



Reinventing the Wheel:

**THE FUTURE OF
AUTOMOTIVE**

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Revving Up

Revving Up

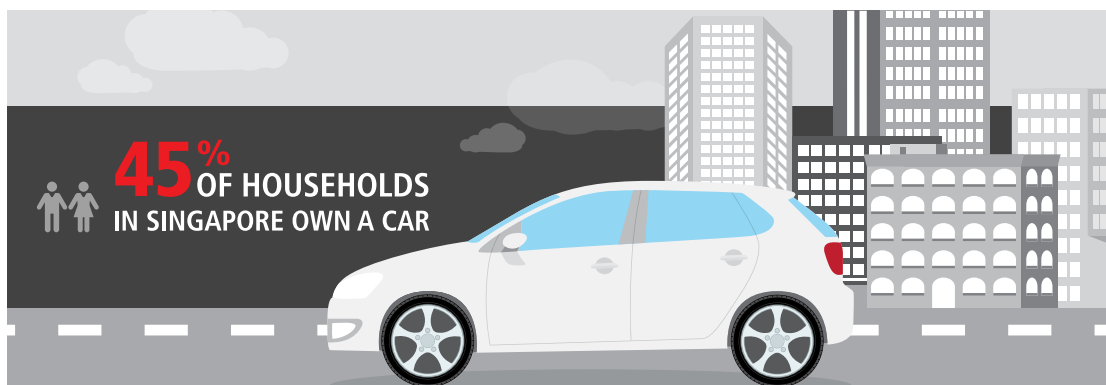
Whether it is the emergence of driverless cars or taxi hailing apps, there is a sense that the future of the transport industry is being written right now.

The ultimate destination is far from certain – Uber is facing regulatory issues in some of the markets it operates in and self-driving vehicles are several years away from appearing in the showroom – but some clear sign posts are emerging.

Faced with the issues of pollution, safety, poor transport infrastructure and, in the case of Singapore, the high cost of owning a car, the automotive industry is being disrupted across all its segments by players big and small.

Global carmakers like Audi and BMW are now producing vehicles that only existed in the minds of designers a few years ago. Audi showcased an autonomous super car at the consumer electronics CES Asia earlier this year, while BMW's 2016 7-series sedan lets the driver park the car while standing *outside* the vehicle by using just a key.

Despite persistently high COEs and the spread of ERP gantries, Singaporeans still love their wheels. A report by DBS Group Research estimated that around 45 per cent of the total households in Singapore own a car in 2014.



With around 15 per cent of the car population aged 9-10 years old and many of these expected to be scrapped, the supply of COEs being released back into the system is expected to surge. This surge in supply, coupled with lower pump prices, means the market for new cars is expected to be healthy in the near future compared to previous years, according to the DBS report.

In the public transport space, a handful of tech start-ups are changing the way commuters get from home to office and back, challenging traditional taxi operators along the way. And just when apps from Uber and GrabTaxi seem to be the new normal, newer entrants such as Ryde Technologies, a Singapore-based car pooling platform is threatening to disrupt traffic yet again.

With the government's push for Singaporeans to ditch their cars for public transport and no respite in sight from high car prices, car sharing and carpooling services could grow in popularity here as people change their mentality towards owning a car.

The rising number of tourists into Singapore is also fuelling demand for cab hailing services, especially those who have used such services in their home countries. According to DBS Group Research, foreign tourists spent some S\$835 million on transport when they visited Singapore in 2013, CAGR of 8% over a five-year period.

Even the logistics industry is feeling the heat of disruption, particularly from peer-to-peer platforms. Hong Kong-based GoGoVan, for instance, allows customers to access thousands of drivers directly from their mobile phone, while a Singapore startup, Ninja Van, is looking to grab market share with its niche delivery service targeted at e-commerce companies.

This wave of innovation shows no sign of letting up. A laboratory in the US has successfully produced a car using 3D printing technology and US car giant Ford expects this form of manufacturing to become commonplace in the not too distant future. Already, Ford 3D prints prototypes of its cars, although it has yet to do so for its finished vehicles.



Many more “Jetsons”-like inventions – from flying cars and vehicles that run on compressed air (see pg 19) – could be just around the corner.

The creativity spreading throughout the auto sector is impacting both businesses and the man on the street. Taxi operators, car rental companies and car dealers in Singapore have all been put on notice.

Based on DBS’ engagement with these traditional players, they are far from ready to throw in the towel, but understand the need to adapt their business models to a rapidly changing environment. Meanwhile, the upstarts are forging ahead with their ambitious plans to upend the industry.

DBS is trying to help make sense of these changes with the Disrupt @ The Bay series of industry-focused events.



Photo: ST

“ A recent survey found that half of the businesses studied are looking to change their business model or leverage technology to scale their business. So one of the things we are trying to do with our Disrupt @ The Bay series is to pull together new technology to connect with local entrepreneurs to see how we can spark off new ideas, and how technology can solve the problems that they face. ”

- Lim Chu Chong,
Regional Head of SME Banking, DBS Bank.

It is a heady time for those in the automotive industry and this report is designed to be an insightful road map for what lies ahead.



In High Gear:
**DISRUPTIVE
TRENDS &
OPPORTUNITIES**

Carmakers and car owners

THE NEXT GENERATION OF CARS

The auto industry is going through massive upheaval as upstarts and new technologies are changing the way traditional carmakers do business.

