

Article

Exploring a Culture of Health in the Auto Industry

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Abstract: The Culture of Health framework includes four pillars of societal health and well-being influenced by business, namely: consumers; employees and workers in the supply chain; the community, and the environment. The Auto industry was an ideal crucible in which to explore the interface of public health with business given the confluence of the different domains in this sector. The substantial benefits of mobility, especially for the under-resourced, sit alongside negative impacts from emissions, accidents, products and services. Through interviews with 65 senior executives from seven major automakers, corporate actions reflecting health as a strategic agenda were mapped to the Culture of Health model. While most of the companies did not use the language of health explicitly in their strategy, key examples were present across all four pillars. Given the future of mobility relies on the interface of human experience with technology, it is a population-level challenge demanding system-level changes. Ostensibly, a framework for sustainability, the Culture of Health model could help the Auto industry navigate the disruption caused by the global megatrends and changing societal expectations of business in society and transition successfully to a new mobility economy.

Keywords: Auto industry; Culture of Health; mobility solutions; equity; sustainability



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1. Introduction

In 2016, the Harvard Business School and the Harvard T.H. Chan School of Public Health embarked on a joint research venture to investigate whether companies embraced the concepts imbued in the vision of a Culture of Health (COH) that, “Every company, knowingly or unknowingly, impacts public health . . . ” [1]. The COH framework includes four main ways that business influences society’s health and well-being:

- Through the products/services business delivers to consumers (Consumer Health).
- In how it treats its employees and supply chain workers (Employee Health).
- By how much it invests in the health of its communities (Community Health).
- Through its impacts on the environment (Environmental Health).

Since the articulation of these four areas, and with the advent of the COVID-19 pandemic and the Black Lives Matter movement, the agenda has increasingly focused on an underlying element critical to attaining a COH, namely societal equity, i.e., the impact business needs to make in stemming the tide of increasing inequity in society [2]. In addition to the suffering inequity causes to the individuals whose relative position in society is lower, it also negatively affects societal health [3] and undermines global economic growth and prosperity [4]. Relevant to the COH framework, the Business Roundtable’s revised ‘Statement on the Purpose of a Corporation’ [5] redefines corporate purpose as serving society and all of its stakeholders—a radical departure from shareholder primacy. The World Economic Forum’s Davos Manifesto 2020 also includes a similar list of goals and stakeholders that business must serve [6]. As such, the COH aligns closely with the sustainability agenda in business and environmental, social, and corporate governance (ESG) metrics, connecting as it does people, prosperity, and planet.

Some connections between the Corporate Social Responsibility (CSR) agenda [7], and that of the COH framework can be drawn in terms of a company looking beyond its own business interests to create social and economic value through engagement with their communities and beyond. However, we consider there are important differences. For example, there is an intentionality towards CSR initiatives that relate to a company seeking to be viewed as a good corporate actor with many CSR projects separate from core business. In contrast, the COH framework is a strategic lens through which a company can view its collective efforts across the four domains of the model when they place health as a strategic driver. In this way, health connects the emergent possibilities relating to value creation. Of course, some CSR projects may seek to engage in community or other efforts that relate to advancing health and/or well-being. However, the distinction we draw here with CSR is the focus on health from the consumer, employee/worker, community and/or environmental perspective integrated with corporate strategy. The shared value model [8], which “involves creating economic value in a way that also creates value for society by addressing its needs and challenges” also brings relevant insights to dialogue concerning adopting a COH in business. The strategic shift from CSR to Corporate Social Innovation (CSI) [9] perhaps brings more to this debate, in that it seeks to align with company strategy—albeit, its focus will reach beyond health as defined in the COH framing.

The Automobile (Auto) industry was selected as the business sector in which the four different, but interconnected and hyper-dependent, pillars of a COH could be explored to develop a deep understanding of the contextual factors influencing a COH in business. The Auto industry has an outsized impact on societal health, in both positive and negative ways. Its positive contribution to the movement of people and goods throughout the United States of America (U.S.) is profound, being a key factor in the growth of the middle class. Indeed, the prosperity of the U.S. economy can be linked with the rise of the Auto sector as the founder of the first Auto company, Henry Ford, held “... *freedom of movement drives human progress*” [10]. Perhaps less widely appreciated is the influence freedom of movement through individual car ownership has on equity. One of the executives interviewed in the present study captured this sentiment, “*Mobility equals access ... without being able to move, you can't get anywhere on so many levels ... you can't access better jobs, a better life*”.

Indeed, for those with the least socio-economic status, owning a car consistently increases economic stability and overall prosperity. The negative economic consequences of not being able to afford a car are known [11], with the connection between car ownership and improved accessibility of the under-resourced to all elements of society including jobs [12], with the authors noting “... *vehicles, in most of the United States (are in themselves) essential infrastructure*”. It has even been suggested that those who have the least in society should be given priority and supported to have cars over those of higher socio-economic status who lack a commensurate need, given the environmental concerns of increasing numbers of gas-powered cars on the road overall [13].

Cars are particularly important for those in rural areas, especially those designated as ‘medically underserved’ [14], with some 30 million Americans lacking timely ambulance transport to a trauma center [15]. Car ownership has been associated with better health compliance, given easier access to doctor appointments yielding better outcomes [16]. It helps combat both food insecurity and food deserts [17–19] by extending grocery options and shopping patterns. It enables people to relocate more easily to low-crime neighborhoods [20–22], supports children’s participation in school activities linked to higher educational attainment, and is associated with a greater likelihood of gaining employment in adulthood [23]. As many of these issues disproportionately affect low-income U.S. communities, vehicle ownership can help advance social equity. One study commented, “*Families with access to cars found housing in neighborhoods where environmental and social quality consistently exceeded that of the neighborhoods of households without cars*” [24]. When low-income individuals obtain a vehicle, they are more likely to secure employment and enjoy better job security [25–28], with car usage linked to economic mobility beyond that of reliable and affordable public transportation [24,29].

