

# Using Systems Theory to Analyze Management Styles, Market, and Product Competition Between Tesla and Legacy Carmakers

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## Abstract

*Tesla Motors has captured the public's attention, making its CEO a celebrity while legacy carmakers are scrambling to catch up in electric car production. This paper examines the competition between Tesla and legacy carmakers using systems theory to analyze three battlefields including: 1) mechanical management versus organic management; secondly, 2) stable markets and of dynamic markets; and, thirdly, 3) as a battle between analog versus digital products. Tesla is an evolved Silicon Valley Deming, an organic organization producing digital products, whereas Detroit legacy carmakers are mechanical organizations producing analog products. We use the historical comparative method to examine a longitudinal history of what happens when evolved management and products meet in stable and dynamic markets to inform analysis of what has already taken place and for the future in the competition between Tesla and legacy carmakers.*

## 1. Introduction

The Mass media, businesses, governments and the public are fascinated with the clash between Tesla and legacy car manufacturers. It is a battle between a defiant upstart evangelizing non-polluting technology and older familiar brands with the venerable internal combustion engine. Who will win? Who will lose? What market changes are we witnessing if any? Whom should I invest in? Or should I even purchase a car? Questions abound as the drama plays out before us.

The Big 3 closed plants in the United States and moved production to Mexico, while Tesla opened the world's largest factory in Texas, and opened the world's most advanced car factory in Gigafactory Berlin-Brandenburg. Tesla has one of the largest super computers in the world and continues to invest billions in chip design, batteries, software, robots, and aerodynamic design. Meanwhile, the legacy carmakers contract out for chip and software design. Chip shortages during the pandemic have hit legacy carmakers more severely than Tesla because Ford, GM, Volkswagen, etc. contract out for digital products and services while Tesla's are in-house. A forward-thinking research comparison in forward thinking research has the legacy carmaker Honda demonstrating their Asimo robot while Tesla's

Optimus robot is slated for commercial release in 2023 or 2024. It is like comparing a bullet to a cruise missile. Asimo is a proof of concept with the simple goal of expanding robotic visual and balance technology, while Tesla's robot is able to interact with humans using spoken language, and can carry out fine motor skills while walking in the house doing domestic chores. Asimo is a PR campaign stunt for Honda, but Optimus is a commercial product that will change the home as we know it. The difference in magnitude of change is phenomenally disparate, whereas Optimus is light years ahead of Asimo [1], [2].

Tesla travels in a different realm and is cut from a different cloth than the legacy carmakers. We will examine the competition between Tesla and legacy carmakers on three battlefields: management, market, and product. These are not the only fields of engagement where competition between organizations can take place. For example, witness how the Big Three have eliminated competition through surrogate government litigation that squashed Tucker Motor Corporation, TMC, when TMC was threatening the stability of the auto market when it posed the threat of a competitor introducing rapid innovation and concomitant capital investment. However, our goal is not to examine maneuvers outside of the market, but is to use theoretical constructs established by systems theory to analyze the historical engagements of competing organisms in the market.

Ultimately this involves comparing Deming Models because Deming directly taught the Japanese in the 1950s, Detroit in the 1980s, and Silicon Valley indirectly. Edward Deming conceptualized his model in two iterations he calls his four parts of profound knowledge and fourteen points for total quality management. Starting with profound knowledge, the Deming model composites four distinct parts: Appreciation for a system, knowledge about variation, theory of knowledge and knowledge of psychology [3], [4], [5]. The first part is appreciation for a system. For Deming, appreciation for a system refers to the idea that the leader(s) of an organization should have not only a nuanced knowledge of the system that one manages but should thoroughly understand the magnitude and power the organization has in society. He further posits that if one does not completely understand the system they are managing, they are incapable of

fixing or improving it; particularly when challenged with expected or unexpected variations[4].

The second part is knowledge about variation. For this part, Deming argues that there are two causes of variation: common cause and special cause. Common causes of variation are internal and can be predicted with probabilities. These causes may not be statistically supported; however, they are predicted based on historical occurrences. The other variation is special cause. This cause of variation occurs unexpectedly and usually after there has been a sudden change in the system. This change can be internal or external and cannot be predicted [3]. Organizations can be better prepared for both types of causes of variation by analyzing and understanding pragmatic theory.