With their huge financial reserves and cutting-edge expertise, Silicon Valley's tech giants are fast encroaching on the car industry. Google intends to have self-driving cars on the road within five years. Besides Tesla Motors' line-up of sexy electric cars, Apple's electric version is expected to start production within five to ten years.

Tech minnows are keen to disrupt the auto industry, too. In June, a Hong Kong-based startup launched a DIY electric four-seater car that can be easily assembled from separate parts – like flat-pack furniture from Ikea. Targeted at companies that want to sell electric cars or run car-sharing schemes, the mass market OSVehicle kit platform tackles issues such as the slow take-up of electric cars and the growing popularity of car sharing.

One area with serious potential to disrupt automobile manufacturing – and where both startups and established automakers are keeping a close eye on is 3D printing. This manufacturing technology of the future has the potential to reduce waste, pollution and costs.



Photo credit:
Divergent Microfactories

In the US, a company called Divergent Microfactories has built a supercar using customisable 3D printed aluminium alloy parts. Called the Blade, the incredibly sleek, light and fast prototype car has only a third the emissions of an electric car and 1/50 the factory capital cost of manufactured cars.

“We’ve developed a sustainable path forward for the car industry that we believe will result in a renaissance in car manufacturing, with innovative, ecofriendly cars like Blade being designed and built in micro-factories around the world.”

– Kevin Czinger,
founder and CEO of Divergent Microfactories.



Smart cars are becoming smarter

Smart vehicles are becoming more common too, especially those from the US, Japan and Europe. These clever cars are usually equipped with safety features that notify drivers of potential threats, such as cyclists or road debris, detect traffic lights and read road signs. A handful of New York City’s taxis are now being fitted with Mobileye technology. This connects special cameras to the brakes that brake in time to avoid potential accidents.

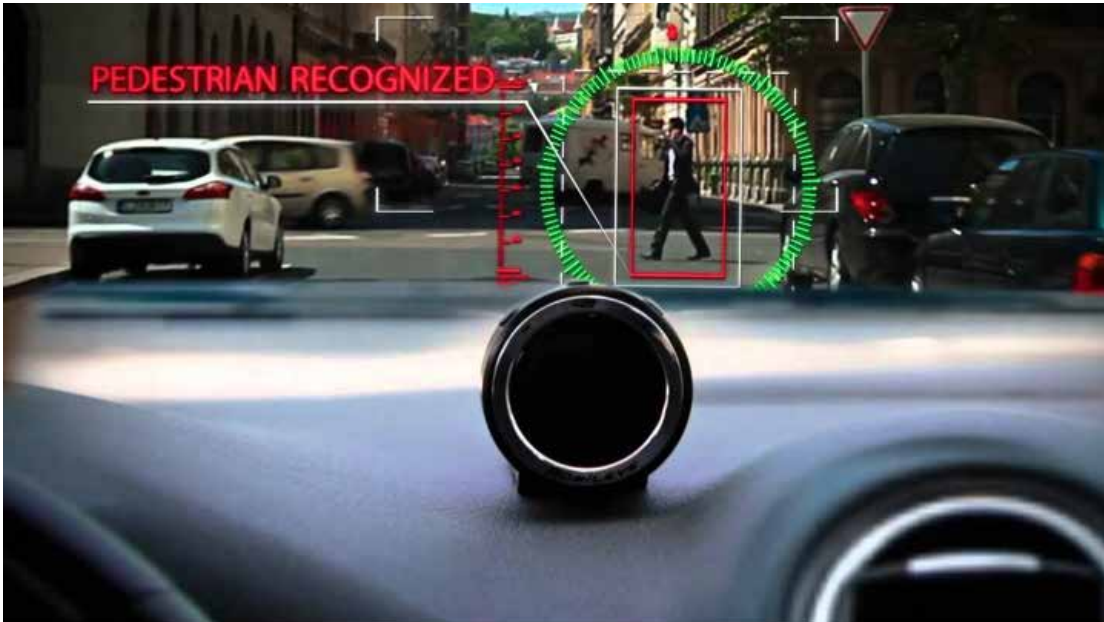


Photo credit: YouTube

Besides improving safety, some smart cars are also helping their owners save money, as well as the environment. Already installed in a few car models, a new technology called the stop-start system prevents a car engine from guzzling fuel in situations like traffic jams.

The result? A better fuel economy. Research firm Navigant Research estimates that the number of cars with stop-start technology worldwide will grow from 8.8 million in 2013 to an impressive 55.4 million by 2022.



Then there are the cars that talk to each other, via wireless connection. Yes, talking cars are becoming a reality. Known as vehicle-to-vehicle communications, or V2V, the technology allows cars to broadcast their position, speed, steering wheel position and other data to nearby vehicles within a few hundred metres.

