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FUELLING THE FUTURE: THE US$580 BILLION IN-CAR PAYMENT OPPORTUNITY

The in-car payment market is growing rapidly thanks to advances in new technologies that allow drivers to make payments using their vehicles. We forecast that the market will reach over US$580 billion by 2030.

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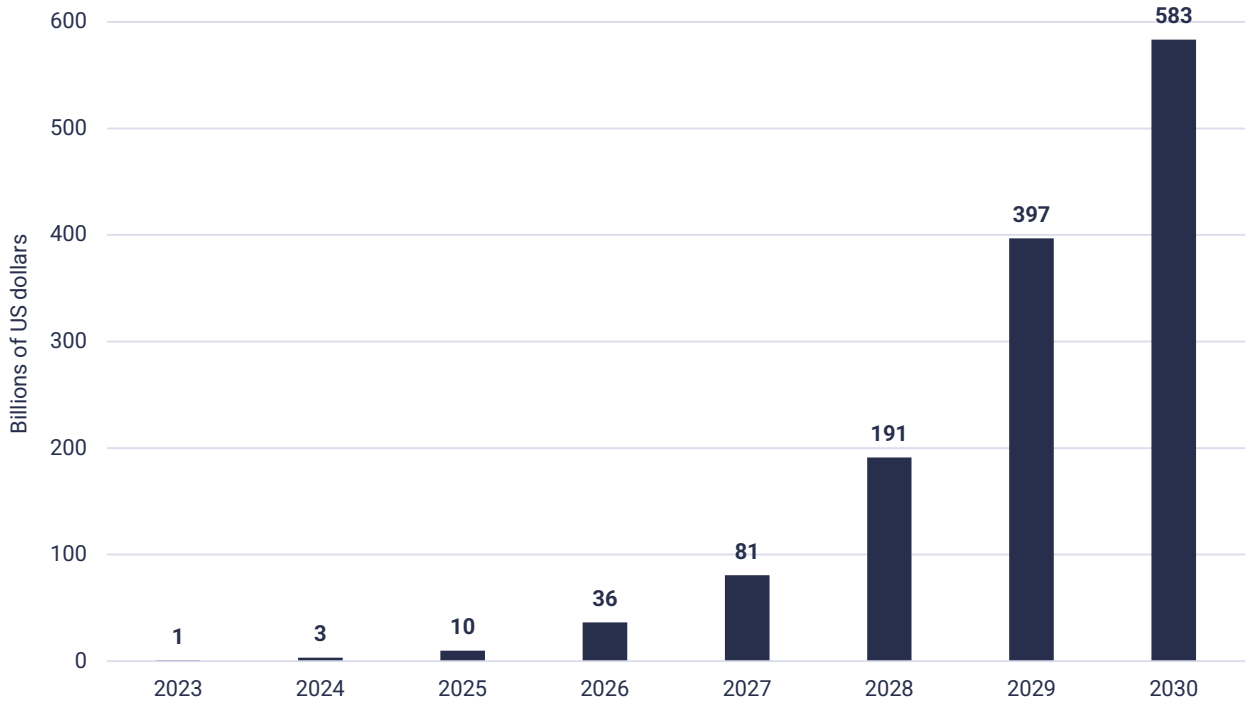
Executive Summary

Telecoms operators are playing a crucial role in the automotive industry by providing the advanced connectivity services necessary for connected vehicles. Vehicle connectivity enables a wide range of use cases including pay-as-you-drive insurance, remote vehicle monitoring, real-time driver information and automated emergency calls. Being able to make payments, often automatically, through your car dashboard software after you have finished fuelling your vehicle, is another key opportunity area. This is generally known as in-car payments. STL Partners forecast that the global transactional in-car payment market will reach a tipping point within the next five years and by 2030 will be worth over US$580 billion, growing at a compound annual growth rate (CAGR) of 130% in the period 2023-2030.

Figure 1: In-car payment market, worldwide, 2023-2030 (billions of US dollars)



Source: STL Partners

Although the earliest widespread in-car payments initiatives began in 2018, these initiatives faced several challenges and failed to create a seamless and secure experience for drivers. However, the emergence of cutting-edge technologies including biometric authentication, AI, blockchain and cloud tokenisation have fast tracked the adoption of in-car payments. This has enabled a wide range of use cases from on-demand software updates to vehicle-related payments including fuelling, electric vehicle (EV) charging and parking.