The third part of the Deming model is theory of knowledge. Deming posits that systems' evolution isn't contingent upon a continuous study of the organization. Deming makes it clear that knowledge is the concrete foundation for the sustainability in an ever-evolving marketplace. This knowledge is grounded in the application of theory. Theory provides the framework and gives meaning, understanding and context to the experience. Finally, Deming argues there is a distinction between knowledge and information. He argues that information is without the application of theory and analysis and does not improve the process [3], [4], [5]. Without the knowledge, a system can lose its identity, which bears the final part.

Deming hypothesizes systems self-organize around its identity. Thus, the final part of the Deming model is the psychology of change. Deming recognizes and appreciates the fact that organizations are as distinct as a fingerprint. Systems are unique and personalized by its vision, purpose, guiding principles, values, history, theory of success and shared aspirations. The identity may be designed by leadership, or it may evolve without design, more by accident. However, if it occurs accidentally, it will lack clear and shared direction. Here, Deming explains the difference between formal organizations and informal organizations. For a system to sustain, regardless of how it started, it must become formalized to have a long life -span [4]. These four parts of Deming's profound knowledge are often deconstructed into his fourteen points for total quality management. He posits that the total quality management principles can be put into place by any organization to more effectively implement total quality management that will drive productivity and profits. These principles include:

- i. Create constancy of purpose for improving products and services.
- ii. Adopt the new philosophy.

iii. Cease dependence on inspection to achieve quality.

iv. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.

v. Improve constantly and forever every process for planning, production, and service.

vi. Institute training on the job.

vii. Adopt and institute leadership.

viii. Drive out fear.

ix. Break down barriers between staff areas.

x. Eliminate slogans, exhortations and targets for the workforce.

xi. Eliminate numerical quotas for the workforce and numerical goals for management.

xii. Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system.

xiii. Institute a vigorous program of education and self-improvement for everyone.

xiv. Put everybody in the company to work at accomplishing the transformation [6].

In sum, the Deming model of profound knowledge can be applied to organizations by clearly defining quality and applying empirical knowledge and concepts to organizations that can increase productivity and profit. In addition, his fourteen points of quality chores everyone in the organization. In this study the Deming model will be equated with Japan and advanced form of Deming management will be equated with Silicon Valley companies in the tradition of the HP Way. With the 14 points, top management has more leverage towards continuous improvement; however, their policies that they create can conceal and stunt the organization's growth [3]. For example, have legacy automakers stunted their growth by allowing Tesla to take the helm of automobile innovation?

## 2. Method

This paper frames the competition between Tesla and legacy carmakers in three fields: the first being a management battlefield between mechanical management and organic management; secondly, a market battle between stable markets and dynamic markets; and, thirdly, as a platform battle between

mechanical-analog products and digital platform products. Fordism will represent mechanical management and is hierarchical where, similar to children, workers should be seen and not heard, managers tell workers what to do and is, for the most, part one-way communication where information rolls downhill from management to the ranks. Mechanical management is defined by hierarchy, where a key feature is communication is predominantly one way from the top down. Japan in the 1950s and beyond will represent classic Deming management since Japanese CEOs learned the method directly from Deming at General McArthur's request. Silicon Valley' high tech' and computer companies will represent an evolution of the classic Deming method based in the Hewlett-Packard tradition where innovation and rapid change based on an unstable market define a key difference where rank is even further reduced, and horizontal organizations and "teams" are emphasized much more than in classic Deming management. Silicon Valley Deming management style is thus more 'organic' than Fordism or classic Deming because solutions are much more likely to rise from the bottom ranks and go upward [5].