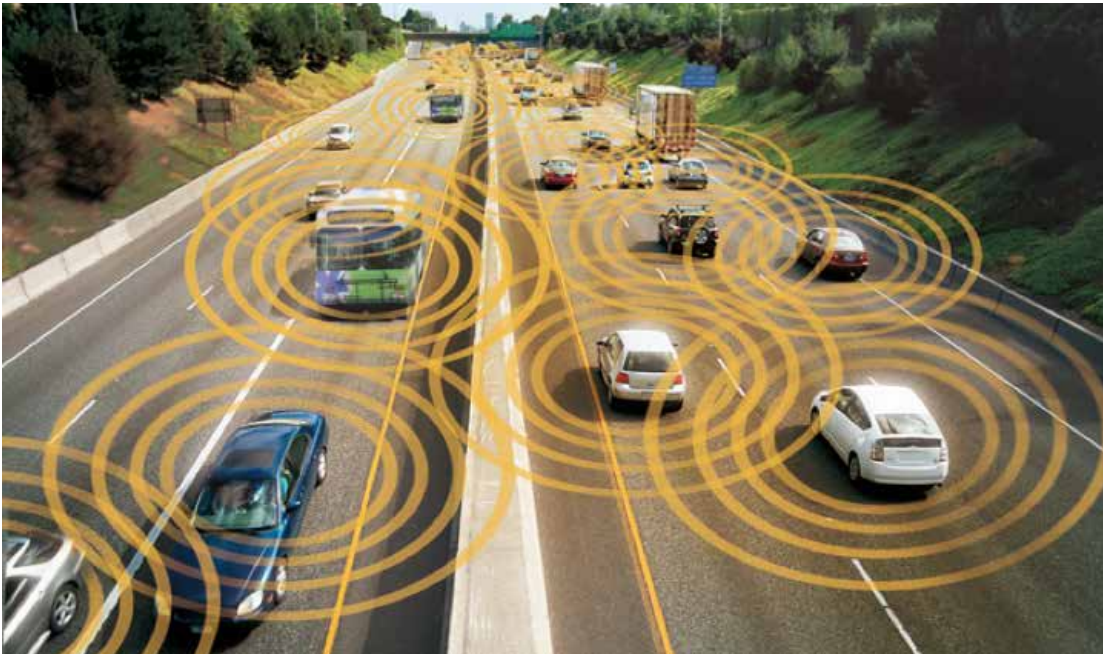


Photo credit: ExtremeTech

In turn, these vehicles adapt the data and relay it on to their drivers. Although already being developed in research centres, V2V technology will be appearing in the mass market in two years, in General Motors' upcoming model Cadillac.

“The traditional thinking in the automotive industry isn't suited to exploit the opportunities in the Internet community. If you need committees, and so on, to make decisions, then you've lost before you started.”

– Wolfgang Ziebart, Jaguar Land Rover's engineering head, speaking to Bloomberg at the Geneva Motor Show in March

Energy of the future

Alternative sources to standard petroleum or diesel – such as biodiesel and electricity – are economical, energy efficient and environmentally friendly. But one could say that these types of car juice are becoming old news.

An emissions-free alternative fuel that looks set to make a real impact on automotives is hydrogen. Pure hydrogen is only available in a few European countries, the US and Japan, because it is difficult to obtain.

But mass automakers Toyota, Honda and Hyundai are starting to sell hydrogen fuel cell cars for the first time. These vehicles run on compressed hydrogen gas and do not emit any exhaust. Although costs are currently high, carmakers expect prices to go down over time.

Examples include the Honda FCX Clarity, the world's first dedicated platform hydrogen vehicle with a compact fuel-cell stack built into the centre armrest, as well as the Toyota Mirai, which launched in Japan last December. The Mirai's hydrogen tanks are mounted underneath the vehicle.

There is also Zero Pollution Motors, a company that believes its latest invention is not just hot air – literally. The world's first car to run on compressed air, the AirPod can be refuelled in just three minutes at a compressed-air station, with each top-up costing less than US\$3.



Photo credit:
2050Publications

While its stated performance may seem wimpy – a top speed of 80 kilometres per hour and a range of 129 kilometres – it is getting some environmentally conscious drivers very excited. The first AirPods will reportedly launch in Hawaii by the end of the year.

Or, for another new method to refuel cars, how about an electric car that can be charged wirelessly – while it drives on the road? The technology is called induction charging or wireless electric vehicle charging, with companies like BMW and Volkswagen doing research on it. Trials are already being held in London.

“The hydrogen age has arrived.”

– Henri Winand,
CEO of Intelligent Energy,
a company that makes hydrogen fuel cells

CASE STUDY**THE FUTURE IS ALREADY HERE**

One established car company that is fully embracing these changes is Audi. The marque is also developing renewable forms of energy, known as Audi efuels – e-gas, e-gasoline, e-ethanol and e-diesel.

These synthetic fuels are produced with only water, carbon dioxide, sunlight and specialised single-cell microorganisms. There is also no need for farmland or clean drinking water. The fuels are currently being tested in production cars in its German headquarters.

The benefits of these synthetic fuels? Highly reduced carbon dioxide emissions. Audi claims that a car using its e-fuels has a carbon dioxide footprint just as good as a battery-operated car powered by wind or solar energy.

Said Jeff Mannering, managing director of Audi Singapore: “These e-fuels require no fossil fuel production. The only by-products are water and oxygen. They have emissions from somewhere between zero and half of current emissions. Synthetic fuel is the fuel of the future.”



