



Patent Insights From Times of Industry Transformation

The UnitedLex Automotive U.S.
Patent Lapse Analysis

Volume 3



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Executive summary

From 2018 to 2021, there was an 83% increase in purchases of electric vehicles (EV) with more than 600,000 purchased in 2021 alone. As the automotive industry trends toward the production of autonomous vehicles (AV), advanced driver assistance systems (ADAS), and EVs, original equipment manufacturers (OEM) are investing more heavily in these new categories and aggressively pruning their combustion-engine-related intellectual property (IP) portfolios.

This report compares the U.S. patent portfolios of startup and legacy OEMs and details the value and impact of strategically lapsing patents at the three patent renewal gates. The findings show how far new market entrants must go to reach the legacy OEMs' patent volumes and provide a cross-industry view of misalignment of IP strategies against publicly stated core business objectives. The report's insights reveal potential future automotive trends and offer lessons for companies in other industries managing their IP through times of transformation.

In the [UnitedLex Automotive U.S. Patent Lapse Analysis, vol. 1](#), we analyzed Tesla's evolving approach to patent lapse management and how its increasing patent retention rates run counter to public comments made by the company's high-profile leader. Patent lapse rate and strategic lapsing of patents offer companies and their IP departments powerful cost controls, but as

Ford increasingly embraced strategic lapsing over the last five-to-seven years, Tesla began retaining patents at much higher rates, with a more electrified future in its sights.

In [volume 2](#), we focused on many of the world's largest automotive OEMs, whose massive U.S. patent portfolios dwarf that of Tesla and represent millions of dollars of shareholder value for the brands that most effectively manage these IP investments. The analysis revealed Honda, the fifth largest car company in the world based on revenue, as a leader in strategic patent lapsing. Honda has received accolades for its innovative approach to patent lapse analysis, deploying artificial intelligence (AI) to save nearly \$3 million in renewal fees annually.

Volume 3 of the Automotive Patent Lapse Series offers a final sneak peek at key insights into the patent portfolios of 30 different automotive organizations. Throughout the series, UnitedLex used [Vantage for IP](#), its technology-driven solution that provides a comprehensive competitive analysis of any organization's IP portfolio, to pop the hood of top OEMs and parts suppliers. Later this year, UnitedLex will release a comprehensive automotive patent lapse report that reveals key patent trends showing the rise of AVs, ADAS, and EVs; the slow decline of combustion engines; and the impact those trends will have on the companies' bottom lines as they pay to maintain their IP portfolios.

Budget boosters

Strategic lapsing of a company's patent portfolio is among the greatest cost-saving levers available to IP departments. Companies with large portfolios that strategically pull this lever regularly save 20-30% of their annual patent renewal fees. For a large automotive manufacturer, this could range from \$2-\$4 million per year in renewal fees. Reinvesting these savings can create a snowball effect for businesses, allowing them to optimize their entire approach to IP, strengthen their IP position, and reduce associated costs.

Refocus

This analysis illustrates the power of data to improve decision making and how patent lapse data can help IP teams modernize their approach. Under pressure to find new efficiencies, corporate legal teams are incorporating financial goals beyond cost reduction in favor of a more holistic view of efficiency that includes value creation and quality of work. Patent lapse, filing trends, and litigation data can not only help IP teams improve portfolio ROI by reducing costs, but also by generating revenue and improving strategic positioning.

Industry lapsing engine patents heavily; retaining AV, ADAS, and EV-focused patents

The automotive industry is undergoing a major shift. Since the invention of the combustion engine, it has been the cornerstone around which everything else was built. OEMs and suppliers invested significant time and money into improving the combustion engine, and their patent portfolios reflected that. However, of the categories with the highest lapse rates, Engines & Emissions stands at the top with an industry average lapse rate of 24%.

As combustion engine patents lapse at such a high rate and decline in volume, two categories standout with the lowest lapse rates:

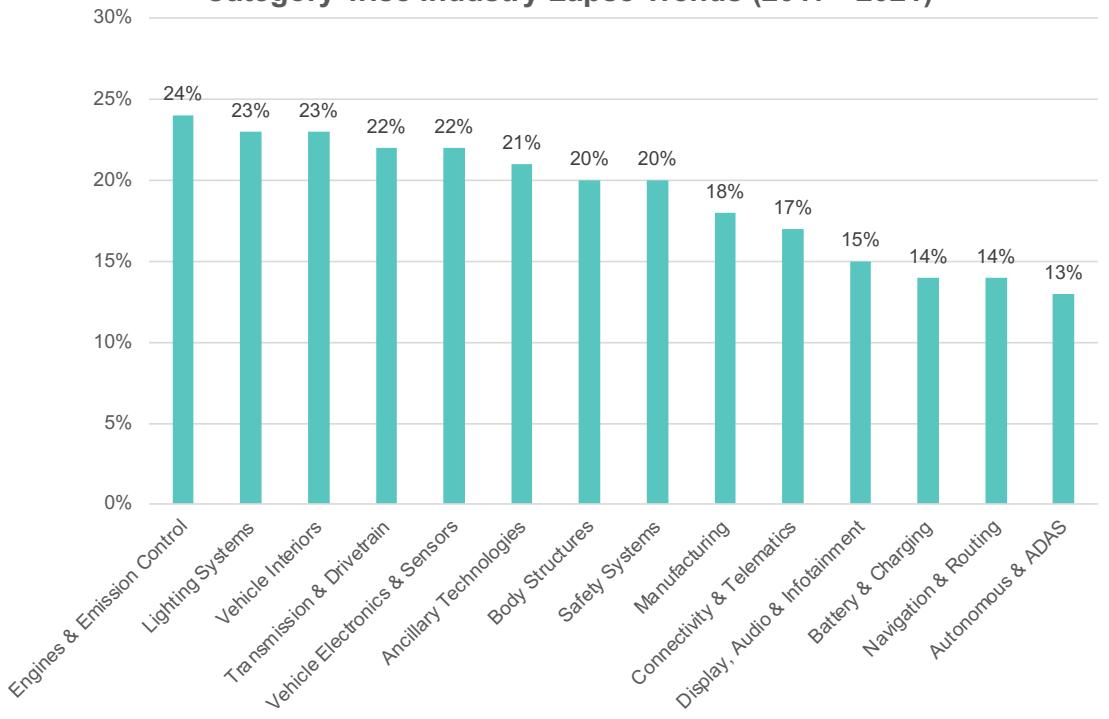
- **Battery & Charging** – The industry average is 14%, with some OEMs lapsing at or below 10%.
- **Advanced Driver-Assistance Systems (ADAS)** – The industry average is 13%, with some OEMs lapsing at or below 10%.

