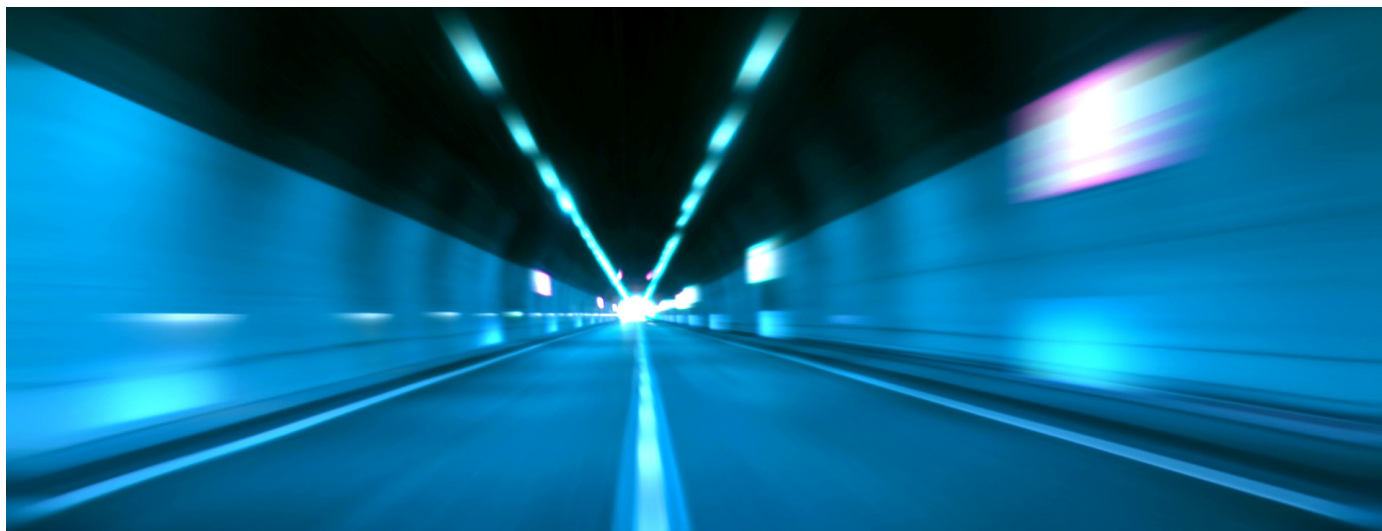


## AUTONOMOUS DRIVING OFFERS NO EASY PATH FOR INVESTORS

**Though the future of cars may be automated, our investment decisions will be anything but.**

June 2017



### ■ KEY TAKEAWAYS

- The development of autonomous driving technologies has the potential to significantly impact the auto market, weakening long-standing barriers to entry and creating new industry winners and losers in the process.
- Software providers could gain the most from this shift: immensely complicated algorithms will probably contribute the most to getting consumers safely from point A to point B, while auto hardware may, in a similar fashion to smartphones, be reduced to commoditized platforms on which to run highly differentiated software that consumers will ultimately care much more about.
- Debates are ongoing as to whether autonomous driving technology may increase overall vehicle demand by creating a more attractive product, whether buyers will be willing and able to shoulder additional costs associated with the technology, and even whether a smaller fleet of autonomous cars could replace widespread personal car ownership, hurting future car sales.
- While many predict the widespread adoption of autonomous vehicles by 2030, we are more cautious in our forecasting as we see a number of risks that could stall the incremental shift from driver assistance (Level 1) to fully automated driving (Level 5).
- We are watching this market very closely to determine the best companies to invest in—and the best times to do so—recognizing that the risk of *not* entering this market may be commensurate with the risks entailed within it.

In recent years, autonomous driving has inexorably progressed from the domain of science fiction to university robotics labs to the city streets of San Francisco and Pittsburgh, and looks set to create both challenges and opportunities in the auto industry in the coming years.