There are also substantial negative costs to car ownership; vehicles can increase carbon dioxide (CO₂) emissions, compound traffic congestion, and exacerbate urban sprawl with substantial impact on environmental degradation (including climate change, air quality, and pollution from manufacturing), as well as fatalities and injuries that incur high social costs [30–32]. The use of personal vehicles contributes two-thirds of the 30% of all U.S. greenhouse gas (GHG) emissions produced by all modes of transportation [33,34]. Indeed, exposure to particulate matter (PM) from fossil fuel emissions accounted for almost one in five (18%) of total global deaths in 2018, with 10.2 million premature deaths annually attributable to the fossil-fuel component of PM_{2.5} [35]. Moreover, the burden of air pollution is not evenly shared, with poor people and some groups facing higher exposure to pollutants. One study estimated that minority communities incur around twice as much of the impacts from transportation as they cause [36]. The Global Burden of Diseases, Injuries, and Risk Factors Study 2015 [37] identified ambient air pollution as a leading cause of the global disease burden, especially in low-income and middle-income countries [35].

Electric mobility, driverless cars, automated factories, and ridesharing are just a few of the major disruptions the Auto industry faced even before the COVID-19 crisis [38]. Technological advances in electric (EV) and autonomous (AV) vehicles raise new possibilities to both address environmental concerns and offer new mobility solutions. For example, an aging population with co-morbidities, distracted drivers, inequitable access to private and public transportation, urbanization, and the growth of mega-cities would support a focus on a COH as a strategic agenda. Adopting the COH framework may help the Auto industry navigate the disruptions and changing societal expectations about the contribution business should make to impact positively society's challenges, with the four pillars guiding the sector's strategic initiatives.

The Auto industry is an important economic force in the U.S. with approximately seven million people employed overall: two million in manufacturing vehicles, parts, and wholesale trade; 3.8 million in retail trade, and another million in repair and maintenance jobs [39]. As such, the industry influences the health of its employees, workers in its global supply chain, as well as in communities near its factories and roads almost everywhere. There are some 1.4 billion cars in operation worldwide, with growth in passenger vehicles doubling every 20 years. Older vehicles affect the environment more than newer ones, given poorer fuel efficiency with greater GHG, nitrogen oxides (NO_x), volatile organic hydrocarbons and particulates emitted along with brake and tire wear emissions. With approximately 40 million used cars sold per annum versus approximately 17 million new ones in 2018 [40]—with an average of 6.75 years per transaction [41]—older vehicles failing environmental standards in one country are often exported to countries where standards are lower to the detriment of the global environment [42].

The present study uses the COH framework to explore how Auto industry leaders considered their company's role in promoting a healthy, sustainable, and equitable society as part of their company's business strategy. The focus was to explore how the initiatives of the Auto industry connected with the COH framework. The methodology centered on engagement with the top companies in the sector through interviews with C-suite, senior level executives, and managers. The aim was to understand the pathway to progress a COH in a business sector working at the confluence of the four pillars. Does a COH influence the thinking of top executives in an important sector of the economy? If so, how does this affect strategy and actions? Is a COH a path to value creation and sustainability?

2. Materials and Methods

To date, in-depth interviews have been undertaken with 65 leaders (C-Suite, senior executives, and managers) across seven major Auto companies (see Table 1) using an interview guide (Appendix A). Visits were also made to all the company headquarters. The aim was to understand the specific ways the company strategy considers a COH, with a focus on equity. The methodology for securing engagement with Auto industry executives

was effective given this industry rarely joins such efforts. Added to this is the context of the industry, experiencing major disruption in the market, as well as recent emissions and financial scandals in some companies.

Table 1. Culture of health: auto industry companies interviewed.

Auto Company	Interviewed	Location ¹
Bavaria Motor Works (BMW)	Yes	Munich, Germany
Ford Motor Company	Yes	Dearborn, MI, USA
General Motors Company (GM)	Yes	Detroit, MI, USA
Hyundai Motor America	Yes	Fountain Valley, CA, USA
Nissan North America	Yes	Franklin, TN, USA
Tesla Inc.	Yes	Palo Alto & Fremont, CA & Reno, NV, USA
Toyota Motor North America	Yes	Plano, TX, USA

¹ Headquarters and key facility locations visited by the researchers to conduct interviews.

Collectively, the Auto companies studied offered both a broad and deep look into the sector as a whole and the sample included:

- Two of the original ‘Detroit 3’ U.S.-based Auto manufacturers (GM, Ford), as well as the newest major technology company and market disruptor, Tesla.
- Two of the top three global automakers, by volume of vehicles sold globally, Toyota and the Renault-Nissan-Mitsubishi Alliance represented by Nissan.
- Broad participation from companies in the three most important global Auto manufacturing regions of the world, the U.S. (GM, Ford, Tesla), Asia (Hyundai), and Europe (BMW).
- The first (Tesla) and second (Toyota) ranked Auto manufacturers by market capitalization.

The first step in securing engagement of a target Auto company was to identify and secure the interest of an executive leader of appropriate rank who was able to obtain the full commitment of the company as a corporate entity, a prerequisite for inclusion in the project. Connections were made through Harvard faculty contacts, by direct ‘cold’ calls to company headquarters, and via invitations on LinkedIn professional networks. At least four-six interviewees were required per company. Interviews, typically 60-min duration (range 30-min to over an hour), were conducted between April 2018 and July 2020; most of the interviews were recorded and transcribed, and contemporaneous notes were always taken. Using the interview guide (Appendix A), and flexing to accommodate the interviewee’s role and responsibilities as appropriate, the discussion explored the different dimensions of the COH framework. To foster the frank sharing of information, confidentiality was assured with a Non-disclosure Agreement in place for one company. Accordingly, executives interviewed for the study are not identified, nor are any quotes attributed to a particular company. Data was reviewed thematically, drawing out key examples as they relate to each of the four pillars of a COH. Given the timeframe of interviews, the study effectively had pre-COVID-19 data as well as that secured while the pandemic was at its peak in the U.S.; where relevant this context is reflected in the narrative.

