). Social development must be explicitly planned for along with technological development. This is not an easy task, but a necessary one.

Take, for example, the very term "disruptive technology". This is spoken of in glowing terms by almost everybody, referring to its supposedly beneficial effects of wiping away outmoded and inefficient practice and enterprise and replacing it with efficient and effective venues that expand choice and happiness. Disruption is this parlance is treated in the same way as the term "progressive". But it should be pretty clear that social considerations are nowhere present in this discussion, narrow technological and economic criteria being the ideal. When it comes to the affairs of community, sociality, social bonds, culture, and other human affairs, disruption is generally something that is far from an unvarnished good, though it is sometimes necessary.

The American experience with the automobile shows that while there has been a good understanding and devotion to optimization with respect to the technical side of technological adoption and diffusion, the consideration of related non-technical aspects of such adoption and diffusion, especially with respect to the car, has been minimal.

Indeed, the idea of "progress" comes from the Enlightenment that posits a forward movement of human society driven by increasing knowledge and rationality. But what is often lost is that the principles underlying the Enlightenment generally also spoke against disruption of moral rules for regulating society's members. "Rationality" is a principle that is indeed rational but not necessarily "scientific" or "technical" in the sense that they are designed to ensure orderly progress of humanity along lines of higher ideas and not just mere technological advancement. All of this is the antithesis

 doi:10.20944/preprints202410.1038.v1

of the disruptive technology model and disruptive technology as a concept is in fact amoral, assuming disruption is good for its own sake (Hobsbawm 1994).

In fact human beings progress organically not mechanistically. The sociologist Norbert Elias studied the way in which automobiles and their systems upended organic human growth and self-regulation. He observed how the car was at least partially de-humanizing this process, referring to it explicitly as a "decivilizing" process through "technization" (Elias 1995). Some of this is absolutely necessary, as with any innovation. For example, the mere speed of cars does require significant adaptation of human behaviour and practice to automobility systems being interacted with by creatures evolved to deal with much slower movement. Mechanical aids of all sorts, from traffic lights, to signage, to automatic barriers, are needed to minimize casualties and properly manage system traffic flow and people need to adjust to these accordingly, however much they may go against natural human impulses. The cost, though, is a sort of inner alienation from both oneself, one's mode of movement, and potentially from the human embodied and intuitive pathways of human society. Clearly the message is that people must adapt to the car, not the other way around (Dant & Martin 2001). And this can be a depressing and enervating message, and not one always good for people and their social relations.

Even in what it is generally considered to be the purely technical aspects of road safety, the social dimension is present. Elias found that traffic fatality rates vary widely across countries and cannot be accounted for solely by technological or policy differences. Humanity still matters, apparently (Elias 1995). And it should be planned for along with the technology.

That is what needs to be more fully incorporated into planning for the next generations of automobiles. What will driverless vehicles mean to urban space, social fabric, human institutions, and folkways of living and being? These are issues that are marginalized at best in transportation and urban planning. Even the "human factors" field puts the car first and adapts human beings to it, the very term indicating that human elements are just "factors" in the larger technological system instead of the be-all and end-all to be served by it (Salvendy 2012).

So instead of just letting technological progress rip and reacting to it after the fact, explicit research and planning and implementing should be devoted to the question of how to shape and direct the coming modes of car-sharing and driverless vehicles to get more density where we want it (e.g. in areas of employment) and less where we want that (e.g. in some residential settings or in urban open space etc.). We should think about the social order that seems most human, most civilized, most sensible, in the basic sense of that word, and bring technological progress in that will equate with and promote social progress. "Smarter" vehicles and systems should not be assumed to be socially intelligent just because the word "smart" is in their title. Actual "smarts" need to be dedicated to the human aspects first.

An analogy can be made with the introduction of foreign plants and animals to an ecosystem. We now know well that such introductions have wreaked havoc in the ecosystems they were supposed to benefit, or at least remain neutral to. Though we still continue such introductions (often unintentionally) we nonetheless do study the possible impacts in advance more than we used to, and sometimes avoid such introductions entirely, or at least adapt them to greater requirements of nature as we find it. Similarly with the new generations of the automobile: instead of such wholesale introduction, let's first try to "civilize" untamed car technology and make it fit for and consistent with human society and its social development, and then introduce and develop it in a civilized manner. Or at a minimum, refrain from "uncivilized" (Gordon 2017) uses and do no unnecessary harm.

References

Barrett, P., & Rose, M. H. (1999). Street smarts: The politics of transportation statistics in the American city, 1900-1990. *Journal of Urban History*, *25*(3), 405-433.

Beckman, K. (2010). *Crash: Cinema and the politics of speed and stasis.* Duke University Press.