Extensive adoption of in-car payments relies on providing a user experience which is more convenient than traditional card transactions (whether physical or on a mobile device). To do this, the automotive industry must focus on creating:

- **Widespread ecosystem adoption:** A critical mass of partners must be onboarded so that consumers can use their car to purchase a wide range of services seamlessly.
- **Automated processes:** So that transactions can occur in a frictionless manner, without the need for consumers to use separate phone applications or physical cards.
- **A highly secure system:** Initiatives have to minimise the transactional risk and associated costs.

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Introduction

> **"The automotive industry is changing from the car purely being a physical asset to becoming a connected device that enables payments across the whole ecosystem."**
>
> *Joseph Losavio, Manager Global Automotive Partnerships, Mastercard*

We are entering a new age of digital innovation where vehicles are becoming more than just a mode of transportation and are transforming into connected intelligent spaces. "In-car payments" are one contributing element to these intelligent spaces and is broadly defined as: "Being able to purchase products or services natively from within the car, where the car itself acts as the authenticator of the payment to create a frictionless experience for the consumer".

For example, the experience of completing an in-car payment could be:

1. If an electric car is running low on charge, the driver would use the car's dashboard software system to locate a nearby charging point and confirm the selection on the screen.
2. The driver then pulls into the charging point, plugs in the car and waits for it to fully charge.
3. The driver unplugs the car and drives off, without the need to input any details or create an account to pay.
4. For some transactions there may be no additional authentication required. However, in other cases, the driver may use fingerprint authentication via the steering wheel or look into the mirrors for retinal recognition.

Advancements driving the in-car payment market

There are several factors accelerating adoption of the in-car payment market:

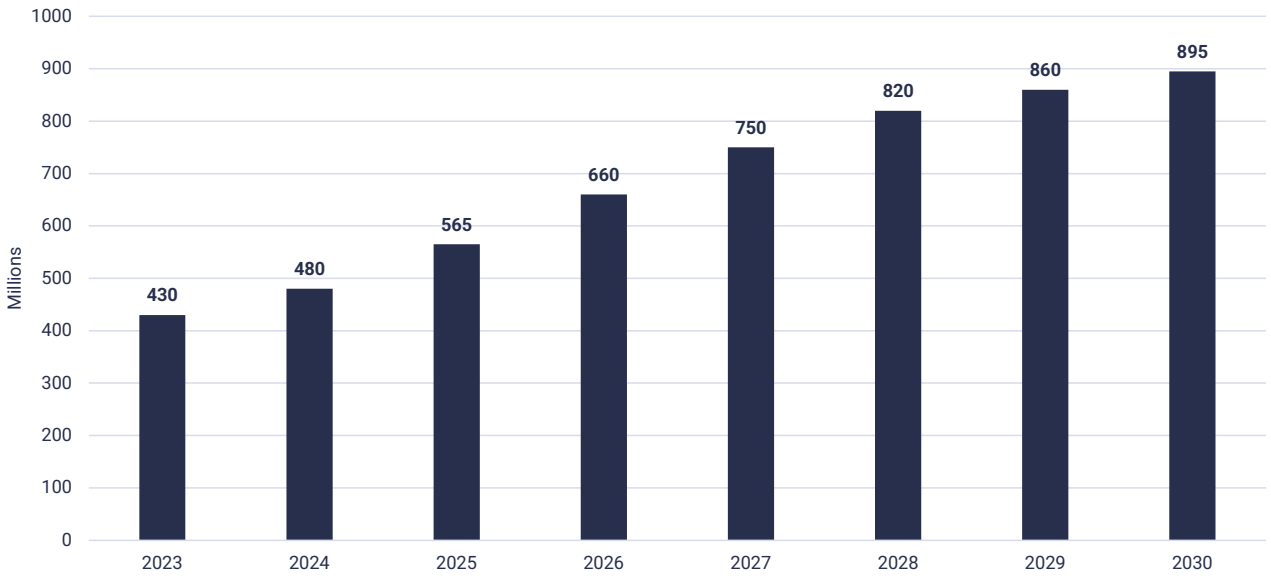
- **Disruption in the automotive industry caused by increased adoption of electric vehicles:** EVs are equipped with advanced technologies to help drivers to locate, navigate and pay for charging through their vehicle and minimise fears of "range anxiety". As EV charging infrastructure is fairly nascent there is scope to invest to fast-track the adoption of in-car payments.

> **"EV charging will help advance in-car payments as it is a new infrastructure that is still being established across markets and is open to development to facilitate in-car payments in a frictionless way."**
>
> *Timo Lisk, Lead Principal Engineer, Infineon Technologies*

Increasing number of connected vehicles: By 2030, we forecast there will be nearly 900 million connected vehicles on the road globally (see

- Figure 2). These vehicles will be equipped with advanced technologies to facilitate real-time and secure transactions.