Photo credit: AUDI AG

The German automaker has also tested automated driving – or what it calls “piloted driving” – over the last 15 years. It became the first carmaker to test drive in real-world conditions for long distances when it unveiled the Audi A7 piloted driving concept car, which drove itself 885 kilometres from Silicon Valley to Las Vegas.

Mannering, who said piloted driving has to be safe, fuel efficient and convenient, added: “The difference between autonomous driving and piloted driving is you need to keep the pilot in charge of the car. Somebody has to be responsible for it.”

He explained that the “secret weapon” is a technology called zFAS that acts as the brain, retrieving and interpreting data from its sensors and surroundings. For instance, the system will optimise fuel consumption by adjusting driver modes of the car. It can also help the driver by doing boring or stressful tasks such as parking.

He said: “Piloted driving is very close because the car can do it today. The thing that we have to solve as a society is, who is responsible for the legislation and the liability if there is some problem?”

Logistics

TAKING THE ROAD YET TRAVELLED

A new generation of tech-driven start-ups is giving traditional logistics players a run for their money.

Dominated by big multinational corporations like DHL and Federal Express, the logistics industry is being disrupted by smaller, nimbler tech start-ups that are looking to overhaul the business of delivering widgets to customers.

Many of the changes are being driven by the rise of online shopping globally. In the US, for instance, there are already specialist logistics players that focus on omni-channel retailers – those that sell their wares online and in a brick-and-mortar outlet. These include companies like Shutl, a technology platform that links retailers and local courier companies, which was recently bought by eBay.

Another e-commerce giant, Amazon, is betting on drones to be the delivery mechanism of the future and has so far invested over US\$14 billion in the technology since 2010. Closer to home, China’s Alibaba recently invested US\$250 million in SingPost as it looked to expand overseas.

The ultimate aim of these efforts is to achieve the dream of almost instantaneous delivery of anything and at anytime. In Asia, Hong Kong-based startups GoGoVan and EasyVan have adapted the Uber business model of using independent contractor drivers for the logistics business.

Both offer a peer-to-peer app that connects customers who need something delivered quickly with their network of van drivers, cutting out middle-man call centres in the process. A user simply types in his or her pick-up location and destination in the app and requests for a vehicle. And like Uber, drivers registered with the service will receive the request and decide if they wish to accept the job.

Started in 2013, GoGoVan – the bigger of the two with over 20,000 vehicles and 7,000 drivers – has since expanded to Singapore, Korea, China, and Taiwan.

Uber itself is considering entering the logistics space. Said the company’s chief executive Travis Kalanick last year: “We’re in the business, today, of delivering cars in five minutes. But once you’re delivering cars in five minutes, there’s a lot of things you can deliver in five minutes.”

Taking a slightly different route is Singapore-based Ninja Van, which offers a niche delivery service targeted at e-commerce companies. The company employs its own drivers directly – as opposed to the independent contractor model – but differentiates itself by using sophisticated algorithms that allows it to promise deliveries that are faster, cheaper and more reliable.

These innovators are offering businesses a lower-cost alternative to traditional delivery services, but without compromising on delivery standards. It may be early days, but it is already looking like an Uber-style revolution is sweeping the logistics sector.

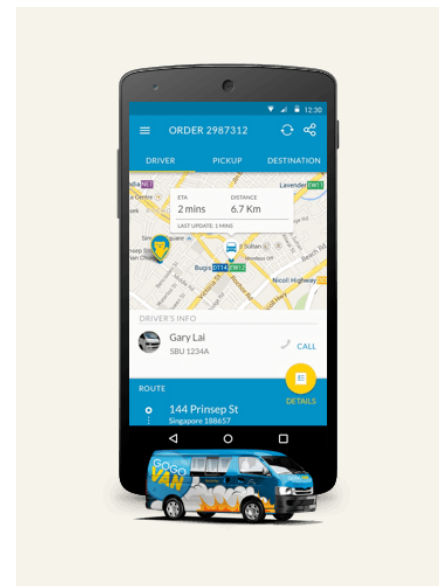
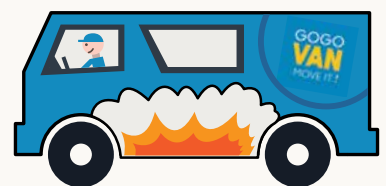


Photo credit: GoGoVan



Over **20,000** vehicles
and **7,000** drivers



Expanded to
**Singapore, Korea,
China, Taiwan**

CASE STUDY**CHEAP AND GOOD**

DBS BusinessClass spoke to Ninja Van founder and CEO, Lai Changwen, about how his year-old business with a fleet of 80 vehicles is disrupting the logistics space



Photo credit: Ninja Van

Can you briefly describe your business model?

Ninja Van offers last mile delivery service specialising in e-commerce companies.

What is the profile of your customers?

We have a rapidly growing and diversifying customer base. Among many others, these include Charles and Keith, Nespresso and online retailers with different specialties, such as Pupsik Studios (baby products), Luxola (beauty) and Love, Bonito (women's fashion).

What differentiates your offering from traditional logistics players?

Ninja Van concentrates on e-commerce offerings. We specialise in optimising vehicle routes, allowing optimum utilisation while keeping costs as low as possible. Hence we are able to provide a cheaper rate without compromising the service level.

What are the key benefits for companies that take up your service?