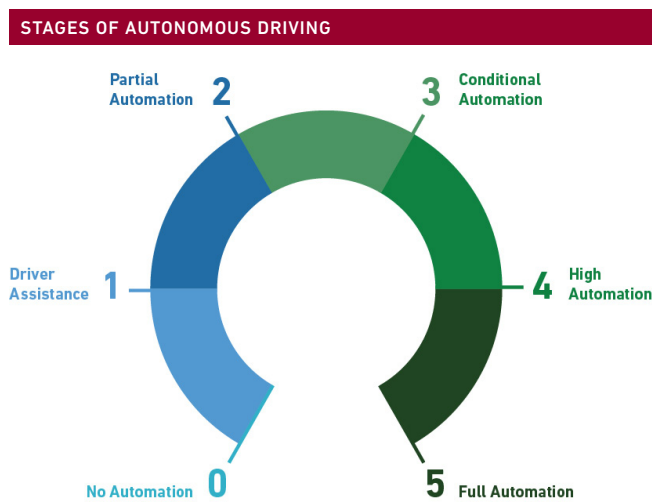
Seeking to capitalize on this competitive shift, new entrants from technology giants to ambitious startups try to surmount barriers to entry that have stood for decades. Meanwhile, major auto companies are spending heavily on automated technologies in an attempt to lead, or at least keep up with, the rapid pace of innovation, satisfy customer and regulatory demands, and retain or advance their market positions.

**As is often the case when a dramatic change in a competitive landscape is hypothesized and forecast, many more winners are envisioned and promoted than will actually succeed.**

Harding Loevner has a number of sector analysts—spanning the software & hardware, auto & auto parts, and telecommunications industry groups—whose research touches on the issues surrounding autonomous driving. The potential far-reaching ramifications of this ongoing transformation have not been lost on them. In fact, Industrials Analyst Peter Baughan, CFA, claims “one of the fastest and biggest changes in the world right now is the move toward autonomous transport.”

## ■ UNCERTAINTIES AT EVERY TURN

However, as investors focused not only on growing companies but also, importantly, business models that sustain durable growth, we remain cautious in our approach as, although there are a wide range of opportunities in this rapidly changing industry, there is also no shortage of risks and uncertainties. Among these are technological uncertainties—because the path to fully autonomous vehicles will proceed in stages from driver assistance (Level 1) to “hands off” (Level 2) to “eyes off” (Level 3) to “mind off” (Level 4) to full automation requiring no driver at all (Level 5),<sup>1</sup> it is not immediately clear which technologies and, by extension, which firms will emerge as durable industry standards and achieve widespread adoption, and which will become obsolete.



SOURCE: SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL

Beyond the technological uncertainties, the pace and depth of consumer adoption remains unclear as well. We simply do not know the cost of this future technology and what proportion of the population will be willing and able to pay for different levels of automation. Consumer appetite for such a fundamental lifestyle change is also difficult to predict at this point. In addition, government oversight could be intense, legal liability for algorithm-caused accidents remains unresolved and could hinder roll-out, highly-publicized events such as fatal crashes could sway public and lawmaker opinion, and we believe hacking and cybersecurity could become consistent concerns as well.

**There are over one billion vehicles on the roads globally today—virtually all of them are still Level 0, and many are likely to remain on the road for the next decade and beyond.**

Moreover, the industry may be less ripe for change than some would suggest—Level 0 and Level 1 assisted driving could be with us for much longer than anticipated. Amongst new cars, Level 1 driver assistance is in only a small fraction of vehicles being sold in 2017, primarily as optional add-ons in higher-end models. The most highly autonomous cars sold today fall into the Level 2 category, existing in only a handful of

low-volume premium models as costly options. One must also consider that there are over one billion vehicles on the road globally today—virtually all of them are Level 0, and many are likely to remain on the road for the next decade and beyond. We do anticipate volume growth in Level 1 and Level 2 technology over the next five years, as features like automated braking and lane-keeping-assist will likely become required for automakers to achieve top governmental safety ratings in developed markets. Nonetheless, we think the oft-predicted pace of adoption of autonomous driving in developed markets is rife with overconfidence—while some expect fully autonomous vehicles to be widespread by 2030, we doubt they will become ubiquitous by that point.

## ■ DRIVER VS. CAR

Apart from questions related to technological durability and the pace and depth of consumer adoption, another central question we have been grappling with is whether hardware or software makers are better positioned to achieve the sustainable profitability we seek. Or, put another way: what offers greater lasting value to the autonomous vehicle market—the car or the driver?