Figure 2: Connected vehicles in use by 2030, worldwide (millions)



Source: STL Partners

- **Technological advancements:** Enhancement of current in-car payment systems through advancements in new technologies such as AI, blockchain and biometric authentication. For instance, biometric authentication provides an extra layer of protection by verifying the driver's identity before authorising transactions to minimise security concerns.

- **Digital payment wallets and contactless solutions:** There is acceleration in the adoption of contactless solutions which allow users to make payments through their smartphone. Consumers are now more comfortable with this type of technology and are expecting more secure and frictionless payment experiences, without the need to use a physical card.

- **Advancements in the software in cars:** There is increasing investment by automotive original equipment manufacturers (OEMs) in building expertise in software, led by innovators such as Tesla. Telsa has heavily invested in its EV network and software, providing drivers with a seamless charging experience at its "supercharger" locations.

> **"Tesla broke the ground for electric vehicles – their EV charging infrastructure is miles ahead of anyone else, automatically recognising the car and billing straight to their account for a seamless consumer experience."**
>
> *Jaap van den Hoek, Director of Business Development & Partnerships Europe, Parkopedia*

In-car payment opportunity spans from live software updates to parking

In-car payments offer a wide range of use cases that enhance convenience, efficiency and overall driving experiences for consumers. Figure 3 shows the three areas of opportunity that will drive adoption for the in-car payment market.

Figure 3: Leading areas of opportunity for in-car payments

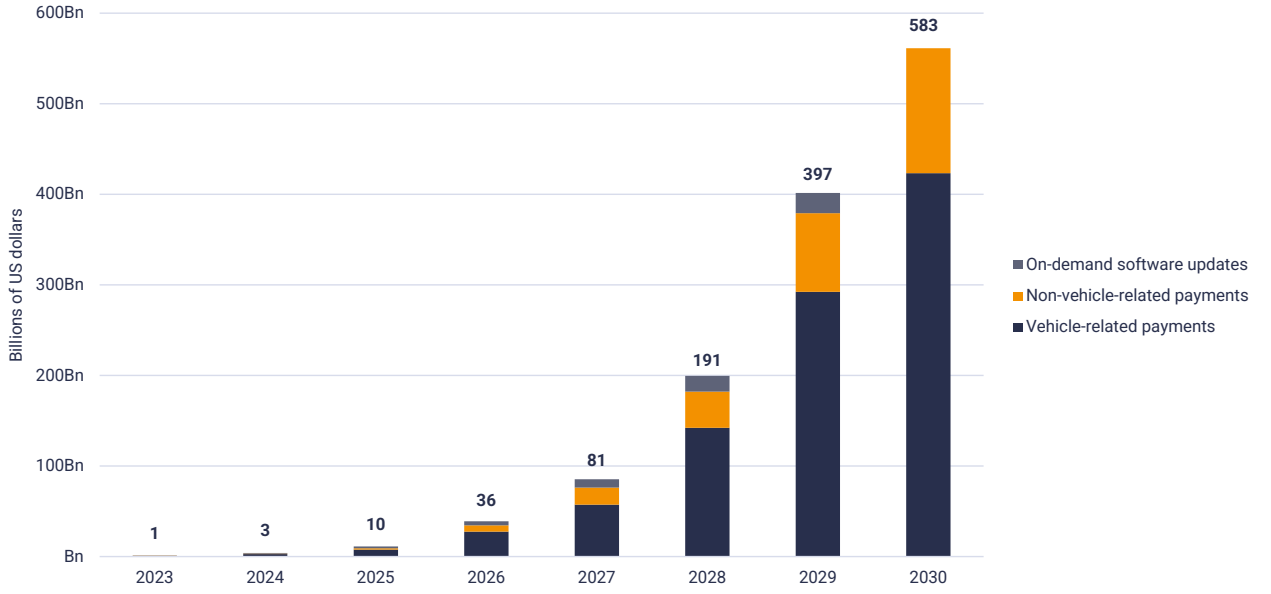
Source: STL Partners

- **Vehicle-related payments:** All payments for any maintenance and operational costs that occur throughout the ownership of the vehicle, such as fuelling, EV charging, parking, automated tolling and car washing. These payments are made to a disparate group of companies that own driving-related infrastructure like petrol/gas stations, EV charging points and car parks.
- **Non-vehicle-related payments:** All transactions that occur and can be sold through the vehicle turning the car into a mobile e-commerce platform including entertainment subscriptions, for example Netflix, food, drink and groceries. These payments are made to companies beyond the automotive ecosystem, including fast food restaurants, shops and streaming platforms.
- **On-demand software updates:** All payments for any supplementary software or over-the-air upgrades after the vehicle has been purchased encompassing comfort, driving and performance features. This could range from luxury features like heated or cooling seats/steering wheels to updates to navigation systems, engine remapping or adaptive cruise control in real time. These payments are made directly to the automotive OEM.