3. Results

The study sought to explore the COH framework in the Auto industry and map a range of specific initiatives and projects against one or more of the COH domains in order to illustrate how they connect with the COH model. To date, 65 interviews across seven Auto companies (see Table 2) have been completed. By level, the executives interviewed included 35 C-suite executives (including two Chief Executive Officers; CEOs), 24 Senior Executives, and six Management level staff. By functional area, the interviewees included representatives from General Management, Product Development, Operations, Manufacturing and Labor Affairs, Purchasing, Human Resources, Sustainability, Communications, Marketing, Information Technology, Government Relations, Community

Affairs, and new Limited Liability Companies (LLCs) started by corporations to pilot new technologies/business models.

Table 2. Culture of health: auto industry interviewees.

Auto Company	Interviewees ¹
Bavaria Motor Works (BMW)	N = 6: 4C; 2SE
Ford Motor Company	N = 10: 7C; 3SE
General Motors Company	N = 13: 8C; 3SE; 2M
Hyundai Motor America	N = 6: 1C; 3SE; 2M
Nissan North America	N = 6: 5C; 1SE
Tesla Inc.	N = 14: 5C; 7SE; 2M
Toyota Motor North America	N = 10: 5C; 5SE

¹ C = C-suite; SE = Senior Executive; M = Management.

In discussing the COH framework with Auto executives, the terminology typically needed to be reframed in language that resonated within the industry, with interviewees responding:

“Well, I’m not sure we’re the kind of company you’re looking for ... we don’t cure illnesses, we aren’t medical people ... ”

“We don’t really see ourselves as a health company ... ”

However, some C-suite executives resonated immediately with the framework, noting how their company affected the health and well-being of society:

“I don’t know what you are referring to by a culture of health exactly, but if you are asking whether we are trying to make people’s lives better, whether we care about how our business is affecting society, whether we want to improve society, then the answer is yes, we definitely do. Our CEO is on record saying this many times. Our top goals and objectives are aligned to this. We are out front on this”.

“So, first, I want to maybe redefine what health means in the context of what we do or what we can do ... in the communities. ... health also includes things like hunger, education, youth development, and the well-being of underserved communities ... social innovation, it’s how we are delivering impact in underserved communities or communities where we work and live”.

The Auto companies described technology and societal changes affecting their core business as opportunities, but also as pressure to make wise decisions about strategic investment to ensure the long-term viability of their business:

“So, the future is, on the one hand, uncertain, on the other hand, exciting, because of technological change and the pace at which this change is happening. The world will not look the same two years from now or five years [from] now as it does today, and the challenge for companies like ours and every Automaker is to stay ahead of the curve, stay relevant, always push the boundaries of innovation ... making society work better and lifting all boats at the same time, improving everyone’s lives”.

A majority of the C-suite and senior executives expressed sincere interest in making decisions that improved people’s lives in all dimensions:

“We have developed some very promising pilot programs that have great social impact ... innovation in partnering ... anchoring our understanding of the best use cases for electrified and autonomous vehicles which will address health directly, but also lead to less congestion on the road and more effective transportation for people who really need it ... ”.

Detailed thematic analysis of the results revealed key areas where the Auto companies' work mapped easily to the COH framework (Figure 1). These included means to advance equity among consumers, promote well-being among their employees, ways to create social and economic connections within their communities in the manner of an anchor institution, and actions to reduce their negative environment impact. Across the four pillars, we selected 12 examples (Table 3) informed by the interviews with company executives and illustrated by publicly available company press releases, company reports, and news articles featuring at least one of the seven automakers. The basis of selection included two key criteria: that the case illustrated one of more of the COH pillars in practice, and that the activity advanced equity. In calling out a particular example in one company should not be read as absence of such in another company.

