

Why automotive OEMs risk losing out and what they can do to stop it

As the automotive and technology industries collide, prominent original equipment manufacturers risk being overtaken by tech-savvy new entrants and their own suppliers, unless they proactively change their IP strategies

By Kevin Rivette, Peter Detkin, Mark Gober and Michael Poppler

Over the years, we have heard many company executives say things to the effect of “no one in the industry sues anymore” (AT&T executive, 2004) or “we don’t need our intellectual property, we will win based on our supply chain” (Nokia executive, 2005). While these comments are usually made with conviction, the convergence of different technologies from outside industries is transforming accepted norms.

At an auto conference last year, one prominent original equipment manufacturer (OEM) executive said something similar from the dais, proclaiming that the auto industry does not sue each other over patents and that the tech and auto players have learned how to live together peacefully. These kinds of statement remind us of the six most dangerous words in the English language: “This time it will be different.”

With this in mind, we provide a perspective on how convergence in the auto industry will likely unfold and what smart players are doing to prepare for it.

In the late 1990s and early 2000s, auto companies began a large-scale move to outsource most of their component manufacturing and associated R&D, leaving them to act primarily as designers and systems integrators. The one notable exception to this outsourcing trend was the powertrain, as this was long viewed as a vehicle’s heart. However, in the brave new world of transportation, the most important part of the vehicle is now the brain – the computers, software and sensor networks which enable autonomous driving, ride-sharing and electric vehicle (EV) operation.

The problem for car companies is that for the most part they do not own the technologies or intellectual property associated with these trends. To put it bluntly, they are behind the curve and thus vulnerable. We saw the same thing happen in the smartphone space: kings of the hill Motorola and Nokia, and later Research in Motion (RIM), all got dethroned by competitors who changed the rules of the game and innovated ahead. IP wars ensued. Unfortunately, there is no reason to believe that the same thing could not happen in the automotive industry.

Most traditional automakers are unprepared for this shake up and, as shocking as it sounds, could be eliminated from the industry altogether unless they get their acts together. Just as it was impossible in 1995 to imagine a telecom world without Motorola, Nokia and Blackberry, it is not far-fetched to imagine a world where Toyota, Volkswagen, General Motors (GM) and Ford are supplanted by Tesla, Apple, Google and other entrants.

Converging industries – automotive and tech

The old-school automotive industry comprised manufacturers and suppliers. However, as the industry becomes more high tech, new companies are entering the space. These days, tech companies (eg, Google, Apple, Microsoft and Samsung), semiconductor companies (eg, Qualcomm, Broadcom/Avago and Intel), EV companies (eg, Tesla and NextEV) and ride-sharing companies (eg, Uber, Lyft and Didi) share the terrain with auto incumbents. These are companies that the auto industry did not have to worry about – until now.

From the tech side, companies are salivating at the opportunity to expand their reach into this new market. They are not taking baby steps either, but are rather going all in. Over the last year alone, we have seen a flurry of significant acquisitions and investments with an eye towards the automotive sector:

- Qualcomm acquired NXP for \$47 billion to bolster its automotive-focused semiconductor capabilities;
- Intel acquired MobileEye for \$15.3 billion to expand into self-driving cars; and
- Samsung acquired auto supplier Harman for \$8 billion (see Table 1).

The function of a car itself is morphing. No longer is it merely a machine to take people from one destination to the next. Cars are now becoming connected devices which serve as commerce and data platforms – a trend that is accelerating (pun intended) as vehicles become self-driving. The car is also becoming a service. People use cars as needed (via ride-sharing), which reduces the need for personal car ownership. Intel predicts that the value of the goods and services associated with this new passenger economy – enabled by driverless cars and ride-sharing – will be close to \$7 trillion by 2050. These are significant business model shifts which tech companies – not auto companies – know how to manage.