> **"In-car payments can help create a seamless experience for the consumer enabling the user to pay for operational services through the car such as parking charging and tolls. However, they will also enable OEMs to sell services such as software updates through the car and make the car into a touchpoint for wider e-commerce potentially making the car an important retail channel."**
>
> *David Palmer, Chief Product Officer, Pairpoint*

Figure 4 shows the predicted market share by opportunity area for the in-car payment market over the next seven years.

Figure 4: Transactional in-car payment market by opportunity area, worldwide, 2023-2030 (billions of US dollars)



Source: STL Partners

The largest in-car payment opportunities are charging and fuelling

> **"Fuelling represents the most significant amount of consumer spending on their vehicles accounting for around 45% of total costs and signifies a large market for in-car payments."**
>
> *Sterling Pratz, Chief Executive Officer, Car IQ*

The use cases that show the greatest initial opportunities are associated with vehicle-related payments such as EV charging, fuelling, tolling and parking. These are regularly occurring payments that are essential for the everyday maintenance and running of the vehicle. We forecast that these payments will account for over US$400 billion in transactional revenue by 2030, representing over 70% of the total opportunity (see Figure 4).

The strongest demand for vehicle payments will come from EV charging or car fuelling, reaching nearly US$250 billion by 2030, representing over 40% of the total opportunity. This is primarily because fuelling is a guaranteed set of high-value transactions. For example, on average a driver would re-fuel their car bi-weekly at a cost of US$50, representing an annual spend of around US$1,300, although this number varies greatly by country. Early demand is set to come from EV charging as the infrastructure is more nascent and open to development to streamline adoption. See Figure 5.

Figure 5: Fuelling/charging is the most significant share of the vehicle-related payment market in 2030

Source: STL Partners

Vehicle-related use cases are reliant on third-party integration

Strong uptake of vehicle-related use cases requires the integration of third parties such as fuelling stations and parking providers to ensure strong ecosystem participation. We predict earliest adoption will come from fuelling as there are fewer concentrated players who hold significant market share (Shell, BP, Exxon Mobil, etc.). The onboarding of these large corporations into the ecosystem will ensure the critical mass of partners required for fuelling to reach the tipping-point for in-car payments by 2028 (see Figure 4).

"The EV and fuelling markets are saturated with lots of different applications from different providers but there are very large players that have significant market share. Onboarding these players to the payment ecosystem will help fast-track the adoption of in-car payments."

Mark Gerban, Senior Payment Expert

In contrast to fuelling, the parking landscape remains more fragmented with hundreds of thousands of different merchants owning parking properties globally. However, some players are entering the market as intermediaries acting as platform aggregators and onboarding these entities onto one unified application. By 2030, we forecast that this will help enable in-car transactional revenue for parking to exceed US$100 billion, with a CAGR of 131% in the period 2024-2030 (see Figure 5).

In-car payments face challenges before wide adoption

The first widespread initiatives around in-vehicle payments began in 2018 with activity from companies such as Honda, Jaguar, General Motors and Shell. However, these initiatives failed to initially create a seamless driver experience and have faced several challenges.

- **Consumer experience:** Consumers are looking for a frictionless experience and do not want to have a separate application for each separate payment provider/use case. If the functionality is limited and only certain partners are onboarded, users may not see the value in adopting in-car payments for only limited circumstances. For instance, EV drivers often have to have separate accounts, applications or Radio Frequency Identification cards (RFID) for each charging network leading to confusion and frustration. A unified payment solution with a critical mass of partners onboarded would enhance the overall user experience and ensure the widespread adoption of in-car payments.

> **"The biggest challenge for OEMs and payment providers is aggregating millions of diverse parking garages, fuelling stations and EV charging networks into one unified interface. Consumers are looking for a seamless, secure experience and will only want to have one interface that can facilitate their in-car payments across all use-cases."**
>
> *Joseph Losavio, Manager Global Automotive Partnerships, Mastercard*

- **Security concerns:** Users have been hesitant to link their payment information directly to their vehicles due to concerns about data breaches or the potential misuse of their financial information. This is particularly relevant for high-value purchases like those that provide software upgrades to the car (it is thought that upgrading to heated seats for one year would typically cost a consumer US$180 a year).