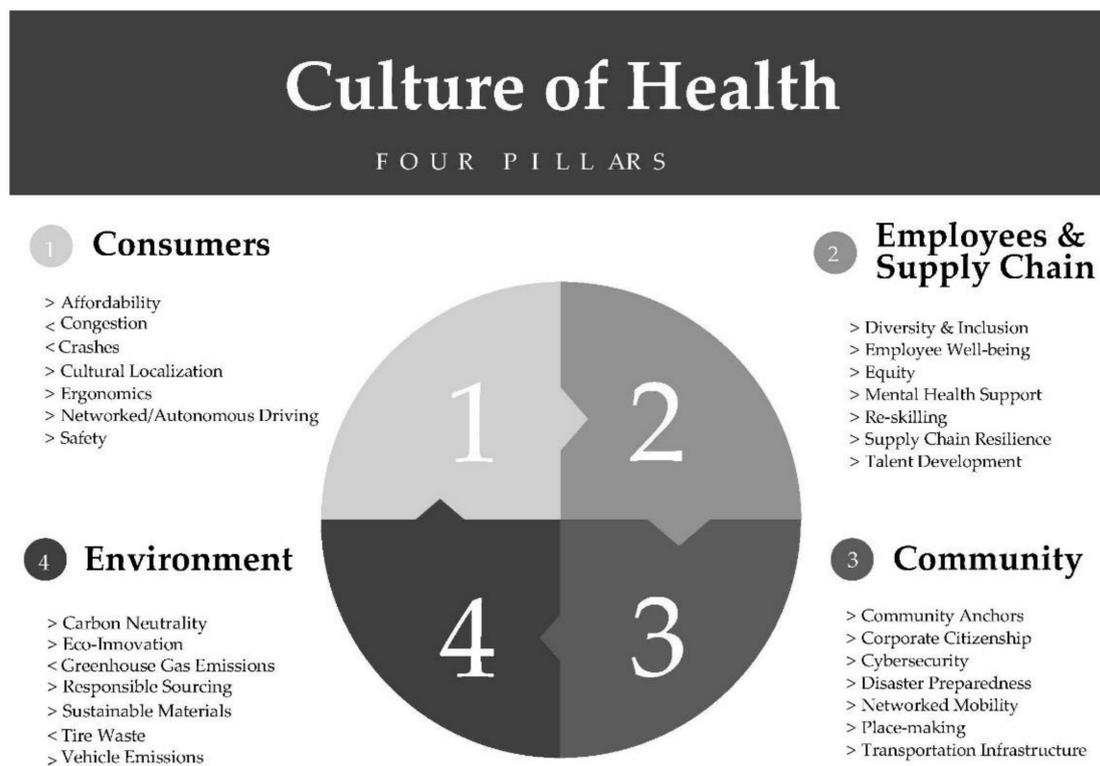


Figure 1. Culture of health: key thematic issues in the auto industry.

Table 3. Culture of health: auto company examples of activities advancing equity.

COH Pillars	Examples	Automotive Companies
Consumers	Financial Literacy & Inclusive Financing Generational Ergonomics Childhood Safety	Ford, GM, Toyota Ford, Toyota Toyota
Employees & Supply Chain	Organizational Well-being Mental Health Support Supply Chain Resilience & Inclusion	BMW, Ford, GM Ford, Toyota Ford, Hyundai
Community	Economic Anchors & Place-making Minority-Owned Dealerships Talent Pipeline Development	Ford, Hyundai GM, Hyundai, Toyota Tesla
Environment	Eco-Innovation Electric Vehicles Green Manufacturing Processes	Ford, Hyundai GM, Tesla, Toyota Nissan, Toyota

3.1. Consumer

All the Auto companies prioritize customer care, but operationalize this in different ways. Against the COH framework, it ranged from ensuring safety technology was standard across their product range, to enabling dealerships to educate consumers on health-related driving features. Here, three examples that reflect COH tailored to key customer segments are described. To be sure, declining U.S. interest rates and stagnant consumer demand for vehicles may partly explain the companies' programs. Yet, these initiatives have helped consumers take advantage of the benefits of car ownership [29], such as empowering them to build more expansive social and economic ties, gain employment, increase their earnings, and more easily gain access to medical care.

3.1.1. Financial Literacy and Inclusive Financing

Auto companies have sought to make the financing process more equitable and inclusive, lowering the barriers to car ownership. Several of the Auto companies improve access to car ownership among under-resourced groups by collaborating with local organizations. For example, GM Financials 'KEYS' program is a free education resource that equips car buyers with personal finance information with videos and articles that seek to clarify credit, budget, and leasing terms to support consumers' financial literacy [43]. A Toyota senior manager outlined their company's involvement in an 'On the Road Lending' (OTRL) program scheme, noting "*Reliable, affordable means of transportation can transform lives . . . so we've been supporting [OTRL] with Toyota Production System thinking and with cash*". Toyota was testing a program on financing used fleet vehicles for single mothers in economically disadvantaged areas near the company's headquarters, targeting those who could not get financing on their own, yet whose ability to earn a stable income most often required having a car. Auto companies were especially attentive to financial inclusion during the height of the COVID-19 pandemic, standing up programs to help prevent loan defaults. For example, through its Ford Credit subsidiary, the Detroit automaker formed a payment deferral program 'Built to Lend a Hand' while GM allowed consumers to defer monthly payments for up to 120 days, and offered interest-free financing for up to seven years on certain vehicles.

3.1.2. Generational Ergonomics

Auto ergonomics are being adapted to better address age-related physiological declines and health conditions so that customers 65-years-and-older—a group with weaker perceptual, motor, auditory, and visual skills who disproportionately suffer from age-related ailments—are enabled to continue driving safely [44]. For example, Ford designers and engineers created the 'Third Age Suit', a device that can simulate vision-related and nervous system impairments, and used the information to redesign the interior spaces of its cars. Toyota integrated consumer health into its automobile design process. For example, its in-vehicle cardiac measurement systems to reduce the risk of heart-related vehicle accidents [45]. AV are an ultimate solution to those with impairments that might affect safe driving. One senior executive at Tesla cited the company is leading efforts in AV as the reason they joined the company, given the life-changing impact this technology could have on a close family member suffering from a neurodegenerative condition.

3.1.3. Childhood Safety

Car manufacturers have worked to reduce the number of vehicular accidents and deaths involving children, directing critical resources to improving youth consumer safety [46]. While regulation and market demands compel automakers to engineer a safe riding experience, Toyota's commitment to childhood accident reduction targets safety education for under-resourced communities. Since 2004, the automaker has partnered with the Cincinnati Children's Hospital to educate more than 100,000 people nationwide about the importance of car seat installation. By detailing age- and weight-specific car seat guidelines, as well as specifics about adaptive car seats for children with special needs, Toyota

has encouraged caregivers to drive safely. Toyota also has a commitment to eliminating vehicle-related deaths among children, developing local partnerships in approximately 200 cities specifically focusing on under-resourced communities. For example, its 'Buckle Up for Life Safety Lab' in Austin, TX, USA offered one-on-one car seat installation instruction, knowledge about Texas's childhood passenger safety laws, and free car seats to families in need. The Lab reached individuals who may otherwise have lacked the ability to receive guidance on the importance of childhood injury prevention and reduction.