Mechanical management and classic Deming work well with stable markets, but Silicon Valley Deming management is in its element in unstable markets. A stable market is where the product does not need to change, and basically remains the same. An example of a stable market is represented in the case of the Checker Marathon automobile that remained essentially the same car from 1956 to 1982, with minor variations in the interior, engine, and trim, such as headlights and turn signals, and to this day Checker Taxi, the taxi version of the Marathon, is still recognizable as a transportation icon even though it has not been in production for 40 years [7]. Silicon Valley companies thrive in an unstable market that is marked by rapid change and innovation, because they are the ones that introduce innovation especially when competitors do not. Bill Hewlett and David Packard started Hewlett-Packard in a garage in Palo Alto, California in 1939, producing an oscilloscope that they sold for \$79, while less stable oscilloscopes sold for \$200 or more. Bill and David figured they had to sell innovative products that cost less because their company was a start-up and was on the West Coast which was not associated with and was a world away from the established electronic companies of the time located in New Jersey, New York, Pennsylvania and Massachusetts. Hewlett-Packard started that way and kept their products rapidly changing through to the 1980s living by the axiom "do something new with something old and do something old with something new, but never do something new with something new." Hewlett-Packard emphasized a culture where college degrees and rank were essentially

unimportant, whereas innovation and ideas were valued and prized [8].

The third battle of competition is one between analog and digital enhanced products, aka also referred to as digital products. The East Coast and Midwest were the homes of the assembly line, the old electric vanguard of Edison and Westinghouse, and mechanical organizations. The West was where Deming was born and was where Silicon Valley gave birth to home computers, the digital age, and the HP Way. The difference in attitudes, capital investment, and laws is why California gave rise to Silicon Valley instead of Massachusetts, and is the reason both Bill Gates and Mark Zuckerberg left Harvard University and went West to the Golden State in search of starting digital companies [9].

In systems theory, this is a classic battle between organisms of different management styles and concomitant organizational structures, to see learn what organism will survive in its environment, the market, selling its product. This involves a longitudinal view, and, as such, a genealogical history will structure the narrative in order to contextualize players, management styles and organizational structures, markets, and products in play. Thus, the main primary method is a longitudinal historical comparative method involving a narrative describing key critical elements in the roots of legacy carmakers, represented by Detroit and the 'Big Three' and the key elements in the structure of Tesla.

### 3. Results

In 1913, Henry Ford ushered in a new age with his mass production assembly line producing Model Ts where a customer could have any color as long as it was black. Fordism management and its mechanistic organization, under advisement from Frederick Taylor no less, ruled the day until the sweet tranquility of mass manufacturing stability was derailed by a violent international crisis known as World War II [10]. The United States government needed bullets, bombs, planes, and tanks that would not fail, so a new management style, the Deming method, was taught and required of American businesses. The Deming method is a 14-point model for total quality management. Similar to the scientific method, it is designed to help organizations make better business decisions by using statistical analysis to focus on continuous improvement in manufacturing quality products instead of fixating on cutting costs [5]. The Deming method reduced product error in a process achieved through the reduction of social hierarchy, increasing communication, and democratizing the work place workplace [4]. The Deming method won the war abroad, but it failed to gain followers in the U.S. corporate world [3]. Free from federal contracts and

War restrictions, most manufacturers, including General Motors and Ford, abandoned the Deming method as fast as they could and reverted back to anachronistic mechanistic organizations, management, and hierarchal positions and status [11].

Japan was a different story. The once mighty economic powerhouse of the Pacific was decimated by massive aerial bombings that had reduced factories to rubble and made millions homeless [12]. In 1949, four years after the War, food was still at a premium, and starvation was still an issue. General MacArthur was in charge of getting Japan back on its feet, and he pleaded, cajoled, and convinced William Deming to visit Japan to teach his business methods and management style to the Japanese [4]. Deming arrived in 1950 and promised business leaders if they followed his methods, they would gain market share and double production every year for a decade [3]. Japanese executives may have been skeptical about such radical ideas, but they implemented them because they were in a desperate situation.

During the first decade, each Japanese company using the Deming method exceeded Deming's projections, so that by the next decade, Japanese businesses were well positioned to dominate key critical industries [3]. During the 1960s, one by one, Japanese corporations used the Deming method to gain global dominance in manufacturing motorcycles, cameras, radios, and televisions. The Japanese "economic miracle" was thus American bred. In less than the 20 years, Deming's management methods had helped win World War II, had been discarded by American businesses, were recycled by a defeated nation, and had resurrected a shattered economy [4]. In the 1970s and 80s, Toyota, Nissan, Honda, and Mazda would topple the once all-powerful General Motors, Ford, and Chrysler [13].