Further, the enabling technologies for cars are new. It is not just the powertrain which is important any more. Instead, light detection and ranging (LiDAR), graphic processing units (GPUs), lithium batteries, 5G wireless or Internet of Things, cybersecurity, sensors and software are what matter. These technologies are outside what auto incumbents are accustomed to developing and yet they are now central to what will differentiate otherwise similar vehicles.

TABLE 1. Recent auto acquisitions by tech entrants valued at \$1 billion-plus

Date	Acquirer(s)	Target	Price \$billion	Topic
October 2016	Qualcomm	NXP	\$47	Automotive semiconductors
March 2016	Intel	MobilEye	\$15.3	Sensors / autonomous driving
November 2016	Samsung	Harman	\$8	Connected car
September 2015	Qualcomm	CSR	\$2.2	Automotive software
August 2017	Didi	Uber China	\$1	Ride-hailing
May 2017	Apple	Didi	\$1	Ride-hailing
Total spend on mega (\$1 billion-plus) deals			\$74.5 billion	

FIGURE 1. Market capitalisation (\$ billions)

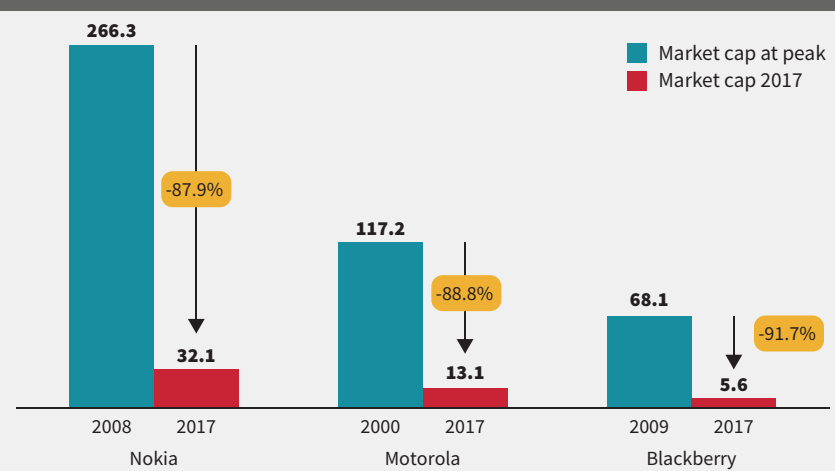


FIGURE 2. Mobile phone market share (% worldwide units shipped)

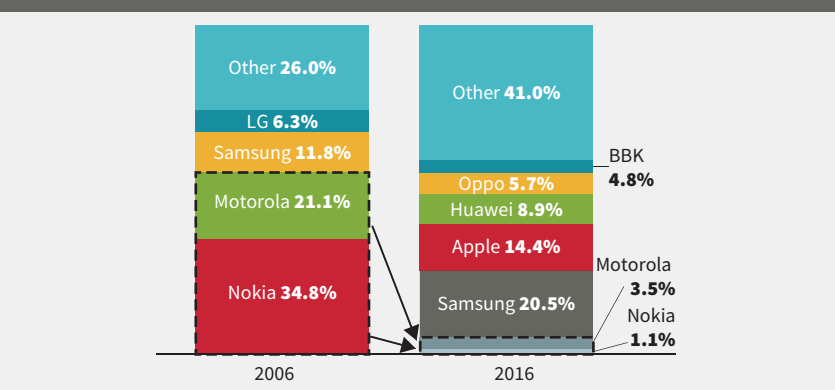
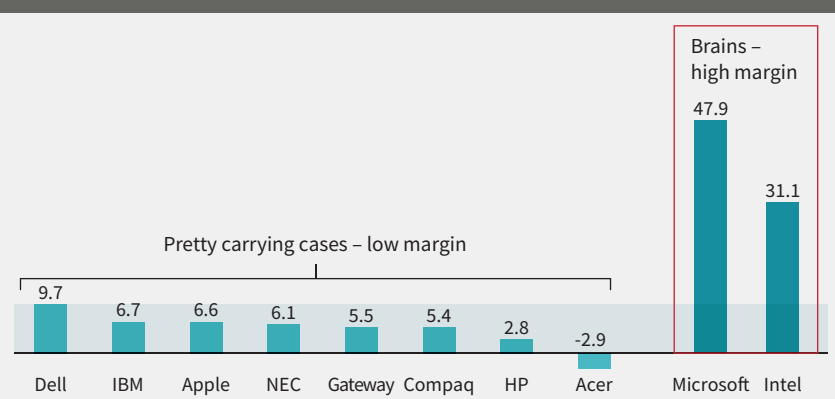