Lapse (or Prune): To not pay maintenance fees on a patent; the patent expires and is no longer enforceable.

Granted U.S. patents have three maintenance fees due at 3.5, 7.5, and 11.5 years (Gates 1, 2, and 3).

Lapse Rate: The number of patents lapsed as a percentage of the total number of renewals due.

Category-wise Industry Lapse Trends (2017 - 2021)



Together, these data points confirm the industry's evolution. Continued technological advancements and shifting consumer preferences will almost certainly continue to guide the industry toward a more electric future. The companies that successfully shift to electric, autonomous, and connected vehicles while also prioritizing safety will lead the pack.

Maintaining protections and improving business outcomes

Automotive brands often choose to retain patents to protect their interests and ward off litigation. However, similar to homeowners' insurance, protection levels should align with asset values to keep costs in check. Automotive brands do not need to renew every U.S. patent in their portfolios. When managed too defensively, patent portfolio costs balloon, and financial successes become impossible.

For many, a more optimized defensive approach in which they retain the best portion of their portfolios will maintain an equally effective defensive position. This strategy empowers manufacturers to increase their lapse rate, or transact on patents due for renewals via sales or licensing, to offset the rising costs of those they retain and realize millions of dollars in shareholder value.

Focusing manual review

As uncovered in volume 2, Honda's strategic patent lapsing helped the company

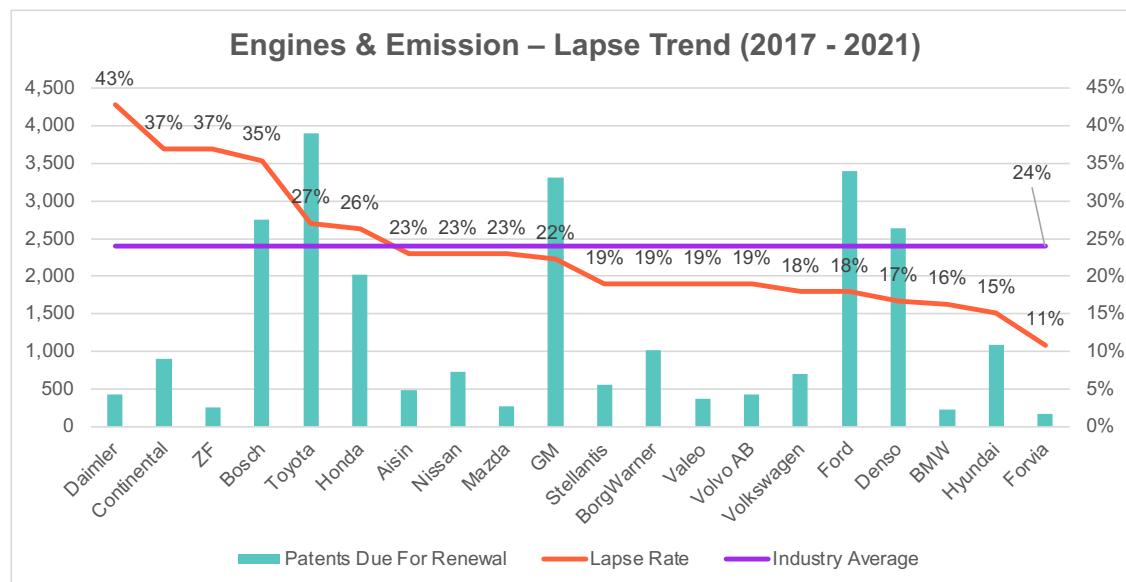
save more than \$28 million in U.S. patent portfolio maintenance fees from 2012 to 2021, reducing its renewal costs from \$83 million to \$55 million. Honda's historical embrace of strategic patent lapsing has earned it residual benefits as we look to the next five years. While costs for many are set to grow substantially, Honda has positioned its upcoming renewal fees to be only slightly higher than what it spent over the last decade. If Honda were to maintain its lapse rate, it could expect to save \$18.5 million over the next five years (2023-2027) or more than \$3 million annually.

Using AI and automated classification, companies with significant patent portfolios can greatly focus manual analyses to quickly and comprehensively analyze competitors, detailing strengths and weaknesses of the entire IP portfolio. These analyses provide IP experts the actionable insights needed to make informed decisions about which patents to prune and growth areas for filing.