By the 1980s, the once unbeatable American economy was in full industrial retreat as steel and automobile corporations closed factory after factory [13]. Suddenly, with lost market share and non-existent profits, American car companies begged Deming to come teach them how to make cars less than 40 years after unceremoniously throwing him and his methods out the door like an unwanted stepchild. For all the claims and advertising of "Quality being job one," the big three remained unrepentant and to the core were still Tayloristic in essence and mechanistic in organization. All the Deming workshops and flow charts were a band-aid approach that did not change the systemic problem of mechanistic organizations trying to survive in a changing environment of innovation and social organization [3].

The 1960s produced much more than Woodstock as some ephemeral gathering symbolically representing a fantasy of peace and music. The era

produced idealists informed by the logic and wisdom of Frantz Fanon, Rachel Carson, Martin Luther King, Jr., and Bobby Kennedy. These idealists were tired of bleached, authoritarian, sexist Tayloristic management styles where women did not worry their pretty little heads, people of color knew their place, and rivers caught fire because a little industrial pollution never hurt anyone [11]. These were idealists who recognized the industrial age was passé, and it was killing people and the planet. These idealists wanted to create companies and governments that helped people and the earth to heal and live full lives [13]. They wanted to make a world that was as real, dynamic, and innovative as their music.

The 1978 advertisement in Personal Computing magazine read, "Start your own revolution – with a personal computer," and reflected the 'can do, if it does not exist create your own solution' attitude born by the idealists fresh from the 1960s who were looking to change the world and save the planet [9]. The San Francisco Bay Area had a bohemian, American Revolution zeal cultivated by college protests and engineering at San Francisco State University, University of California at Berkeley, San Jose State University, and Stanford University [14]. The region followed the lead of San Francisco, a city with a long, rich history of eclectic thinking and individual freedom.

More importantly, by 1970, the area and computer freedom movement had elder statesmen with successful companies, like Hewlett-Packard. Bill Hewlett and David Packard started their company in a garage in 1939., and by 1970 they had a successful high-tech company that had been challenging, for over two decades, traditional norms of company growth while explicitly contradicting the Taylor management ethos of rigid hierarchy and workers who should be seen and not heard, taking the Deming method further in its evolution [15]. "The H-P Way" of management, encouraging communication, equality, and profit sharing, had become a rallying cry and a blue print for new companies in the area [8]. By 1970, companies and divisions, such as Fairchild Semiconductor, Intel, Advanced Micro Devices, Stanford Research Institute, and the Palo Alto Research Center, were forming a nucleus of what would become 'Silicon Valley.'

Thus, the San Francisco Bay Area had created three foundational components that were key to the rise of Silicon Valley: a cadre of engineers and computer enthusiasts from local universities with revolutionary attitude and zeal; a growing nucleus of older companies privy to the HP management "way," a nucleus growing financial backing; and the final piece to fuel the mix for explosive success was California state laws that allowed former employees the freedom to start companies without being sued

by companies for which they had formerly worked [14]. Individuals organized clubs and businesses to promote democratizing the power of computing and argued this power should be in every home rather than only in the hands of powerful governments, institutions, and corporations. Individuals, such as Doug Engelbart, Nolan Bushnell, Bob Albrecht, Roy Kepler, Pam Hardt, Lee Felzenstein, Liza Loop, Fred Moore, Paul Terrell, etc., started organizations, such as Atari, People's Computer Company, Kepler Books, Resource One, the LO-OP Center, Homebrew Club, the Byte Shop, etc. [14]. These organizations brought people together and they did things, such as teaching free computer classes and providing public access to computing, that fomented what would become the home computer industry and Silicon Valley [9], [14]. In 1976, new companies, such as Apple Computer and IMSEA, were producing a new product, the home computer, in an area fraught with revolutionary philosophy promoting fulfillment before profits. By 1977, the area was hosting the largest event of its kind, the West Coast Computer Faire, with an attendance of 13,000 micro computer enthusiasts [9].

By 1980, the Faire had grown in size, and the phenomenal growth in revenues for Apple Computer, IMSEA, Atari, etc., had made Wall Street and Japan take notice. The new home computer market was not a temporary fad, but was becoming more integrated into the home and daily use [9]. Wall Street wanted in on the profits and a piece of the action. Japan saw a new territory to conquer and thought it would be so easy to conquer the Californian upstarts, just like Japanese businesses had done in motorcycles, cars, cameras, and televisions. But while the Japanese were good students of the Deming method, they were poor observers of their opposition, and made a fatal error. The California start-ups were not based in mechanistic management styles like camera, television and car companies predicated on mass production, but were in essence the next step in evolution of the Deming method for they were egalitarian organizations rooted in the HP Way that thrived in dynamic markets predicated on rapid innovation and change [3], [11].