FIGURE 3. Percentage of operating margins (financial year 2000)



Cautionary tales: mobile phones and computers

The situation in automotive is eerily similar to what happened in the mobile phone space.

In 1997 Motorola was an industry leader with a market share of 24%, maintaining a share of approximately 20% into the mid-2000s.

In 2000 Nokia accounted for 70% of Helsinki's stock exchange market capital, 43% of Finland's corporate R&D, 21% of its total exports and 14% of the country's corporate tax revenues. In 2006, Nokia controlled 41% of the mobile phone market worldwide.

Meanwhile, in the United States, so-called 'crackberries' were considered so vital to government operations that when RIM (the manufacturer of the Blackberry phone) lost a patent infringement lawsuit in 2005, the US Justice Department filed a legal brief asking a federal court to delay any immediate shutdown so that state and federal employees could continue to use their devices. At the time, there were more than 3 million Blackberry devices in the United States, an estimated 10% of which were used by government employees. In 2007, RIM became the most valuable company in Canada, passing the Royal Bank of Canada to reach a \$67 billion market capitalisation. In 2009 *Fortune* declared RIM the fastest growing company in the world, after posting an average sales growth of 77% over the preceding three years.

Yet where are these companies now? They are virtual non-entities in the smartphone space (see Figures 1 and 2), driven out the market – a market they once dominated – by companies such as Apple, which did not make or sell a single mobile phone until 2007. How did Apple do this? It created an ecosystem around its devices. It built an operating system and its own commerce platform (the AppStore and iTunes). While the device itself was sleek, the true differentiation lay in the full-service platform it enabled.

The same theme is emerging in the auto space. As the powertrain becomes secondary to the brains, auto OEMs risk a fate similar to that of those fallen cell phone makers.

Computer industry

The PC industry provides another example of a sector which has dwindled and its leading players struggled – although not as dramatically as Nokia, Motorola and RIM. The more pertinent story here is the business model. PCs themselves are not particularly profitable, yet PC companies continue to focus on making and selling them while outsourcing the manufacture of microprocessors and operating systems to companies such as Microsoft and Intel. It is these companies which are making all the money, while PCs have become pretty carrying cases for their products (see Figure 3).

Auto OEMs risk meeting the same fate. Just because they have been around longer than the mobile phone and PC companies were at the time of their respective demises does not mean that the same thing cannot happen. These global auto brands could end up assembling cars at low margins, leaving the riches to the innovators. Two questions remain: how did the auto industry find itself in this position and what can it do to save itself?