Alphabet (then Google), one of the first firms to invest significant resources into autonomous driving technology in 2009, has remained emphatic that its “Waymo” autonomous driving division is focused on building a driver, not a car. Tesla, on the other hand, is developing both the car and the autonomous driving software on which it will run. Meanwhile, some new entrants, such as Mobileye and Codha Wireless, seek to integrate purpose-built autonomous driving software into the hardware products they sell in an attempt to provide value in both domains.

### The Case for Software

Using this car vs. driver framework, one could argue that software companies that produce driving algorithms, accident avoidance logic, machine learning capabilities, and operating and entertainment systems—Alphabet, Baidu, Uber, and NuTonomy are examples—will provide the more valuable aspect of driverless technology in the long term. This is the view of Information Technology Analyst Chris Mack, CFA, who reasons “by efficiently interpreting copious amounts of real-time data to automate the incredibly complex task of driving in unpredictable environments—no small feat—software, more than hardware, will perhaps play the more critical role in safely getting consumers from point A to point B in autonomous vehicles, thereby providing greater value.”

**“The biggest pot of gold at the end of the autonomous driving rainbow is probably the control software.”**

This perspective would hold that, though some hardware suppliers may enjoy a spurt of high profitability in the early stages of autonomous driving adoption when growth is higher and competition lower, in the longer run this segment of the industry will see its products become increasingly commod-

itized, with profit margins falling back in line with industry norms over time.



Auto Analyst Andrew West, CFA, has seen this cycle play out before. “At one point both seatbelts and airbags were big new things offering big growth opportunities. Now they’re just another autopart because the major auto manufacturers eventually turn innovations into standardized and competitively-priced components.” This same process, then, could also apply to contemporary manufacturers of sensors, cameras, advanced brakes, computer chips, and perhaps even vehicles themselves.

In comparison, as software companies should be able to charge a premium for highly differentiated products and user experiences, they would have a naturally stronger position. Lakshman Venkitaraman, CFA, our other Information Technology analyst, likens this possible outcome to a trend in the Android smartphone market, wherein Google, the software platform provider, is currently capturing profits at the expense of Android-based hardware manufacturers (with exception of Samsung) that struggle to make money due to low differentiation. According to Venkitaraman, “in new technology industries, hardware tends to become progressively less differentiated over time, ultimately reduced to a platform on which to run the highly-differentiated software experiences that consumers care much more about.” Andrew West agrees, suggesting “the hardware could be an okay business, but the biggest pot of gold at the end of the autonomous driving rainbow is probably the control software.”

### Mixed Signals for Hardware Makers

At the carmaker level there are differing and sometimes contradictory forecasts about the impact of autonomous driving on Original Equipment Manufacturers (OEMs) such as BMW, Ford, and Toyota. Investors debate whether autonomous advances will increase sales, open the door to new entrants, or even possibly lead to an overall reduction in the number of cars owned. Or perhaps these advances will instead be anticlimactic, representing a gradual evolution that would ultimately be less significant than future industry shifts resulting from changes in propulsion, regulation, and economic cycles.

The most apocalyptic forecasts for incumbent OEMs envision a world in which, instead of having a fleet of over one billion, mostly personally owned vehicles that spend most of their day parked, instead would need fewer than half as many fully autonomous highly utilized cars that would shuttle people from place to place as an “on demand” commercial service. Companies such as Uber are betting on this scenario. While such a fleet would likely take decades to build, its creation would dramatically alter the automaker to auto-consumer relationship and would result in lower annual auto sales after moving to a new industry equilibrium.