3.2. Employee Health

All the companies were fully conversant with standard employee metrics, including retention, satisfaction, and engagement, with most focused on increasing diversity, inclusion, and belonging. Health and safety were a strategic consideration given the link with creating a competitive business advantage [47]. Speaking to GM and BMW in follow-up discussions amid the pandemic revealed that well-being was now higher up on the agenda, as they recognized the differential impact of COVID-19 on people, whether through social determinants of health and/or the presence of co-morbidities.

3.2.1. Organizational Well-Being

Carmakers are transforming their organizational cultures to better support the physical, emotional, and social health of their employees. Clearly, companies are incentivized to invest in their employees; healthier workforces boost profitability, raise worker productivity, and combat absenteeism. Nevertheless, automakers have defined employee health as more than just a topline budget item. As BMW'S 'Health Initiative' notes, "*Health is our most valuable asset as human beings. We regard it as the basis for individual performance and personal enjoyment of life*" [48]. This goes beyond occupational safety, occupational medicine, and ergonomics to champion four new areas: exercise, nutrition, mental health, and addiction prevention. From employee welfare programs, to installing wood flooring in their factories rather than concrete to reduce musculoskeletal strain, these all speak to BMW's commitment to advancing a COH and philosophy that integrates personal well-being with job performance.

At Tesla, well-being is infused from the design phase of new vehicles, with factory health and safety experts drawn in to ensure the well-being of employees who make the vehicle is fully considered. Ford has developed a health-monitoring system based on wearable technology for employees at 15 manufacturing plants in seven countries. GM, spurred by the COVID-19 crisis, drew its Chief Medical Officer into a strategic role with the company's injury prevention focus transitioning to prioritize well-being.

3.2.2. Mental Health Support

With the COVID-19 pandemic, many Auto companies expanded or introduced new mental health programs to support their employees during this challenging period. For example, BMW stressed the importance of cultivating psychological and emotional well-being, advising workers to prioritize self-care. Similarly, Toyota bolstered its Employee Assistance Program, which offers personalized help from professional counselors via voice or video, to provide "*one-on-one help for employees to deal with their fear regarding health and safety, loss of control and uncertainty, loneliness due to isolation and social distancing, or frustration and distress due to changed routines*". Toyota has taken steps to improve the health of those populations disproportionately affected by the pandemic, noting, "*Minority populations—including those in the LGBTQ + community—are at increased risk during a pandemic*". The company is working with nonprofit partners to disburse grants, specifically related to providing mental health services, and has supported minority organizations' transition to a telehealth platform to ensure healthcare needs are met during the pandemic.

3.2.3. Supply Chain Resilience and Inclusion

Automakers recognize the importance of adopting a ‘healthy’ supply chain built on a relational and collaborative basis, noting as one senior executive interviewed said, “*For every one Auto job, there are ten in the supply chain. The question is, how to benefit everybody?*” Relevant to COH and equity, the COVID-19 pandemic saw many of the Auto companies in this study make their expertise available in support of the health crisis. For example, GM mobilized first for ventilators, working in partnership with Ventec Life Systems, reconfiguring its manufacturing facility in Indiana to scale up production with a federal contract to produce 30,000 ventilators [49]. Ford forged a collaboration with one of its suppliers, Joyson Safety Systems, for airbag materials and Beaumont Health for design, to manufacture reusable medical gowns [50] and worked with GE Healthcare to produce thousands of ventilators.

Tesla’s in-house vertical integration model has helped it imbue its culture into its workforce worldwide. Hyundai noted in its 2019 Sustainability Report [51] it has sought to create “... a virtuous cycle whereby we support growth in our value chain, and then share the value generated with our suppliers”. Ford has been intentional in purchasing from veteran-, minority-, and women-owned suppliers, spending over U.S. \$10 billion purchasing from under-represented enterprises in 2018, and creating a robust and sustainable procurement network.

3.3. Community

Several of the Auto companies cited work in the communities near their headquarters and/or major manufacturing facilities that went beyond efforts to be a ‘good neighbor’. Indeed, many had moved away from an approach based on corporate social responsibility (CSR) or philanthropy to one focused on corporate social innovation and collaboration with community non-profits, especially those working in economically depressed areas. Adopting a shared value model ranged from targeting issues relating to food deserts, lack of adequate medical facilities, poor transportation infrastructure, and limited adult training opportunities. In so doing, companies spoke of how this work was co-terminus with their human capital and sustainability agendas, with some companies expanding their view of community from where they have operations to everywhere their products were on the road in the world.

3.3.1. Economic Anchors and Place-Making

The role of the Auto industry in economic development and place-making is important [52]. For example, Ford is leading a cultural revitalization effort in Corktown, a traditionally low-income neighborhood in Detroit, MI, USA. Through redevelopment of Michigan Central Station and adjoining properties in this historically under-resourced area, its ‘Innovation Hub’ plans to help “*preserve the cultural heritage of existing neighborhoods, while creating modern, sustainable mixed-use spaces that foster innovation and community engagement*”. As part of the project, Ford is providing home repair grants for local homeowners, targeting lifelong residents or low-income individuals given redevelopment can often lead to uneven economic gains and displace long-time community members. Its goal of relocating company staff into the city aims to increase economic support to the community, but in ways that minimize gentrification.

Hyundai has used creative place-making to help enhance the lives of local community members. For example, its ‘Culture Station’ campaign saw it transform abandoned gas stations into public spaces, prompting a dialogue about how to transition from gas to electric or hydrogen fuel cell vehicles, with art murals of endangered Korean birds in Seoul’s public parks raising attention about biodiversity; both initiatives developed recreational spaces in support of well-being. Additionally, through its IONIQ Forest program, Hyundai planted 30,000 trees, specifically zelkova and pine trees that help absorb fine dust, at the Incheon metropolitan landfill. The effort helped combat land degradation, absorbing more than 500 kg/year of fine dust and sequestering more than 130,000 kg/year of CO₂.