Repercussions of vertical dis-integration

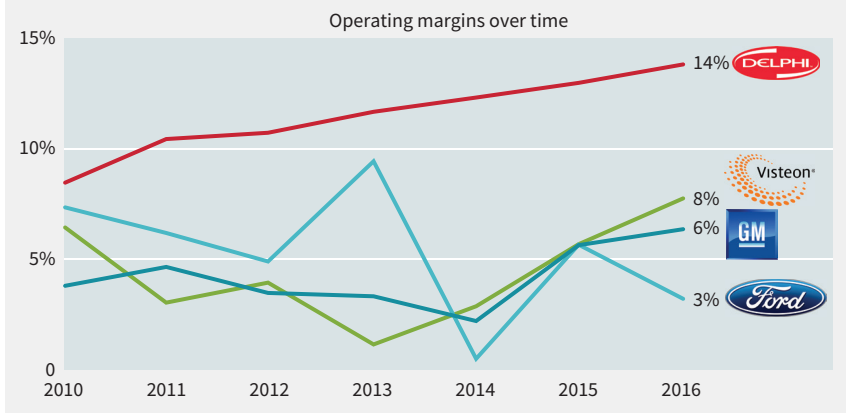
In the early 20th century, the auto industry set the gold standard for vertical integration. When Ford's River Rouge Complex in Michigan was completed in 1928, it was the single largest integrated factory in the world, spanning 1.5 miles by 1 mile (nearly 16 million square feet). It had its own dock, railroad line, electricity plant and integrated steel mill, enabling it to convert basic raw materials into a fully operational vehicle all under one roof. This business model was wildly successful and other automotive companies followed suit.

The age of vertical integration in the automotive industry lasted until the late 1990s and early 2000s, when car companies started to outsource major elements of their manufacturing capabilities. Some spun off internal operations into separate entities which could do business with competitors (eg, GM spun off Delphi, Ford spun off Visteon and Toyota spun off Denso). In the short term, OEMs benefited from lower pricing of parts while reducing their exposure to unionised labour and pension programmes. Today, the auto industry has an extremely fragmented supply base and OEMs are outsourcing nearly every aspect of the vehicle. It is estimated that the contribution auto suppliers make to a vehicle's value has increased from approximately 40% in 1990 to roughly 82% in 2015. Even more, many of these suppliers have gone on to achieve greater profit margins than their OEM parents (see Figure 4).

Amid this wave of vertical disintegration, there is one thing that car companies never outsourced: the powertrain. However, this is no longer the primary source of competitive advantage. Not only is the most important part of the vehicle now the brain, the powertrain itself is becoming simplified as the industry transitions to EVs. A traditional internal combustion engine powertrain has roughly 3,500 parts but an electric powertrain has just 35. No longer can OEMs rest on their laurels, knowing that they control the aspect of the car which requires the most expertise to manufacture.

Recognising this transition, tech entrants have quickly moved in and are seeking to control the associated technology chokepoints. Qualcomm, Intel and Samsung

FIGURE 4. Delphi and Visteon now have higher operating margins than their parents GM and Ford



have collectively spent more than \$70 billion in acquisitions for autonomous vehicle and connected car technology over the past year. That is more than the market cap of most auto OEMs. It is also a drop in the ocean compared to the cash and cash equivalents sitting on the balance sheets of these companies. In fact, using cash alone, the tech industry could buy most of the auto industry tomorrow if it wanted (see Figure 5). Not only do tech companies have more cash on hand, but they also have larger price-earnings multiples and offer better compensation schemes, which in turn attract stronger talent to their organisations. For example, GM pays its software engineers on average \$75,000 a year, while Google pays its software engineers over \$120,000 a year (see Figure 6).

Supplier involvement

Auto suppliers are making moves too. Delphi has acquired or made strategic investments in 11 companies which specialise in the electrical architecture and software required for autonomous vehicles and connected cars since 2012. Denso has been investing in deep learning software and LiDAR start-ups, while Bosch announced in June 2017 that it is building a \$1.1 billion facility to produce semiconductors used in self-driving vehicles.