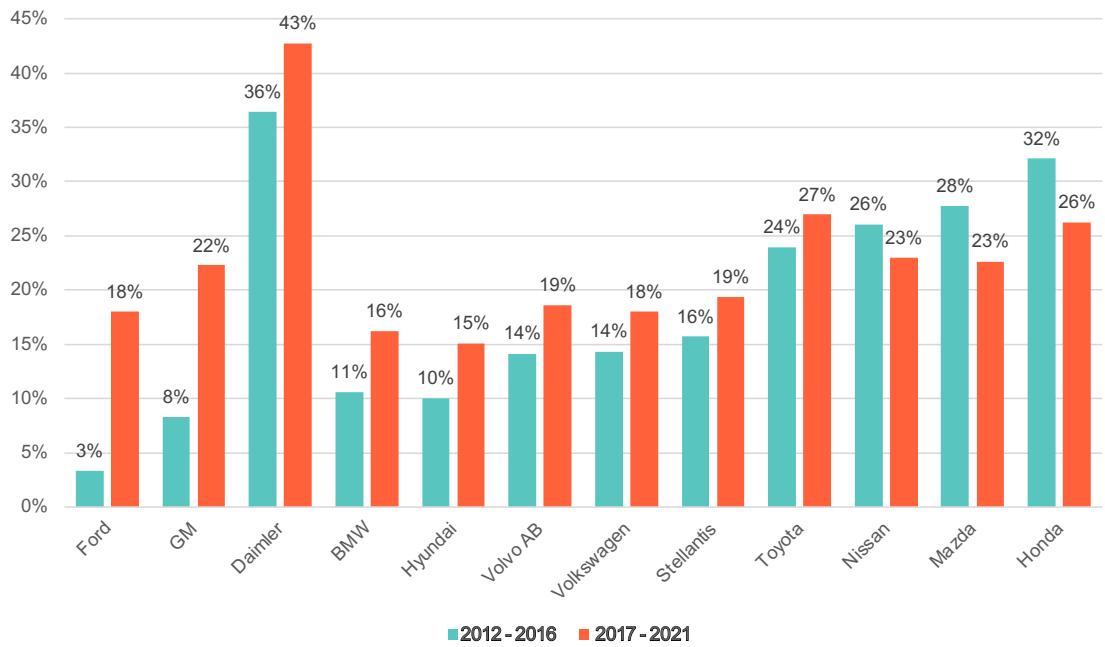
Two diverging trends

Decline of the combustion engine

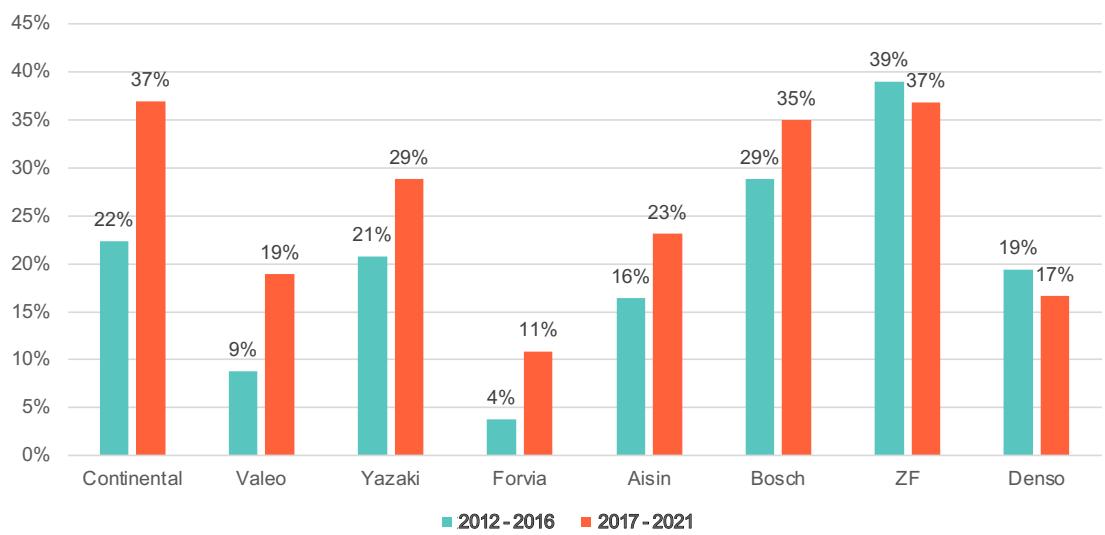
Even with the changes happening in the auto industry, the legacy of internal combustion engines will persist. Incremental advancements and improvements to meet emissions standards continue to be a focus area for OEMs that need to support older models and give customers potentially more affordable vehicle options when compared to electric.