In the 1980s, Japan's Ministry of Industry and Trade, MITI, set about repeating the "Japanese Miracle" by organizing electronics giants, like Hitachi, SONY, and NEC, to negotiate a common strategy and common standards for a single chip on which to base a common home computer design that would make economies of scale possible. These negotiations took months, and ramping up production took even longer, so by the time Japanese companies came to market with their micro-computers they were woefully inferior and out of date. Change and innovation in Silicon Valley happened with a rapidity that was counted in days and weeks, not months and years. For the first time,

the Japanese and their method of production and management were unequivocally defeated, and it was embarrassing. Silicon Valley welcomed the Japanese challenge in a way Detroit never had, because the revolutionary upstarts viewed Japanese corporations for what they were: one step removed from the evils Silicon Valley was fighting. The Japanese had to be defeated so the planet could be saved, and rapid innovation and change were the weapons of choice.

#### 4. Discussion

On a serious note, there was a battle between Tesla Motors and the legacy car companies, including those beyond Detroit, such as Volkswagen, Toyota, etc. This is a battle Detroit cannot win in the three fields of management, market, and product. Fordism mechanistic management ruled the day in 1920. During the 1970s Detroit was knocked out by the Deming method and Japanese MITI economies of scale, and in the 1980s Deming and MITI were O.K.'s equivocally by Silicon Valley revolutionaries fighting with the DNA of Deming that evolved into the HP Way. Detroit is hopelessly entrenched in a bygone era of hierarchy and mindless repetition while Japan remains rooted in less antiquated economies of mass production. Meanwhile, Tesla Motors' production and their products are thoroughly rooted in the home computer revolution that has transitioned into the cyber world of the internet and connectivity.

The first field in this battle is management, and Tesla is absolutely destroying both Detroit and Japan in this realm. Detroit and Japan are mechanistic and wedded to living in a world where mass production thrives in a stable market. Meanwhile, Tesla is predicated on the revolutionary ethos of saving the world. Their management thrives on rapid innovation and the resulting unstable market, similar to the dynamic competition witnessed in computer hardware and software industries. Tesla is cut from a different cloth that feasts on a market of rapid change, not one that abhors investing in innovation for fear of losing profits at the expense of capital investment. How does this translate to production and sales?

Tesla's Fremont plant used to be the NUMMI, New United Motors Manufacturing, Inc., plant that was jointly run by General Motors and Toyota. Workers at the NUMMI plant were retrained by being sent to Japan to work on Toyota production lines to learn Toyota's methods [16]. Peak NUMMI production reached 8,442 cars per week in 2006 [17]. However, Tesla management has redone the factory with the most advanced manufacturing machines and processes, and in 2021 it was the most productive automotive factory in the United States, producing 8,550 cars a week, surpassing the NUMMI record and every Big Three and Japan Inc. car producing

plant in the U.S. The Tesla record of units produced at Fremont is amazing in its own right and is impressive, but it becomes more complex when you understand this high production number was achieved while their production lines make parts and production changes on a daily basis. Tesla can make these changes because their lines are designed for it, where parts machines can be changed with software programming to manufacture an updated part. Tesla does not have to wait for an annual model year shut down of the plant to introduce part changes, as is the case with older plants run by legacy carmakers. Tesla management based in an advanced evolution of Deming management has produced the evolution of the automotive factory that can literally make changes to the line on a daily basis because it is based in the Silicon Valley tradition of catering to rapid market change instead of mass production catering to stable markets and mass replication.

This leads us to the second field of the market. It is hard to find a news story about Tesla where they are not labeled as a “disruptive” company in a market where legacy car companies crave stability [18]. All these writers should be sued for malpractice because this diagnosis is at best tragically misleading, for Tesla is not disrupting the market, but is transforming the market. Detroit and Japan are reactive to markets and invest heavily in advertising on traditional media of print, radio, television, and film. Tesla spends zero money advertising in print, radio, television, and film, and instead uses social media, product events, and the internet to sell their cars. Tesla has more in common with Apple Incorporated than they do with General Motors or Toyota. Take note journalists and business schools.