FIGURE 5. Cash and investments as of April 2017, per CapitalIQ and company filings

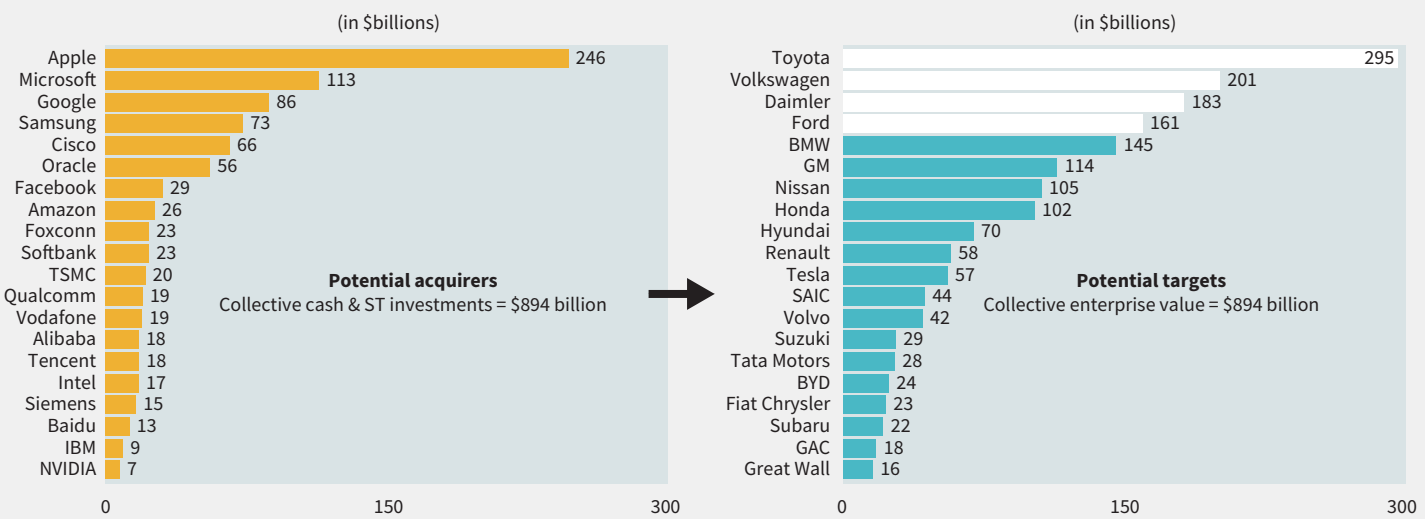


FIGURE 6. Silicon Valley thinks different

	Auto industry Auto OEMs/suppliers	Silicon Valley Tech companies
Culture	Formal; stereotypically “old school” work environment	Less formal; free food; “bring your dog to work”
Comp packages	Salary + profit sharing • Cost cutting/profit-based incentives • Software engineer (GM) = \$75,000 salary	Salary + stock options (heavily weighted) • Growth-based incentives • Software engineer (Google) = \$126,000 salary
Valuation multiple	Avg P/E multiple: 10.8x	Avg P/E multiple: 22.6x (over double)
Technology development	Tends to focus mostly on car-related technologies	Broad focus: big data, apps, e-commerce, communications, sensors and navigation
Business models	Make money from selling cars/parts	Unbounded; make money from everything (eg, data)
IP strategy	Auto “plays nice” with cross licences	Sophisticated use of intellectual property to shape ecosystem, uses standards bodies
Car companies will have no choice but to adapt, which means more proactive IP strategies; otherwise, tech entrants will act first with their intellectual property		

Auto OEMs, by contrast, have done relatively little to compete with tech entrants and suppliers. Ford’s purchase of Argo AI for \$1 billion in February 2017 – the single largest investment in an autonomous vehicle company by any OEM to date – remains exceptional. Instead, OEMs appear to be sticking to their old game plans of purchasing low-tech auto companies (eg, spare parts suppliers and tyre manufacturers) or occasionally, ride-sharing companies with little to no intellectual property (see Table 2).

Manufacturers are not investing much internally either. While auto suppliers are generally four times smaller than OEMs, they spend on average 1% more on R&D. Bosch, Denso and Delphi all have similar revenues to a mid-sized OEM, but spend significantly more on R&D. For example, Bosch has similar revenue to Hyundai but spends 9% of its revenues on R&D as opposed to approximately 1% for Hyundai. What are OEMs thinking? If they are not investing internally to develop technologies to compete with their suppliers and they are not making acquisitions to compete with new tech entrants that means only one thing: they are dangerously exposed.