We offer bespoke solutions to companies, including online order creation, real-time milestones updates and full communication suites with customers.

What technology do you employ to maintain your delivery standards?

We have an in-house developer and algorithm team. We built our own API-centric application to compute capacity checks and optimise vehicle routes, thus ensuring that we do not over-promise.

What are the challenges you face when it comes to expanding the business?

The e-commerce market here has yet to mature, and most retail outlets are reluctant to abandon the traditional pen and paper method for delivery. Hence, Ninja Van intends to extend our logistics model to address payloads such as same day and bulky deliveries, fleet management system and collection infrastructure.

How are you growing the business?

We are already doing cross border delivery to Malaysia via a third-party service, the existing volume will allow Ninja Van to scale quickly over in Malaysia. We are also moving into the Indonesian market.

Commuters

LET'S MOVE IT

Disruptive technologies are already at work for commuters and drivers, as smartphones and other technologies reinvent transport options.

Although Singapore is fortunate to have a world-class public transportation system, commuters and drivers still face problems. Overcrowding and delays on trains and buses, expensive cars due to the high cost of a Certificate of Entitlement (COE), and complicated taxi surcharges are just a few of their woes, not to mention traffic congestion and adverse environmental impact.

Startups keen on entering the transport sector would do well to focus on businesses that get around these inefficiencies and offer a smoother, more seamless travel experience.

Technology has some answers, here and around the world. App-powered services from carpooling to taxi booking give commuters, passengers and drivers more choices, convenience and flexibility.

Drivers have dozens of traffic-related apps, from traffic trackers and maps such as Google Maps and Waze, to real-time carpark search apps. In the US, apps like GasBuddy even help drivers find cheap petrol along their route.

Meanwhile, commuters around the world rely on accurate and real-time public transport apps such as Moovit, with 10 million users in 400 cities, including Singapore. There are even apps that offer travel entertainment, such as Press Play from India, for commuters stuck on a long-distance bus or in a traffic jam.

Hail to the taxi

But for a peek at disruptive technology hard at work in the transport sector here, just search for third-party taxi-booking apps. In Singapore, there are at least five vying for attention. One of the most popular – GrabTaxi – averages about 259,200 bookings each day. Others include UberTAXI and Easy Taxi.

In the region, apps include real-time taxi- and limo-booking smartphone apps Didi Dache from China and OlaCabs from India. There are also “Uber for motorcycles” services GrabBike and Go-jek from Jakarta. The latter offers other features, such as courier service and food delivery, too.

A research team from the Singapore-MIT Alliance for Research and Technology and the MIT Senseable City Lab is going further, with a data visualisation project combining data on taxi locations and Singapore’s climate.

One aim is to help developers create apps that will make it easier for locals to hail a cab in heavy rain, for instance.



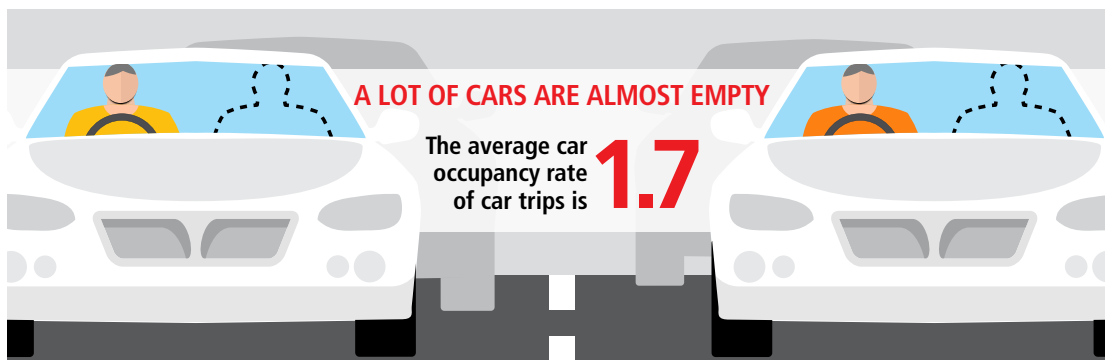
Photo credit: GrabTaxi

“Uber didn’t begin with any grand ambitions.
It began as the answer to that simple question.”

– Uber CEO Travis Kalanick, on the question of simply pushing a button and getting a ride

Share a ride, right now

Ridesharing or carpooling helps to make better use of empty passenger seats in cars, improving efficiency as well as saving petrol and other costs. In Singapore, the average car occupancy rate for car trips is 1.7, which means that a lot of cars are almost empty – bar the driver – on the daily drive to work.



That is where new real-time carpooling apps come in, such as Ryde in Singapore (see case study on facing page). Elsewhere, in the US, there are Carma Carpooling and Duet Commute, while ride-sourcing companies like Uber and Lyft offer carpooling options within their apps.

The benefits are clear: for passengers, they offer immediacy, flexibility and convenience, without the hassle of owning a car; for car owners, they offer a chance to recoup transport and petrol costs.

In Washington, ride-booking service app Split lets the customer order a car, walk a short distance to a pick-up point, and be fetched – along with other passengers on similar routes. Rides cost from US\$2-\$8.

Similarly, in New York, a new ride-hailing app called Via groups up to five passengers going in the same direction, sends a professional driver to pick them up within 10 minutes of their order, and drops them off together at one spot. Rides cost from US\$5.