Engines & Emission Technology Lapse Trend - Manufacturers



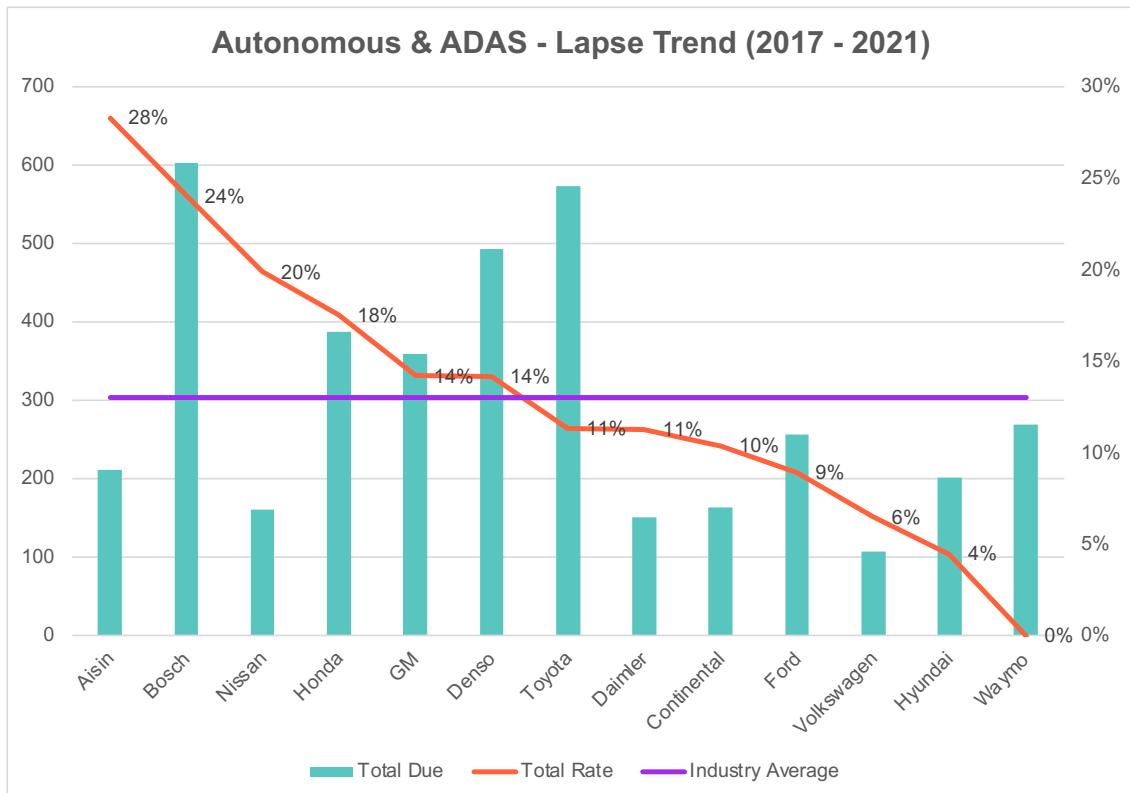
Engines & Emission Technology Lapse Trend - Suppliers



The lapse data in the Engines & Emissions category clearly show the declining prominence of the combustion engine as nearly all OEMs have lapsed these patents at higher rates in recent years. Daimler, with a smaller portfolio in this category, pruned Engine patents most aggressively over the past decade. Nissan, Mazda, and Honda, however, stand out as exceptions, decreasing engine patent lapse rates between 2017-2021 compared to 2012-2016. Among parts suppliers, Continental, ZF, and Bosch lapsed Engine & Emissions patents at the highest rates. ZF and Denso are the only parts suppliers to decrease their Engine patent lapse rate.

Rise of the autonomous and electric

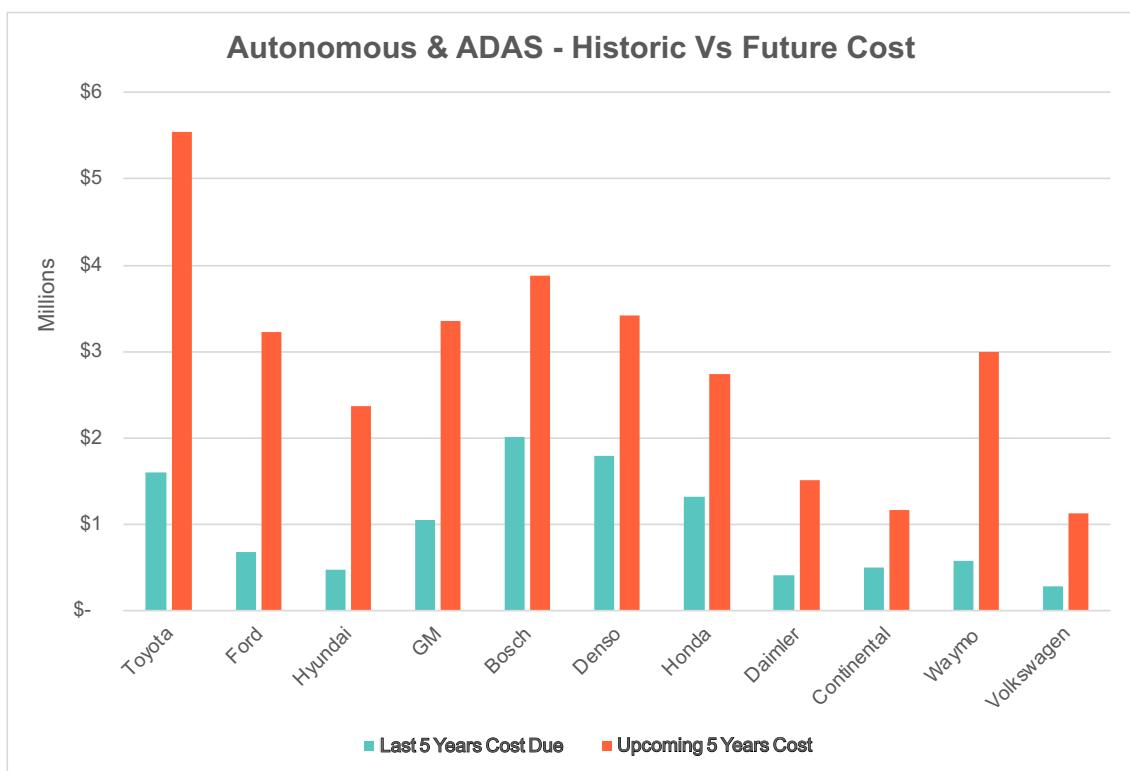
While self-driving vehicles have been part of cultural science fiction for decades, the actual technology behind such vehicles is a priority for several automakers and remains in development. A few freight companies have pilot programs testing driverless solutions, but most consumer ADAS will continue gradual incorporation into vehicles until fully autonomous driving ascends to the level of trust and safety that consumers demand.