Apple Incorporated was also misdiagnosed as “disruptive” when they were transforming markets from day one, but that transformative characteristic is hard to notice while looking at a new market. The Apple I came to market as a revolutionary pc board sporting fewer chip, requiring less power than the competition and peripherals, such as monitors, could be plugged directly into it, and it could work with a regular audio cassette recorder instead of an expensive proprietary data cassette recorder. In 1977, the Apple II came fully assembled with a keyboard, not as a kit, a connection to a television, and optional peripherals, and at the time, this transformed the market again. In 1984, they brought the McIntosh with a graphical user interface. In the 1990s, they brought the iMac and transformed desktop computing, while the Apple PowerBook transformed mobile computing. In the 2000s, they brought the iPod, iPhone, and iPad to market and transformed the music industry, smart phone market, and tablet world [19]. To say Apple has been disruptive is egregious in error, for they have been radically transforming markets while leaving competitors in the dust.

Tesla did not create the electric vehicle market, but, similar to Apple products, their innovative technology and design have transformed not only the nascent electric vehicle market, but the entire automobile world as well. Prior to the Tesla Roadster and S car, electric vehicles were relegated to being built by hobbyists, while mass-produced breakthroughs, like the GM EV1, were relegated to oblivion by their corporate masters. Tesla transformed markets by making the “impossible” possible. The Tesla Roadster came to market in 2008, and it transformed electric cars from ugly economy boxes into sports cars, the first all-electric vehicles to use lithium batteries and to have a range of over 200 miles. The Roadster turned heads and transformed a market from marginalized ecological freak cars into sexy, viable transportation. The model S came to market in 2012, and blew the doors off the car industry. It was the first car to be unanimously named Motor Trends car of the year, and why not? It was officially a luxury sedan, but it performed better than an elite sports car. It could accelerate faster than most anything on the road, had a range of up to 370 miles, and was rated as the safest car on the planet. In addition, its looks took the industry by storm, and to this day, it is hard to find a car that is not trying to imitate the aerodynamic curves and lines of the Model S. Saying the Roadster and Model S transformed the electric car market is an understatement. Ignoring they have transformed the car market remains untenably ignorant.

Tesla continues transforming vehicle markets with the introduction of their commercial truck, the Tesla Semi, the second generation Roadster, and the Tesla Cyber Truck, a pick-up, scheduled for production in 2023. The Tesla Model 3 and SUV Model Y continue to transform the car market as every legacy car maker is scrambling to develop and bring electric cars to the market.

The market battlefield is yet another example of Tesla crushing the competition. Detroit and Japan are reactionary, reacting to market changes. They are mechanical organisms structured to exist in stable markets. Tesla is visionary, and they transform markets. Their DNA is straight from the Palo Alto Research Center. Tesla is an organic organism structured to transform and thrive in rapidly changing markets where their innovation shapes the market.

For this reason, the battle between Tesla and the legacy carmakers has been and will continue to be a repetition of the battle over home computer supremacy between Silicon Valley and Japan. By the time the Japanese home computers washed up on our shores, they were out of date and grossly inferior in processor speed, RAM and programming. The main reason a minority of consumers purchased Japanese products was because of a trust in previous purchases of electronic consumer products, such as in the

SONY Trinitron television. Each year the media labels another legacy electric car as a “Tesla” killer, but one by one, from the Chevy Bolt to the BMW I series, these Tesla assassins have been DOA.

This leads to the third battlefield, product, and again we have a result where Tesla is chewing up the legacy carmakers. Product is a dimension where only Tesla will win, and the legacy car makers can only lose. Detroit and Japan produce cars, mechanical products birthed by an analog world. Tesla produces a digital platform that was begotten by the digital world and enhances transportation. Detroit is wedded to an ancient industrial world while Tesla lives in the digital age. Detroit produces cars with inferior ICE, Internal Combustion Engine, 19th-century technology that are slow to accelerate, noisy to drive in, vibrate with the engine, and stink like a gas station. Tesla cars are quiet, accelerate instantly, handle like a well-balanced knife, and smell like the solar rays coming through the largest glass windshields in the industry. Tesla produces digital transportation that can be improved with software updates. Tesla has proprietary R&D expenditures in chips and software that exceed those of most computer and software companies.