And more of these real-time carpooling apps are offering better points of differentiation or niche services, too. Shuddle, for instance, is a newly released car sharing service app in San Francisco that gets vetted drivers to shuttle children and teenagers to school safely. Parents also get a real-time GPS option to track the ride.

The New York City app SheRides targets women passengers, who are able to quickly locate and order taxis driven only by women. Although it currently has teething issues finding enough female drivers to sign on, it continues to have a loyal following that feel the service is safer and more comfortable.

“Carpools we discovered are 50 per cent technology, 50 per cent social.”

– Oscar Salazar,
chief product and technology officer of Ride, a new real-time carpooling app in the US

CASE STUDY**The RYDE ahead**

Singapore's first carpooling app RYDE has big goals – it aims to be the Airbnb of transportation in the country, says Terence Zou, chief executive officer of RYDE Technologies.

A former private equity investor, Zou saw a need in the market and started the app 18 months ago. The company registered in September 2014. Zou, who has been a driver since he was 18, says: “Two years ago, I took a taxi to town to do my shopping on Christmas Eve and left my car behind. I couldn't get a cab for hours.

“I realised the big problem here was most times we drive alone from point A to point B. So it clicked. Carpooling could solve this issue.”

There were other needs in the market too, he elaborates. Taxi passengers sometimes cannot get a cab in the mornings, commuters must squeeze onto already jam-packed buses and trains during peak hours, and drivers drive almost-empty cars on the road.

The only problem about carpooling was that locally, many drivers were unsure of government regulations and perceived paid carpooling to be illegal. It was not. What was – and is – illegal are private cars functioning as taxis.

As of March this year, the government introduced a new rule on the carpooling practice. Today, every driver is now allowed to make two carpool trips a day and be paid for them. The fees should also be only enough to recover their cost of petrol.

In April this year, RYDE had its soft launch. The app charges passengers a flat fare of about \$5 to \$15 based only on distance. It does not charge them for ERP fees, taxes or insurance. Riders pay directly to drivers to split the cost of a trip.

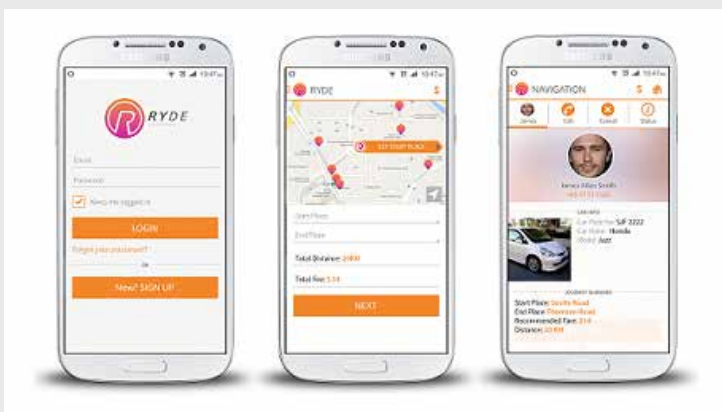


Photo credit: Square Fresco/RYDE

The company is now in its next phase of growth, and working on growing its 3,000-strong network of members to 20,000 – drivers and passengers – over the next six months. It is developing the app further and hiring staff.

Says Zou: “We are sanguine about our prospects – the app helps people to save some costs and money, make new friends and save the environment.”

He has plans to expand the service regionally, into similarly dense, advanced and congested cities, such as Hong Kong, Kuala Lumpur and Taipei. For now at least, “we want to be the Airbnb of transportation in Singapore”, he says.

Ultra-modern car sharing

Standard car sharing plans, which are not unusual in Singapore, offer cars on a short-term rental. But for car sharing with a little creativity, look to Stockholm, where Audi is testing a new “micro-sharing” programme.

Called Unite, it allows up to five people to use the same car for a year or two, with a smartphone app and beacon technology. The app lets Swedish users reserve the car, locate it or check if the petrol tank is full; the beacon, which is attached to a keychain, tracks usage and routes, then splits the monthly bill.



Photo credit: Cité Lib

The city of Grenoble in France is going a step further. It is experimenting with Toyota on a three-year electric car-sharing service called Cité Lib by Ha:Mo, that lets residents use ultra-compact electric models, including a futuristic-looking hybrid car-scooter.

The 70 vehicles, which can be charged at 120 stations, are connected to the city’s transport infrastructure, giving residents an impressive public transport option besides ordinary trams, trains and buses. Users can check their availability and reserve one, as well as plan the best route to their destination.

“It’s a great opportunity for our community to test, for three years and exclusively in Europe, a new mode of mobility that’s not only innovative but also economic and ecological. It’s an experimentation that is bound to be followed by others for the benefit of our citizens.”

– Christophe Ferrari,
President of the Grenoble-Alpes Métropole,
on the Cité Lib by Ha:Mo programme

Apart from cities, companies are even sharing fleets of cars with their employees, if they need to make a short trip from the office. Tech giant Google has one of the most advanced corporate car sharing programmes in the US at its Mountain View headquarters, with a “GFleet” made up of 80 electric cars ready for employees.

CASE STUDY**Hello, Helsinki**

Imagine riding a bike to work, taking the train to lunch and hopping into a shared car to return home. In the future, self-driving cars could be worked into the mix – resulting in even more benefits.