Maintenance cost trends

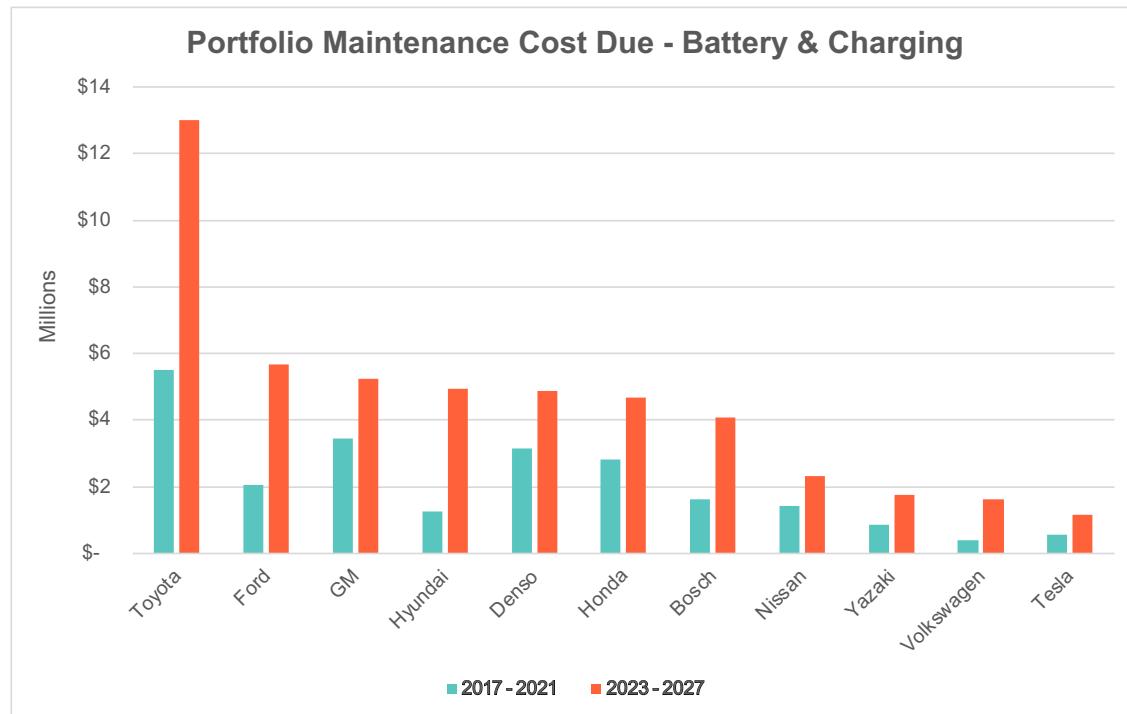
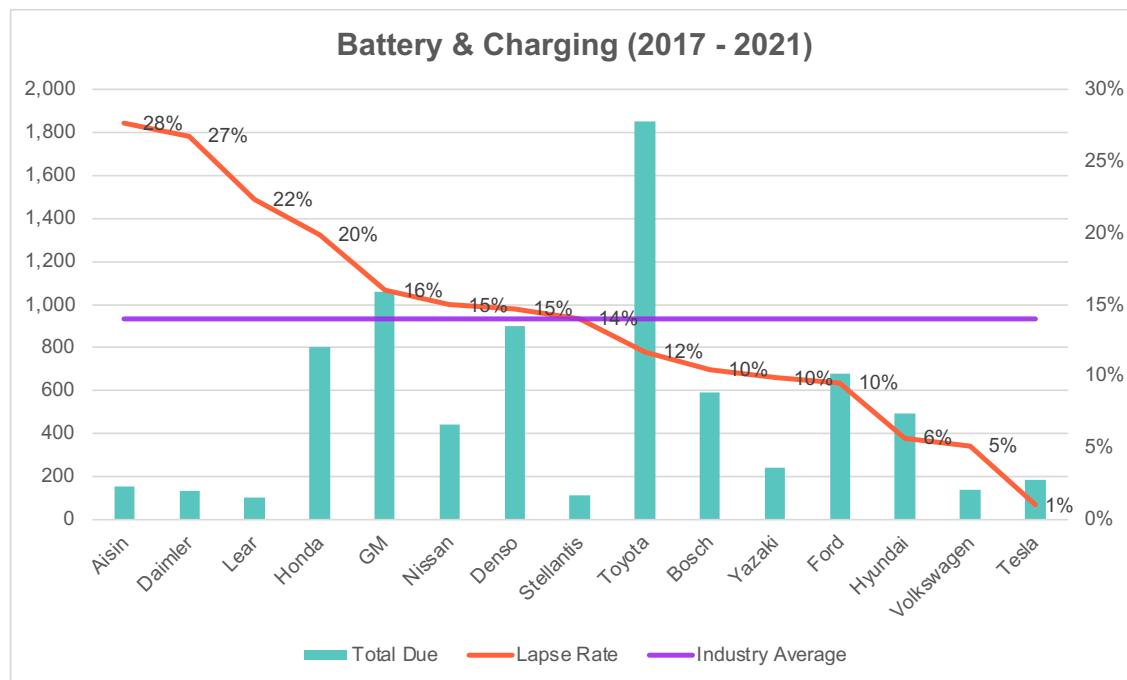
A sharp increase in portfolio costs is on the horizon for Toyota, Ford, GM, and Hyundai, implying heavy investment in the Autonomous & ADAS portions of their portfolios with patents maturing. While not technically an OEM or supplier, Waymo's patent portfolio is included