## 5. Conclusion

We are living in a time of change, a change from mechanical-analog products to digital platforms, aka digitally enhanced products. Apple’s iPod made people forget about the Sony Walkman faster than you could trade your spandex workout pants for yoga natural cotton [16]. AeroFarms is pulling a similar coup while quietly and surgically transforming agriculture as we know it with profits and explosive growth, growth that is outpacing the Japanese Miracle during the miracle years [20]. Tesla is by no means alone among the computer revolutionaries spreading the digital revolution to every sector of the economy.

In essence, Detroit is producing a rotary dial phone while Tesla is handing you an iPhone. In a Tesla, the software can be used to change basic mechanical characteristics, such as suspension, battery pack range, handling, etc. You cannot adjust the suspension in a Ford electric Mustang using your smart phone. You have to climb out and get mechanical with your Ford mechanical organization product.

The past is informative of the present, and in this instance, the battle between Tesla and the Legacy carmakers is most informed by the past battle between Detroit and Japan, and the battle between Silicon Valley and Japan. In the battle between Detroit and Japan, Japan walloped Detroit and constantly gained market share while Detroit’s market share slowly shrank. In the battle between Silicon Valley and Japan, Japanese computer makers

were shellacked en masse, but you can still buy computers from Sony and Toshiba. Yes, Nintendo killed Atari [21], but how many people today are now using their iPhones and iPads as their gaming platforms? The battle for video game supremacy is not over, and the rise of the iPhone and the iPad has Silicon Valley rising from the ashes in the battle of gaming platforms. These battles show inferior, older management styles and organizational structures lose market share to newer management styles and organizational structures.

This does not bode well for Detroit, and investors need to admit we are no longer at the beginning of the game, for we are already seeing the results that do not bode well for Detroit. Ford is abandoning the consumer car market, and GM is on the same trajectory [22], [23]. Chrysler stands huddling in the shadows as a division of a foreign conglomerate. Volkswagen is spending billions in a desperate attempt to bring electric vehicles to market as fast as it can. Meanwhile, the Tesla Model 3 is by itself outselling all other luxury car makers combined, and has been for over a year now, including combined sales of BMW’s 2, 3, 4 and 5 series, Mercedes’ C, CLA, CLS, and E-Class models, Lexus’ ES, GS, IS, and RC series, and Cadillac’s ATS, CT6, CTS, and XTS lines [24].

Having an organic organization with a digital platform does not guaranty guarantee success in a market with legacy automakers, who have been making cars for more than a century. Investment and research development are just a few of the hurdles that have prevented new car companies from joining major players in the U.S. for over half a century. Witness the sting the big three put on Tucker Motors through federal government prosecution when Tucker tried to bring the revolutionary Tucker Torpedo to market with standard roll bar, perimeter safety frame, shatterproof pop-out windshield, directional headlight, and seatbelts [25]. Three decades later witnessed the worse fate that befell DeLorean when he was cornered and entrapped by federal authorities after the big three put the squeeze on investors and banks [26]. Tesla could still end up failing because there are many ways outside of the market to eliminate the competition in the United States.

However, in terms of systems theory, Tesla has the upper hand in management/organization, market environment survival, and product superiority. Drive a Tesla Model 3, and you are instantly aware you are driving the future today. The car sounds almost silent, and you feel your body thrown into the seat as you accelerate, and the G force brings your facial cheeks to your ears. The lower center of gravity and perfect balance of the car is a driving sensation you have never experienced before and forces you to admit this is a thrilling tactile moment. You go to turn the key off, but there is none. In fact, there are

no buttons on the dashboard. After the test drive, return to your Ford Expedition, and you are instantly aware you are driving the past. Wasted space, lethargic, noisy, toxic nauseous, volatile, and it feels like you are driving a war tank when you would rather be driving a sports car. The Ford Expedition is an inferior product from yesteryear. The Tesla Model 3 is the opposite, a convention from the future you dream about existing in the present, with David Bowie playing on iTunes, "Panic in Detroit" blaring through the speakers.

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