Blas, E. (2010). The Dwight D. Eisenhower National System of Interstate and Defense Highways: The Road to Success? *The History Teacher*, *44*(1), 127-142.

Brown, J. (2005). A tale of two visions: Harland Bartholomew, Robert Moses, and the development of the American freeway. *Journal of Planning History*, *4*(1), 3-32.

Brown, J. (2006). From traffic regulation to limited ways: The effort to build a science of transportation planning. *Journal of Planning History*, *5*(1), 3-34.
Cahill, J. L. (2008). How it feels to be run over: early film accidents. *Discourse*, 30(3), 289-316.
Caro, Robert. A. (1974). The power broker: Robert Moses and the fall of New York. Knopf.
Ceruzzi, P. E. (2005). Moore's law and technological determinism: reflections on the history of technology. *Technology and Culture*, 46(3), 584-593.
Checkoway, B., Tabb, W. K., & Sawyers, L. (1980). Large builders, federal housing programmes, and postwar suburbanization. *The City: Land Use, Structure, and Change in the Western City*, 37-60.
Dant, T. & Martin, P. (2001). "By car: Carrying modern society." Ordinary Consumption, 143-158.
Downs, A. (2005). Smart growth: Why we discuss it more than we do it. *Journal of the American Planning Association*, *71*(4), 367-378.
Dunn, J. A. (2010). *Driving forces: The automobile, its enemies, and the politics of mobility*. Brookings Institution Press.
Eckermann, Erik (2001). World History of the Automobile. (SAE Press).
Elias, N. (1995), "Technization and Civilization". Theory Culture and Society, Vol. 12 (3), 7-42.
Fishman, R. (1998). Beyond utopia: urbanism after the end of cities. *Ciudad real, ciudad ideal*.
Flink, James J. (1975). The car culture. MIT Press.
Flink, James J. (1988). The automobile age. Cambridge, Mass: MIT Press.
Florida, R. L., & Feldman, M. M. (1988). Housing in US Fordism. *International Journal of Urban and Regional Research*, *12*(2), 187-210.
Foster, M. (1979). City planners and urban transportation: the American response, 1900–1940. *Journal of Urban History*, *5*(3), 365-396.
Garreau, Joel (1992). Edge city: Life on the New Frontier (1st Anchor Books ed.). Anchor Books.
Gordon, C. (2017). Carbarism: Civilising the Automobile. *World Transport Policy & Practice*, *23*(1).
Handy, S. (2005). Smart growth and the transportation-land use connection: What does the research tell us? *International regional science review*, *28*(2), 146-167.
Hess, D. B., & Lombardi, P. A. (2004). Policy support for and barriers to transit-oriented development in the inner city: Literature review. *Transportation research record*, *1887*(1), 26-33.
Hobsbawm, E. (1994). "Barbarism: a user's guide." New Left Review (206) 44-55.
Jacobs, Jane (1993 (1961)). The Death and Life of Great American Cities. Modern Library: Random House.
Kranzberg, M. (1986). Technology and History:" Kranzberg's Laws". *Technology and culture*, 27(3), 544-560.
McCaffrey, D. W. (1964). The evolution of the chase in the silent screen comedy. *The Journal of the Society of Cinematologists*, *4*, 1-8.
McCarthy, T. (2001). The coming wonder? Foresight and early concerns about the automobile. *Environmental History*, *6*(1), 46-74.
McGerr, M. E. (2005). *A fierce discontent: The rise and fall of the progressive movement in America, 1870-1920*. Oxford University Press, USA.
Mitchell, W. J., Borroni-Bird, C. E., & Burns, L. D. (2010). *Reinventing the automobile: Personal urban mobility for the 21st century*. MIT press.
Morris, E. (2007). From horse power to horsepower. *Access Magazine*, *1*(30), 2-10.
Rose, M. H. (2003). Reframing American highway politics, 1956-1995. *Journal of Planning History*, *2*(3), 212-236.
Sachs, W. (1992). For love of the automobile: Looking back into the history of our desires. University of California Press.
Salvendy, G. (2012). Handbook of human factors and ergonomics. John Wiley & Sons.
Segal, Howard P. (1994). Future Imperfect: The Mixed Blessings of Technology in America. University of Massachusetts Press.
Seiler, C. (2009). *Republic of drivers: A cultural history of automobility in America*. University of Chicago Press.
Sloan, K. (1988). The Loud Silents: Origins of the Social Problem film. University of Illinois Press.
Sovacool, B. K. (2009). Early modes of transport in the United States: Lessons for modern energy policymakers. *Policy and society*, *27*(4), 411-427.
Weingroff, R.F. Federal-Aid Highway Act of 1956: Creating the Interstate System (1996). *Public Roads*, 60(1).