in the analysis given its concentration in Autonomous & ADAS. For context, Waymo, formerly the Google self-driving car project, had more ADAS patents up for renewal between 2017-2021 than Ford (270 to 257, respectively). Perhaps due to multiple rounds of significant fundraising, they have not lapsed any patents yet; that strategy may change in the next decade.



Future maintenance cost data show us one of the key areas of automakers' investment and reaffirms the industry trends. OEMs have a variety of battery designs and chemistries under development for use in hybrid and electric vehicles, including lithium-ion, solid-state, and flow batteries. While lithium-ion batteries are currently the most used, the next generation of battery development appears to be solid-state. Overall, the Battery & Charging category of patents relates to improving performance, safety, and cost-effectiveness to offer better performance and longer range vehicles.

Nearly the entire auto industry advertises how "electrified" their offerings are becoming. From websites to Super Bowl ads, automakers are anxious to show consumers and competitors they lead the EV market. Estimates range from 2027 to 2030 when EV sales will overtake internal combustion engines as the main source of the auto industry's revenue, but as patents mature, the companies that have not strategized around their IP portfolio effectively and still maintain all their early EV patents are about to face a sharp increase in maintenance costs.



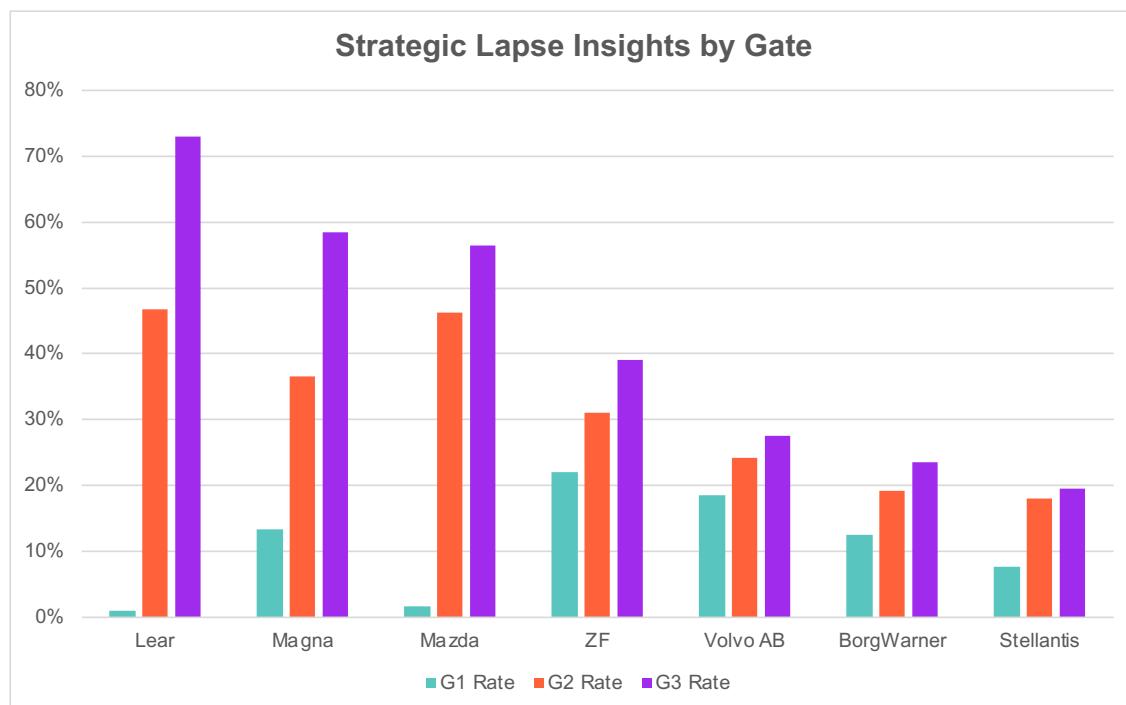
The gating game

Once a patent is filed, maintenance fees must be paid at $3\frac{1}{2}$, $7\frac{1}{2}$, and $11\frac{1}{2}$ years (Gates 1, 2, and 3), or the patent will expire. The more costly renewals occur at Gates 2 and 3, as patents mature.

Vantage for IP reveals insights from the strategy of each company at each gate. For example, the data show most OEMs and suppliers lapse on average about 10% at Gate 1, about 25% at Gate 2, and about 38% at Gate 3. Falling below the average at any of these ranges, but especially at Gates 2 and

3, indicates a noticeable gap in spending versus savings for those companies.

As always, a few outliers adopted a different strategy, lapsing more aggressively at Gates 2 and 3 and increased savings to near parity with annual expenditure on maintenance fees. Over the last five years, Lear, Magna, and Mazda significantly reduced their maintenance fee burden as a percentage of their total maintenance fees due. On the other hand, ZF and Volvo AB lapsed well above average at Gate 1, yet saved far less.