### “Mobileye’s eyes have found a brain in Intel’s CPUs.”

Despite this potential negative outcome, we do see some opportunities for hardware makers. The shift from active driving time to passive leisure time resulting from full automation (Level 5)—a shift that moves entertainment, productivity, and luxury to the center of the car experience—could place tech-forward luxury-car makers such as BMW, which has partnered with Intel and Mobileye to produce driverless concept cars,<sup>2</sup> in a strong position to gain market share due to their brand strength and decades-long expertise in driving accoutrements. Car manufacturers targeting the mass market that manage to forge successful partnerships with leading technology companies, or who can most adeptly acquire startups to bring advanced driver-assistance systems development in-house, could also stand to gain. Ford has been particularly active in this regard, having acquired Livio, a software company, in 2013<sup>3</sup> and SAIPS, a machine learning and computer visioning company, in 2016,<sup>4</sup> and invested US\$1 billion in Argo AI, a robotics and artificial intelligence software company, in February 2017.<sup>5</sup>

Yet perhaps the biggest winners will be companies that successfully integrate both hardware and software. One such example is the advanced vehicle visioning company Mobileye, which was recently acquired by tech giant Intel for US\$15.3 billion,<sup>6</sup> the largest ever acquisition of an Israeli tech company. According to Chris Mack, “Mobileye’s eyes have found a brain in Intel’s CPUs” as a result of this acquisition.





## ■ BALANCING SKEPTICISM WITH ENTHUSIASM

As active managers who believe fundamental business factors are the most important determinants of long-term returns, our investment decisions will be anything but automated. Instead, they will be based on original research into companies and the industries in which they operate, even if this leads us to conclusions that differ from the prevailing sentiment of the moment—sentiments which we believe will often be inflated. By continuing to require that all companies in which we invest meet four key criteria—competitive advantage within its industry, sustainable growth, financial strength, and quality management—we believe we have the best chance of identifying long-term winners while avoiding investments in companies without staying power.

**The risk of *not* entering this market may be commensurate with the risks entailed within it.**

As is often the case when a dramatic change in a competitive landscape is hypothesized and forecast, many more winners are envisioned and promoted than will actually succeed. “The ‘street’ is abuzz with issues that occupy the imaginations of Wall Street and Silicon Valley—a tiny subset of the world’s current and future car-buying population” says West. “Accordingly, during high and rising stock markets with low discounting of the future, investors are willing to pay more for ‘what might possibly be.’ In the automotive industry, historically, such companies have been longshots; a few have worked out, many have not.”

Yet though we believe some degree of skepticism will be rewarded in this context, we cannot afford to take an overly cautious approach either. Ultimately, our investment decisions are not only judged by absolute and relative returns, but also by the trade-offs incurred by not investing in securities that could have generated even higher returns than those realized for our clients. Said another way, the risk of *not* entering this market may be commensurate with the risks entailed within it. Given the level of media coverage, rumor, speculation, and complex dynamics at play, investment skill—and patience—will be of paramount importance to those willing to invest in this industry.

## ■ CONTRIBUTORS

Harding Loevner Analysts Andrew West, Chris Mack, Lakshman Venkitaraman, and Peter Baughan contributed research and viewpoints to this article.

## ■ ENDNOTES

<sup>1</sup>Society of Automotive Engineers International, “Stages of Autonomous Driving,” news release, 2014.

<sup>2</sup>Intel Corporation, “BMW Group, Intel and Mobileye Team Up to Bring Fully Autonomous Driving to Streets by 2021,” press release, July 1, 2016.

<sup>3</sup>Ford Motor Company, “Ford Acquires Software Company Livio To Further Advance In-Car Connectivity Leadership,” press release, September 26, 2013.

<sup>4</sup>Ford Motor Company, “Ford Targets Fully Autonomous Vehicle For Ride Sharing In 2021; Invests In New Tech Companies, Doubles Silicon Valley Team,” press release, August 16, 2016.

<sup>5</sup>Ford Motor Company, “Ford Invests In Argo AI, A New Artificial Intelligence Company, In Drive For Autonomous Vehicle Leadership,” press release, February 10, 2017.

<sup>6</sup>“Intel Acquisition of Mobileye,” Intel Corporation and Mobileye, March 13, 2017.

## ■ DISCLOSURES

The “Fundamental Thinking” series presents the perspectives of Harding Loevner’s analysts on a range of investment topics, highlighting our fundamental research and providing insight into how we approach quality growth investing. For more detailed information regarding particular investment strategies, please visit our website, [www.hardingloevner.com](http://www.hardingloevner.com). Any statements made by employees of Harding Loevner are solely their own and do not necessarily express or relate to the views or opinions of Harding Loevner.

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