The technologies enabling the brains of vehicles are highly specialised and OEMs will not be able to afford to outsource them as they have done with other aspects of vehicles. Oliver E Williamson, professor emeritus of UC Berkeley, was awarded the 2009 Nobel Prize in economics based on his theory that in a producer-

supplier relationship, the more highly specialised a component, the greater the level of risk to both parties if it is outsourced. Additionally, a study conducted by the University of Utah’s Eccles School of Business concluded that companies were between 5% and 70% more likely to fail when they outsourced components deemed critical to their competitive position within an industry. OEMs cannot afford to be at the whim of others when it comes to sourcing critical technologies crucial to their own competitive advantage in the marketplace.

Nothing new under the sun

The challenges faced today by OEMs today are not new. In every industry, there is at least one example of a technology, or collection of technologies, that has disrupted the status quo and caused market shares to change hands. In the smartphone industry, one key technology which reshaped the landscape was the touch screen – the *sine qua non* of today’s smartphones. Arguably one of the biggest blunders ever made by Apple was failing to develop or buy the core intellectual property which enabled the touch screen. Instead, this technology was widely adopted and left Apple litigating Samsung on flimsy IP positions such as slide to unlock and rounded edges.

The car brain is the new touch screen and tech companies, which learned their lessons in the smartphone wars, are carving out IP positions in all of the right places. They understand the value of intellectual property and, unlike automotive players, have a culture of aggressive protection and IP licensing. Auto OEMs, on the other hand, tend to participate in a gentleman’s game of cross-licensing, rarely fighting IP battles against one another in court. However, as tech companies move into key market positions within the automotive space and challenge major profit pools, we are likely to see more and more patent battles break out.

Tech companies, on the other hand, are pleased with their strategy thus far. There is a reason why they are not using their large cash balances to buy auto OEMs. They want to keep OEMs right where they are, providing the manufacturing and system integration services which require huge overheads, while they sell the high-margin GPUs, sensors and software which are brand agnostic.

TABLE 2. Recent acquisitions by auto incumbents valued at \$1 billion-plus

Date	Acquirer(s)	Target	Price (\$B)	Topic
Aug-16	Toyota	Daihatsu Motor	\$3.132	Internal combustion engines
Jan-16	Magna	Getrag	\$2.666	Transmissions
Oct-16	Nissan	Mitsubishi	\$2.189	OEM
May-16	Trelleborg	CGS	\$1.249	Tyres
Dec-16	Daimler	Athlon Car Lease	\$1.221	Traditional car leasing
Jul-16	Yokohama Rubber	Alliance Tire	\$1.179	Tyres
Mar-16	LKQ	Rhino	\$1.135	Spare parts
Aug-16	Punch Powertrain	Yinyi	\$1.110	Powertrain
Feb-17	Ford	Argo AI	\$1.000	Autonomous driving
Total spend on mega (\$1 billion-plus) deals			\$14.881 billion	

Translation: they know how to win. And they know this because they have done it before in other industries. The power dynamic in the auto industry as we know it is changing. It is not about OEMs outsourcing low-margin components to suppliers any more. It is about tech companies and suppliers outsourcing low-margin assembly to OEMs. The fact that this happened in the computing industry should be a frightening realisation for OEMs. Once heralded as leading innovators, they now risk becoming commodity manufacturers of pretty carrying cases to tech companies and their own suppliers.