Company Name	Renewal Cost Due	Cost Saved	% Savings	Cost Spent	% Spent
Lear	\$3,444,360	\$1,596,100	46%	\$1,848,260	54%
Magna	\$6,374,520	\$2,392,460	38%	\$3,982,060	62%
Mazda	\$2,916,160	\$1,084,780	37%	\$1,831,380	63%
ZF	\$10,686,820	\$3,446,000	32%	\$7,240,820	68%
Volvo AB	\$4,456,380	\$1,080,440	24%	\$3,375,940	76%
BorgWarner	\$9,008,320	\$1,795,520	20%	\$7,212,800	80%
Stellantis	\$9,760,880	\$1,657,220	17%	\$8,103,660	83%

Methodology

UnitedLex utilized two paid databases (Derwent Innovation & Relecura) to arrive at a confluence of data for the portfolio sizes when extracting patent data for each OEM/Tier 1 Supplier. A combination of CPC codes and keyword searches were used to generate training data for its proprietary AI and machine learning (ML) model. The searches were performed using the above-listed databases, extracted, and manually verified by UnitedLex subject matter experts. UnitedLex utilized the training data to generate an AI/ML model capable of distinguishing between 14 top automotive-related tech categories and ran the portfolios through the AI/ML tool to classify all portfolios by tech category.

UnitedLex ran the U.S. Grants for each company through its proprietary Vantage for IP platform to generate visual aids and calculate lapse rates within seconds of ingesting the portfolios. The data were filtered, sorted, and analyzed over five-year and 10-year windows. Increases or declines were calculated using comparison formulas to get percentage values. UnitedLex utilized a third paid database, RPX, for litigation data on cases filed within the last 10 years. UnitedLex further utilized publicly available news sources and company websites/marketing materials to determine which business areas were most mentioned or associated as being a focus for a company.

Vantage for IP is a technology-driven solution providing a comprehensive competitive analysis of an organization's IP portfolio that goes far beyond the industry standard, including insights such as growth areas for filing, competitors' IP strengths and weaknesses, patent categories ripe for pruning or divestment, and portfolio cost estimations. Utilizing custom data structures and AI-assisted technology, Vantage for IP is built with continual custom data inputs to deliver insights within minutes,

giving customers a speed and intelligence advantage over rivals. Vantage for IP quickly generates critical business insights so both corporations and law firms can devise IP strategies that better align with broader business objectives, seize new revenue opportunities, increase efficiencies, enhance profit margins, and create a calculated edge over competitors.

Competitive advantages

Throughout this series, UnitedLex spotlights how data improves decision making for IP teams and adds value to their teams and organizations. For over 15 years, UnitedLex has pushed the boundaries of legal innovation across all legal disciplines and within IP departments.

Working with UnitedLex, clients better understand their portfolios using data-driven insights to grow and build a competitive advantage. Using its proprietary AI technology, Vantage for IP, and extensive subject-matter expertise, UnitedLex converts these data-driven insights into increased revenue opportunities, reduced costs, and accelerated outcomes, guiding companies that must reduce costs and navigate shrinking budgets without sacrificing outcomes.

Want more information on the analysis findings?

UnitedLex will publish a comprehensive report taking a deeper dive into 30 OEMs and suppliers in the automotive industry. That report will provide a comparative view of patent lapse and renewal statistics, compare data between suppliers and original equipment manufacturers, highlight geographical trends, and present noteworthy observations derived from technological trends. The companies included in the report, the number of patents analyzed, and their lapse rate follow:

Company	Patents Due (2017 - 2021)	Lapse Rate (2017 - 2021)
Aisin	4,146	25%
BMW	1,222	10%

Company	Patents Due (2017 - 2021)	Lapse Rate (2017 - 2021)
Borgwarner	2,223	17%
Bosch	10,128	24%
BYD	385	4%
Continental	3,910	28%
Daimler	2,653	25%
Denso	11,135	20%
Ford	10,244	19%
Forvia	1,268	12%
Geely	256	9%
General Motors	14,572	22%
Honda	11,559	24%
Hyundai	6,876	13%
Jaguar	304	17%
Lear	921	31%
Magna	1,816	28%
Mazda	825	25%
NIO	1	N/A
Nissan	4,861	20%
Rivian	1	N/A
Stellantis	2,306	15%
Tesla	642	1%
Toyota	15,302	19%
Valeo	1,628	18%
Volkswagen Group	3,246	13%
Volvo AB	1,188	22%