3.3.2. Minority-Owned Dealerships

While minorities purchase some 30% of new vehicles, only 5% of dealerships are minority-owned [53]. As such, carmakers have provided capital and entrepreneurial resources to help minority individuals own and operate car dealerships. These efforts build business capacity among minority groups, who historically have suffered from discriminatory financial lending laws. GM, for example, through its Minority Dealer Advisory Council (MDAC) works to develop Black, Asian, Hispanic, and Native American business leaders, providing educational programming around customer acquisition and dealership profitability. It also offers access to GM leadership to voice feedback about the dealership experience, supporting communities traditionally excluded from founding dealerships.

In an interview with a senior executive, they discussed the carmaker's outreach in Atlanta, GA, USA. Referring to the region as *"the cultural epicenter of Black America,"* the executive discussed how creating a Black history exhibit and partnering with local minority organizations helped increase minority representation among the dealer body. Likewise, Toyota initiated outreach efforts by partnering with the National Association of Minority Automobile Dealers, *"combatting the inequalities and obstacles that historically stifle opportunity"*. To help mitigate these inequitable circumstances, the company's Toyota Dealer Investment Group provides operational, capital, and managerial support to qualified minority-owned dealerships and help communities flourish economically. Hyundai has also taken a long-term approach to placing dealerships in African American neighborhoods.

3.3.3. Talent Pipeline Development

Carmakers, long associated with apprenticeship programs, have expanded their efforts to support technical education programs and create career pathways. For example, Tesla has three programs that help make the recruiting process more equitable for individuals without a four-year college degree. Through its Manufacturing Development Program, recent high school graduates from schools near its major North America manufacturing facilities can start as a Production Associate and simultaneously enroll in a community college to learn robotics. This program expands opportunity pathways and increases equity in the hiring process. As one executive in an interview noted, talent schemes make *"a real difference . . . because we have so many students going right from high school into the workforce"*.

To date, over 100 high school graduates have entered the program. Similarly, Tesla's 'Student Automotive Technical Program' (START) partnered with local community and technical colleges to provide an intensive training program to equip students with the skills needed to work as Automotive Technicians. Over 300 individuals have been hired, and the carmaker has helped achieve a 90% placement rate every cycle of the program. This initiative has widened opportunity for traditionally under-resourced individuals and created a skills pipeline between local educational institutions and employers. Tesla has helped promote technical skill development through its 'Tool & Die Apprenticeship' initiative, noting, *"The vehicle manufacturing industry faces a critical shortage of tool and die makers, with only 2% of the industry being under the age of 35"*. The program brings together academic learning with on-the-job training and is hosted at Tesla's Fremont Factory; it has since expanded to other locations.

3.4. Environment

In terms of decreasing vehicle GHG and particulate emissions, all the companies focused on investing in potential solutions, but the approach chosen and the level of strategic investment varied. Some had developed and produced at least one EV model, others had no EVs in production at the time of interview, and some were investing in multiple options. Some defended gas-powered engines, highlighting dramatic improvements with the combustion engine, while others had publicly committed to an all-electric future. Many of the companies were working with cities on software to improve traffic flow, developing AVs, multi-passenger vehicles and 'last-mile' solutions.

3.4.1. Eco-Innovation

Automakers are developing innovative materials that are more biodegradable, sustainable, and durable. For example, through its research into the use of tomato skin, bamboo, and agave fiber, Ford implemented a tree-based cellulose hybrid material for use in the interior consoles. Since this material is 24% lighter than traditional materials, it has allowed for a less intensive manufacturing process that in turn has reduced GHG emissions and cut costs by 13%. The automaker also found that natural-fiber-reinforced materials could improve fuel economy and sequester carbon. Hyundai likewise has applied an eco-friendly approach to its materials design process. The carmaker noted that plant-based artificial leather, bioplastics, and plant-based paints “offer our customers better air quality inside their vehicles, greater durability, [and] improved safety”. For example, the seat foam in many Hyundai vehicles uses cardanol oil, a byproduct from cashew nuts. The automaker claims that this biomaterial increases interior hygiene by 99.9%, and is less energy-intensive to manufacture than a synthetic alternative. In partnership with the Rhode Island School of Design, RI, USA., the carmaker has developed a concept for a symbiotic bio-engine that is more environmentally friendly, and conceived of engineering designs for improved in-vehicle air filtration.

3.4.2. Electric Vehicles

Automakers have introduced into their product lineup EVs, which help combat environmental degradation, lower fuel costs, and mitigate the harmful effects of climate change. By replacing the internal combustion engine (ICE) with an electrically charged battery, carmakers are significantly reducing the CO₂ emissions that contribute to rising global temperatures and increased pollution. While the environmental consequences of EVs are known, recent studies point to profound public health benefits that would support a policy of rapid replacement of current gasoline and diesel cars and light-duty trucks with EVs [54]. With EVs becoming more available, and a tax credit of up to U.S. \$7500 per vehicle [55], sales have grown but still represent a small percentage of global vehicles. Taking all the parameters into account, the social cost of carbon benefits was U.S. \$10,400 per 150,000 miles with implications for environmental justice.

Tesla noted that in 2019 its vehicles resulted in savings of over 4 million metric tons of CO₂, stating, “This is the equivalent of saving emissions from being released into the environment from over 500,000 ICE vehicles with a fuel economy of 22 miles per gallon”. Given affordability as an equity issue, Tesla has committed to drive down battery costs and produce a model priced for wider accessibility. Likewise, other car companies have committed to electrifying their vehicle fleet. GM pledged in January 2021 to eliminate all tailpipe emissions from light-duty vehicles by 2035, offering 30 EV models by mid-decade [56]. Given its vehicle emissions account for some 75% of the company’s overall carbon footprint, the automaker’s planned shift to EVs will help address climate change. Additionally, Toyota has committed to producing 70% of its vehicles as electric models by 2030. Building on its identity as one of the earliest companies to commercialize hybrid vehicles, this effort will magnify the automaker’s removal of over 38 million tons of GHG globally. Low-income communities and communities of color disproportionately feel the impacts of vehicle pollution and can benefit the most from the clean air and cost-saving benefits of EVs [57].