Exposure of Chinese OEMs

Arguably, it is Chinese OEMs which are most exposed. While companies such as Ford, Toyota and Hyundai have built sizeable IP portfolios across many enforcement jurisdictions (albeit in less strategic technology areas), we are not seeing the same activity from Chinese OEMs. Companies such as SAIC, Geely and BAIC have established patent positions in China but have little to no patent protection in other jurisdictions. Again, we have seen this same pattern in smartphones – for instance, when Chinese smartphone player Xiaomi tried to expand into India and the United States, it was blocked at the gates and subsequently spent millions purchasing patents from Intel, Casio and Microsoft to protect itself. Chinese OEMs need to think globally, acquire intellectual property and enter cross licences in order to enable cross-border expansion without friction. Where should they start? Japan is a buyer's market for intellectual property; Japanese companies have vast quantities of patents but they rarely enforce them. Chinese OEMs should see Japan as an opportunity to build up stronger defensive positions to compete with other OEMs.

Additionally, Chinese and non-Chinese OEMs alike should look at orthogonal industries such as defence (eg, Boeing, Honeywell and Lockheed Martin) and agricultural technology (eg, John Deere), which have intellectual property crucial to autonomous vehicles. These companies have been largely overlooked by tech entrants and auto suppliers and herein lies an opportunity for the IP-savvy OEM. If OEMs do not make acquisitions, develop intellectual property internally or partner with the right players for vehicle brains, they run the risk of dying out like Nokia, Dell and all the other market leaders before them which did not own the technologies that redefined their industries.

Developing an action plan

Although auto companies have found themselves in a precarious situation, it is not all doom and gloom. They can still recover if they acknowledge their predicament and make smart, forward-looking strategic moves in the near term. Auto OEMs should consider proactively adapting their business models. Part of this strategy will likely include partnering with new entrants to ensure that they have solid technology and relevant patent positions to enhance negotiations. At all costs, automakers need to avoid being relegated to a low-margin final assembly business – the direction in which they are heading as things stand. Further, they should spend on R&D and invest in or acquire companies across technology chokepoints enabling autonomous vehicles, ride-sharing, EVs and connected cars with strong IP positions. If they do not figure out how to

Action plan

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The rapidly changing auto landscape presents IP challenges for all those involved. For original equipment manufacturers (OEMs):

- alter your business model and partner with tech companies to get in on the action and avoid being relegated to a low-margin assembly-only business;
- invest in owning technology chokepoints; and
- if you do not figure out how to get control of the new central components of your product (also known as the brains, the electric vehicles powertrain, the interfaces and service models), you will lose control of your industry.

For tech companies:

- allow OEMs to produce pretty carrying cases while you control the technology rights for the higher-margin electronic components (also known as the brains); and
- use your war chest to acquire technology companies and substantial patent portfolios.

For auto suppliers:

- use your existing tech positions to ensure widespread adoption of your technologies through licensing and standard setting; and
- continue investing in R&D and protecting your ideas – do not let OEMs close the gap on you.

get control of the central components of their product, they will lose control of their industry. Finally, they should also consider buying under-utilised assets in Japan and look to other industries (eg, defence and agricultural technology) for technologies with orthogonal applications to the auto sector.

At the same time, there is an opportunity for tech companies to leverage their positions of relative strength. Even though they have the cash to buy most OEMs, they should not do this but rather keep OEMs right where they are, doing the grunt work of designing the vehicles and integrating systems at low margins. Owning the technology rights to the brains, the user interfaces, the e-commerce platforms, EV powertrains and sharing services will make them dominant players in the auto sector, even if they do not make the physical vehicles.

Both tech companies and automotive suppliers should be utilising their technology and IP positions to maintain a competitive advantage over the auto incumbents, inducing beneficial partnerships, reshaping ecosystems to their advantage and developing new revenue streams from licensing. (Remember, Microsoft was making up to \$10 a phone because it had the technology rights to the smartphone software systems – even though it did not manufacture the physical devices). If tech companies can corner automakers into being no more than manufacturers for pretty carrying cases, they will win. Will the auto industry push back and pre-empt their downfall? We will have to wait and see.

Avoiding the “this time it will be different” mindset

For those in the auto industry, it is time to avoid the six most dangerous words in the English language and anticipate that the future will be different. Now is the time to acquire the technology rights that will shape this changing world. **iam**

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