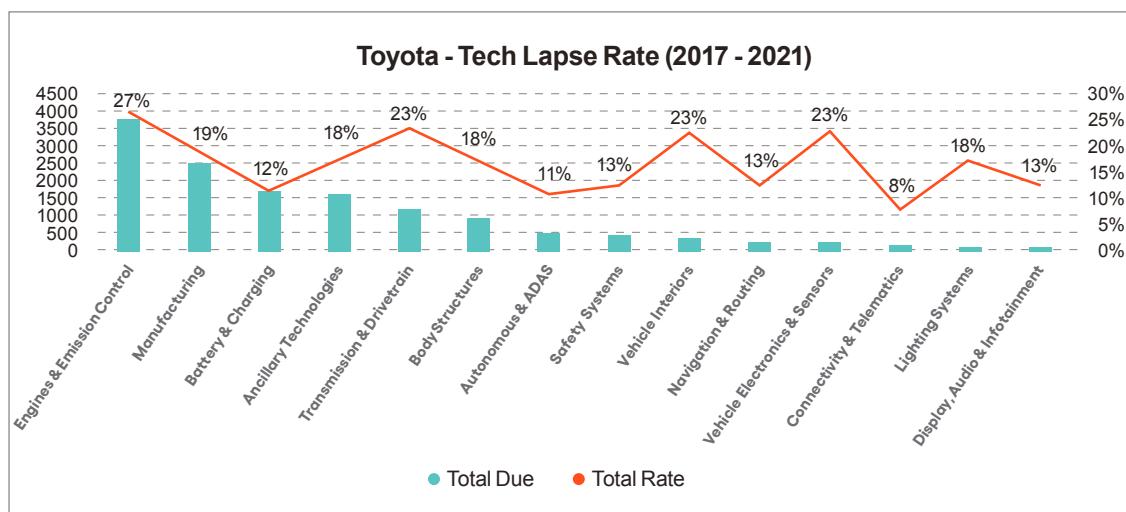
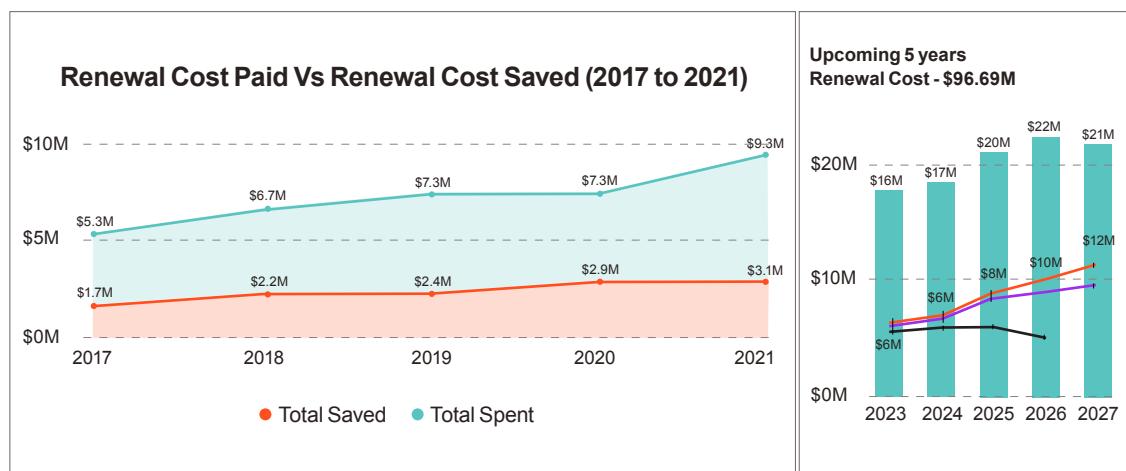
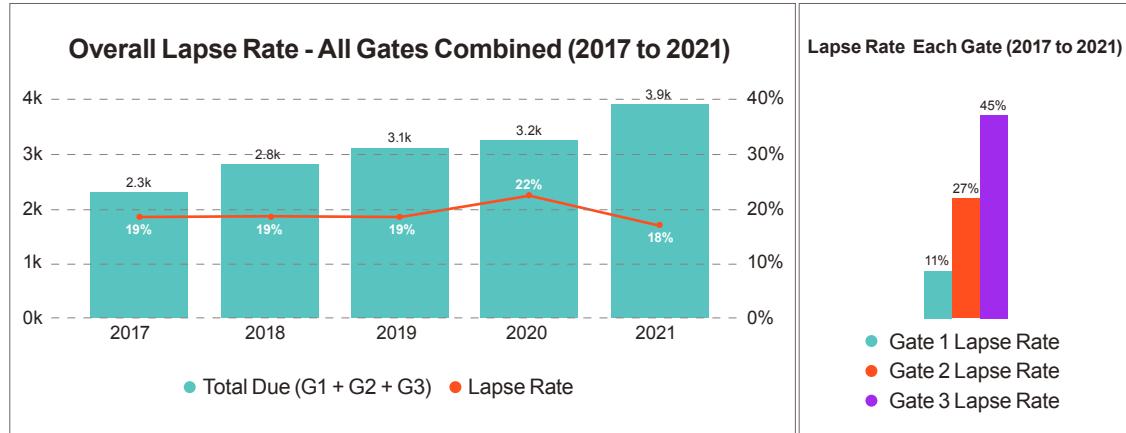
Company	Patents Due (2017 - 2021)	Lapse Rate (2017 - 2021)
Waymo	418	0%
Yazaki	2,921	16%
ZF	2,856	29%

The comprehensive report will include portfolio overviews for most brands included in the analysis. These overviews will include charts and graphs like the examples

below that detail key insights on the patent portfolio of a prominent global OEM. Each portfolio overview will also include expert commentary from the UnitedLex IP team.

Sample spotlight – Toyota

Portfolio Overview
 Lapse Rate (2017-2021): 19%
 US (Active Grants): 22,954



About UnitedLex

UnitedLex is a data and professional services company delivering outcomes that create value for high-performing law firms and corporate legal departments in the areas of digital litigation, intellectual property, contracts, compliance, and legal operations.

Founded in 2006 with a mission to push the boundaries of legal innovation, we provide solutions that enable measurable performance improvement, risk mitigation, revenue gain, cost reduction and digital business synergy. Our team of 3,000+ legal, data and technology professionals supports our clients from operational centers around the world.

**For more information, please visit
www.unitedlex.com.**