3.4.3. Green Manufacturing Processes

Making efforts to reduce the environmental impact of their products, and improve the sustainability of their manufacturing operations, carmakers are mitigating carbon emissions and water waste. For example, Nissan committed itself to reducing CO₂ emissions by 30% compared to its 2005 fiscal-year levels. To achieve this goal, the company developed a new water-based paint that no longer requires energy-intensive, high-temperatures reducing carbon emissions by 25% and using dry painting booths that allows it to collect 100% of the residual airborne paint. This approach, which emphasizes resource conservation and

manufacturing innovation, helps reduce the company's carbon footprint. Nissan has also reduced its CO₂ emissions by 30,000 tons by improving its shipping and logistics processes. Similarly, Toyota has worked to advance environmentally friendly manufacturing policies. For example, reducing the procurement of plastic packaging by 25% compared to fiscal-year 2018, and working with a third-party vendor to implement habitat management policies at its major worksites to help protect biodiversity as part of its sustainability strategy.

4. Discussion

This study explored for the first time the COH within the Auto industry, examining the inter-dependence of health and business. It sought to illustrate where initiatives of the Auto industry could be connected to the COH framework. While it might appear oxymoronic to place the Auto industry within a COH, doing so offered a crucible [58] in which to examine the confluence of the four pillars. While all the companies had active CSR agendas in play, health was an important consideration for the Auto companies' current and future business strategy. However, the industry did not regard its efforts in this domain as a 'health strategy' per se. At first hearing, the COH framework was typically received as being about health as individual disease and disability and, with the exception of concern for employee health and safety, out of place with their purview. However, upon deeper exploration, leaders talked about how their work focused on improving the quality of life for people and the planet. As such, the COH terminology needed to be reframed in language that better resonated for Auto leaders to engage fully with the agenda. Having done so, it was clear all of the seven Auto companies studied were engaged at a strategic level in advancing a COH, with a strong heritage or mission guiding them to "*do the right thing*". At the conceptual level, they understood that part of their role as an Auto company was to improve people's lives, with executives displaying a clear sense of purpose to serve society through mobility solutions.

This study presents an opportunity to examine strategy and actions through the lens of health, from wide-scale negative impacts on human and environmental health to extensive positive benefits associated with mobility, especially for the under-served [13,26–29]. Auto was a good choice because it deeply affects everyone in the U.S. and beyond, for better or worse through whom it does and does not serve. Specifically, its negative impact on climate, air quality, and health; its impact on workers and communities throughout the global supply chain and where its vehicles are produced and on the road, as well the communities in which they are produced; and connections between car ownership and economic advantage and resilience. With strategic pivots to confront its responsibility for climate change and GHG emissions, with poor air quality in urban areas and along mega-highways disproportionately affecting the health of under-resourced people, the Auto sector is experiencing major disruption and transformation from principally manufacturing vehicles to developing broad-based mobility solutions. A COH can help guide their efforts.

For example, by integrating COH-related thinking into its design process, Ford ensured that elderly customers could still drive safely, helping make roads and highways safer for all. Likewise, Toyota's focus on detecting heart-health metrics while driving focused on consumers' health. A greater emphasis on employees' health, including mental health, went beyond occupational and workplace safety into supporting well-being. Adopting a relational approach with their supply chain workers supported corporate resilience, while a focus drawing vendors from all sectors of society was a way of promoting equity. This extended into the efforts automakers are making to invest in their local communities' and enhance quality of life and opportunity for all by investing in education and job creation. All the automakers were paying close attention to building a greener, more energy-secure and more environmentally friendly future, recognizing these changes help under-resourced communities, who are affected disproportionately by transportation-related pollution. Initiatives to pivot to EV will help combat environmental degradation and climate change and yield material public health benefits.

Simply re-framing COH as a strategic intent moves it to a top-line imperative. All of the seven Auto companies demonstrated a strong understanding of the general expectations of them to contribute more to societal health and well-being and to minimize the negative impacts of their business operations. All the companies had active CSR agendas in place [59], but none had adopted health as a strategic lens through which they viewed their corporate actions. No one company had strengths across every COH pillar, but none showed uniform weakness either and there was a general understanding that doing good for society was expected of them. How a company was doing at the time of the interview (vis-a-vis traditional business metrics such as its stock price, profitability, or the perception of it by Wall Street), did not appear to be the fundamental driver of how the companies viewed their ability to make strategic moves related to a COH. Rather, many executives spoke eloquently about how their product affects people's lives and society through allowing greater freedom and mobility. Indeed, the importance of access to a reliable car to their customers' overall quality of life, well-being, and economic stability was understood at a visceral level.

All the companies had embarked on initiatives that could be related to a COH using an equity lens, from increasing access to car ownership, approaching vehicle emissions and safety features, and developing mobility solutions that address the isolation of socio-economically disadvantaged communities directly. Recognizing that those least able to afford cars benefit most from having them—for example, by increasing people's ability to secure and keep better paying jobs [12]—the companies had made various efforts to enable affordable ownership. Likewise, there was full acknowledgement that environmental impact affects economically disadvantaged communities who are more often located close to highways with consequent higher rates of serious health conditions [60,61]. Making safety features standard, especially on economy models, was also a way in which equity was supported, ensuring those who are poorer are not forced to decide between affordability and safety.