Photo credit: bits.blogs.nytimes.com

This fully integrated, mobility-on-demand system is not a pipe dream. Helsinki, in Finland, is aiming to reach for just this goal by 2025. The city is creating a point-to-point “mobility on demand” system, based on public and private collaborations and a whole lot of sensors, big data and smartphones.

The city’s ultimate goal is to become a car-free city. It envisions commuters having a multitude of transportation options for every trip: on-demand minibuses, conventional buses, bicycles, trains, and even self-driving cars. A dedicated mobile app picks the best option, based on real-time traffic data, and the commuter pays for it through their smartphone.

Trips could be customised and the appropriate vehicle chosen, depending on need. For instance, a commuter could be notified that a heavy downpour was expected and advised to switch from a bicycle to a minibus. Or they could pick an autonomous car if they were lugging groceries from the supermarket.

“ It’s a great testing opportunity for our community. A car is no longer a status symbol for young people. On the other hand, they are more adamant in demanding simple, flexible and inexpensive transportation. ”

– Sonja Heikkilä,
lead researcher of Helsinki’s mobility on demand trial



A brewing bus movement?

Increasingly, bus startups offering private bus services are filling in the gaps in public transit systems, particularly in the US. These are shuttle-type services run by private bus companies that can be ordered via a smartphone app.

Many of them offer cushy perks and extras. For instance, luxury private bus service and app Leap Transit, from San Francisco, has buses fitted with bar stools, reclaimed wood, USB ports, Wi-Fi and juice bars. Entry does not come cheap, with one-way tickets costing US\$6. However, the company suspended its service last month, citing regulatory issues.

Chariot, another startup bus service from San Francisco, runs 14-passenger vans along fixed and new routes during peak hours. Not as plush as Leap, Chariot aims to get riders to crowdfund new routes. Riders book a trip via a mobile app, and buy a US\$3-\$5 ticket online using a credit or transit card.

Other bus apps that have mushroomed include Bridgj in Boston and Washington, which optimises pick-ups, drop-offs and routes based on passenger demand.

Faster, Higher, Stronger:

the high-tech cars driving
into the future

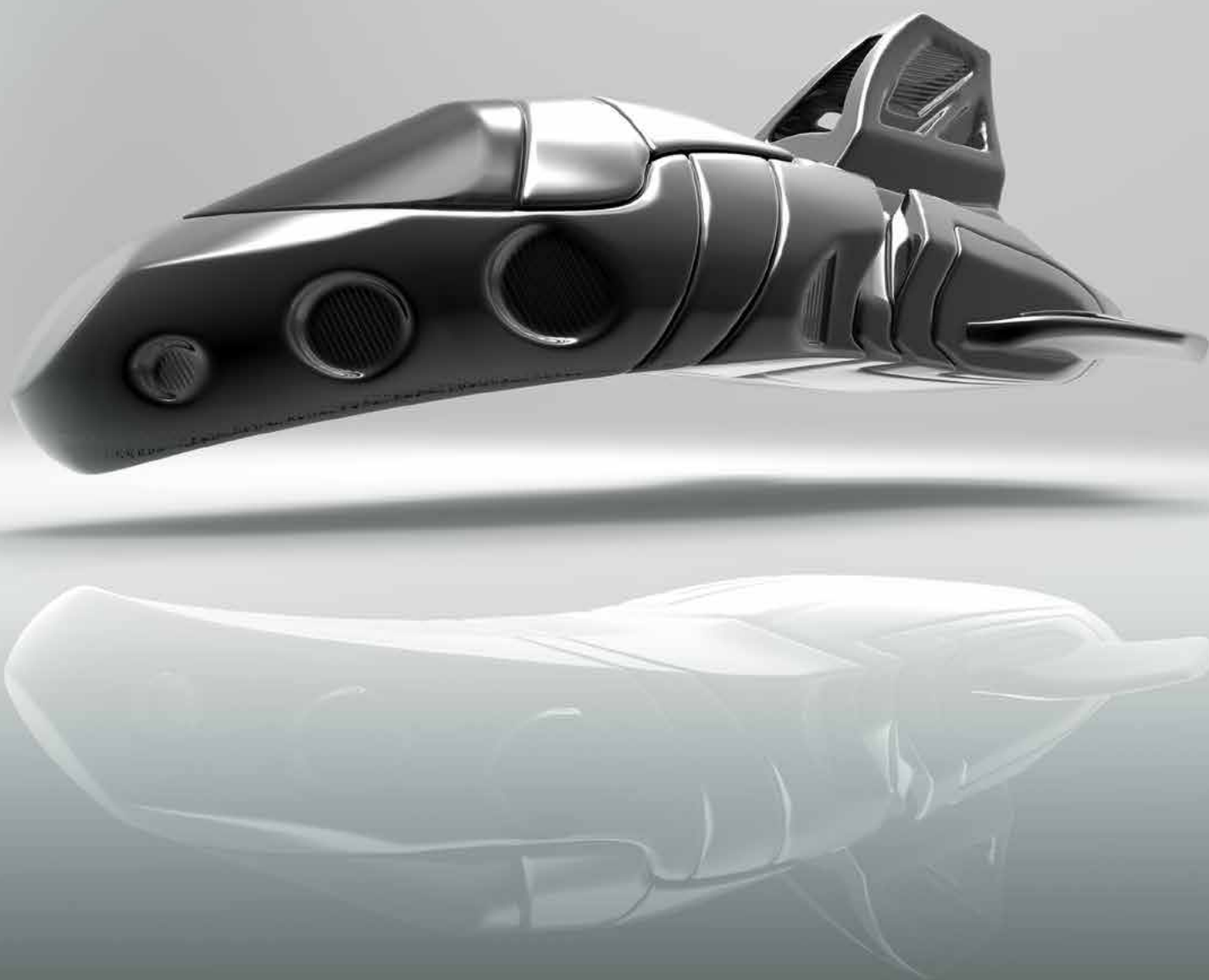




Photo credit: Pinterest

Flying cars

Not just science fiction anymore, flying cars are being developed as we speak. Slovakian company AeroMobil has built a prototype with features such as avionics equipment, autopilot and a parachute deployment system. The AeroMobil 3.0 uses regular petrol, and fits into standard parking space and on the road. Because regulatory issues still prevent flying cars from being widely used, it is unlikely the AeroMobil 3.0 will be adopted in the next five years. Still, adaptable vehicles for the sky and land are a huge step forward.



Photo credit: YouTube

Rocket cars

For automotive fans, this year is going to be heart stopping. The Bloodhound SSC is due to race in South Africa this November. Essentially a rocket car, it has been designed and built to break the 1,000 miles per hour barrier and set a new world land speed record. While the Bloodhound has four wheels and is driven by a driver, that is about as ‘normal’ as it gets. Its engines produce over 21 135,000 horsepower – more than six times the power of all the Formula 1 cars on a starting grid put together! The car’s front has the carbon fibre build of a racing car, while the back has the framework and panels of an aircraft.



Photo credit: hammacher.com

Amphibious cars

Amphibious cars are becoming more advanced. The WaterCar Panther, which went on sale last year, can adapt to water in 15 seconds. It can reach water speeds of 72 kilometres per hour – as fast as a speedboat – while navigating rough land terrains. But for a truly amphibious car that dives – and drives – underwater, there is the Submarine Sports Car. With rear propellers and two water jets, it submerges completely under water, reaching a maximum speed of 121 kilometres per hour. Passengers must be ready to get wet – the car is, after all, still a convertible. But its built-in scuba tanks and diving regulators allow two people to remain underwater for up to an hour.



Photo credit: HeraldM

Foldable cars

One of the biggest urban mobility challenges is the lack of parking space, especially in overcrowded cities. This is where foldable cars come in. The Armadillo T, a made-in-Korea mini-car, parks and tucks itself back over its body, taking up only half the average parking

space. But it has tradeoffs – while it can run 100 kilometres off a 10-minute charge, it has a top speed of just 60 kilometres per hour. Japan's Hiriko Fold, an eco-friendly two-seater, has a similar concept. It runs on a lithium-ion battery, and can adjust itself to take up half its base. Its zero-turn radius, allowing it to spin on the spot, spells relief to anyone who has had to struggle with tight parking spaces.



Photo credit: CNET

Hovercars

Twenty-six years ago, the movie *Back To The Future II* put hovercars in our imagination. Today, Marty McFly's high-tech car may finally be getting, ahem, off the ground. Researchers are perfecting the science of hoverboards – even though questions of sustainability and practicability remain. Last month, Japanese carmaker Lexus unveiled a “real, rideable” prototype, which uses magnetic levitation to create frictionless movement. American company Arx Pax's Hendo Hover may be noisy and heavy, but it can still ‘levitate’ the user off the floor. Arx Pax envisions using the technology on buildings to protect against earthquakes and floods. Another American company, Aerofex, created a prototype called the Aero-X in 2012 that is in commercial development, with the first deliveries expected in 2017.

Hyperloop

In 2013, Elon Musk, the billionaire owner of Tesla, discussed the idea of the futuristic Hyperloop. The proposal is straight out of geeky science fiction: A solar-powered, high-speed, cross-country transport system that uses electromagnetic motors to propel passenger pods through large tubes, taking people from Los Angeles to San Francisco in 30 minutes at 1,200 kilometres per hour. In theory, the science behind the idea is plausible, but in real life, Tesla engineers have yet to hammer out the details of a working system. Last month, a University of Illinois research team built a miniature prototype, whizzing small 6-centimetre pods through a metal tube using roller bearings instead of air bearings, as Musk imagines. Commuters will have to wait with bated breath – Musk has announced plans to build a test track and his company is also breaking ground on a five-mile stretch in California next year. No further details have been announced.



TRANSPORT IN NUMBERS




CAR SHARING 5%

Reuters reports that according to ARK Investment Management, an increase in car sharing to 5 per cent of all journeys in the US could almost cut car sales by half.




50% **CAR SALES**



589,863

There are 589,863 private cars in Singapore.



6.3 MILLION

More than 6.3 million passenger trips are made every day on Singapore's public transport system.







5.3 : 1000

Singapore's taxi-to-population ratio is one of the highest in the world, with 5.3 taxis per 1,000 people.

1.7

The average car occupancy rate for car trips in Singapore is 1.7.



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