As we demand more from business, now is the time for business to take a lead role in promoting societal well-being and embrace a COH as the framework joins sustainability with equity. As one executive commented at interview, *"In our minds sustainability isn't just about the environment or our employees. It's about social responsibility very broadly. It's about what are the basic human rights and what should we be doing to make them available to everybody? We want to have a positive net impact. We want to help put more freedom back into the cities"*. Consumers, employees, suppliers, communities, and investors are all looking to companies to generate positive social returns as well as financial returns, paying all due attention to reducing negative environment impact and a move to restorative approaches. Amid the COVID-19 pandemic, business leaders at all levels recognized health as an agenda for business. The Auto industry is ripe for health-accelerated change through the confluence of it being disrupted by the 'experience economy', as well as the impact of COVID-19 on mobility trends. Rather than market-based evolution, which optimizes commerce at the expense of the well-being of people and planet, the focus will be how leaders progress mobility solutions that reflect an ecology of people, cities, and the natural environment based on equity, community, and well-being.

The Auto company executives interviewed agreed on the sector's core areas that affect health: access to mobility, environmental sustainability, and driver safety. However, the relative priority of these areas and thereby the degree of corporate attention given to each, including to social inequities that may amplify overall health impacts, varied by company. Furthermore, some companies defined additional goals or targets that reflected their company culture and business strategy, such as adopting the Sustainable Development Goals, prioritizing social investments in the communities in which they do business, or investing in their workforce development beyond traditional health and safety protections, such as skills training.

The majority of Auto company executives interviewed were involved to a greater or lesser extent in actively refining their corporate strategy, being intentional in their consideration of their future role, risk appetite, and reputation. Trust in the Auto industry has been challenged, with concerns arising from emissions scandals and cover up along with product defects, job losses, factory closures and loss of life due to accidents, diminishing air quality and being complicit in efforts to roll back fuel efficiency standards. Tesla's disruptive influence is changing the Auto industry for the better, reflected in the recent announcement by GM [56] to be carbon neutral and new that automakers are dropping their opposition to California's climate rules [62]. Uncertainty is high given the technological transformation of the industry with still many unknowns in battery power, artificial intelligence, and consumer adoption of shared mobility and integrated transportation and energy systems. The COH framework offers much in bringing together health with business, sustainability with equity, and offering insights into the hyper-connected and inter-dependent nature of these agendas.

The future of mobility [38,63] relies on the interface of human experience with technology; it is a population-level challenge demanding system-level changes. Rather than seeking to atomize the problem, adopting the COH framework can help promote work at both a strategic level and a community/system level. Pioneers, innovators, and activists are building the field, moving beyond technological determinism to transformational impact, to partnerships defined by inclusion, learning and self-organizing communities. With the impending downturn of the industry, leaders are seeking a future path to profitability with ongoing exploration of EV and AV, as well as shared mobility and connectivity. With original equipment manufacturers (OEM) deciding where to focus, disruption continues apace with interest in data monetization from connected networks.

However, these mobility trends may pause as more people choose to own a car and/or drive more because of concerns about COVID-19, ride-sharing, and public transport, and seek car ownership due to an all-time low on oil prices. At the same time, economic pressures may see new car sales decrease further, with more older and uninsured vehicles on the road because of unemployment, missed payments, and policy lapses. While working from home for some will reduce the commute, this is not applicable across all social groups, with under-resourced populations challenged by the move to technology-enabled work itself an issue of equity. The lived experiences of the pandemic will however serve to reinforce the connections between health and business. From needing to make the case for health, perceived as a cost to business, we now have the opportunity to position health across the four COH pillars as a business asset. Adopting a COH framework can help Auto company leaders make change in and through their companies to survive and thrive in a post-COVID-19 world.

As the World Economic Forum noted "Mobility is a fundamental human need, and an essential enabler of prosperity. But the current mobility paradigm is not sustainable" [64]. Adopting a COH at a strategic level could make an important contribution to the massive transformation underway in the global mobility systems, and in defining a new social contract with the Auto industry. Interactions between organizational practices and socio-ecological systems relies upon a deep understanding of equity and opportunities for shared value creation. The Auto industry is a suitable vessel in which to explore such questions and in which to pilot evidence-based interventions that bend the arc of the curve toward health justice. Ahead, there are fulsome opportunities for the Auto industry—and business in general—to embrace fully Quelch's foresight that "Every company, knowingly or unknowingly, impacts public health . . ." [1].

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Appendix A. Standard Interview Guide

1. How does {company}’s overall business strategy incorporate improving people’s lives, health, and well-being? Does the {company} have a ‘health strategy’? What language do you use (both internally and externally) to describe the company’s impact on people’s lives, health, and well-being?
2. How do you view the area you lead/work in as contributing to the {company}’s progress in making people’s lives better and improving their health and well-being? Specifically, what are the initiatives that the {company} has undertaken to impact the following four areas, and how do you measure this impact for each area? (Feel free to focus on the area[s] most impacted by your work):
 - Communities
 - Consumers
 - Employees (including supply chain)
 - Environment
3. How much or little does regulation drive the {company}’s goals and objectives in improving people’s lives across the four areas listed above? Where it is not regulation, what does drive the company to undertake initiatives aimed at improving people’s quality of life? How do you measure the impact your initiatives have?
4. What do you think the {company}’s strongest contribution to improving people’s lives is now, and what will it be 5–10 years out? How does the {company} measure its impact on people’s lives, and what areas do you think the company will need new ways to measure in the future given the major transformation the industry is experiencing through both advances in technology and changing business models?
5. What are your views on how the auto industry overall is impacting society’s health and well-being today, and what could it do better moving forward?
6. What targets do you think the industry as a whole should aim for in the future (5, 10, 20 years)? What kinds of measurements do you think are needed to show progress against them?

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