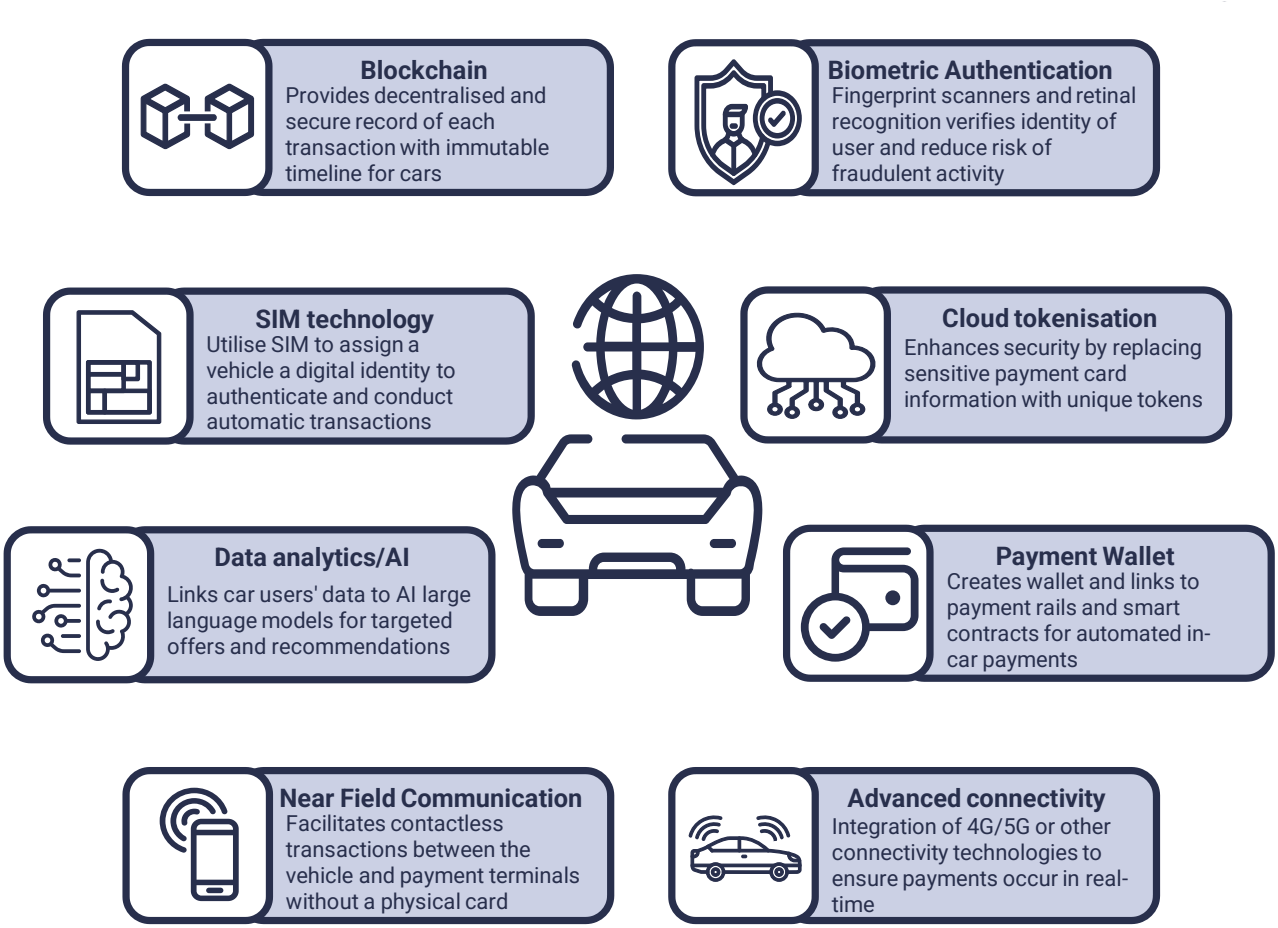
- **Interoperability issues:** Current car payment systems have struggled with interoperability and do not work seamlessly across different makes and models of vehicle which has reduced widespread adoption. It is challenging to retrofit cars with these capabilities so using existing integrated hardware to enable in-car payments could be the tipping point. Financial institutions and banks will also only make cars trusted parties if making these transactions are easy for them to implement.

- **Regulatory compliance:** In-car payment systems must comply with various regulations related to financial transactions, data privacy, and consumer protection. For instance, within the EU there are stringent data protection and financial regulations (GDPR, PSD2) alongside transportation regulations for parking/toll use cases that providers must comply with.

Emerging technologies drive adoption

Despite these challenges, we have seen recent changes that are beginning to accelerate adoption. Several new technologies have been developed that can help deliver seamless and secure transaction experiences. See Figure 6.

Figure 6: Technologies accelerating the adoption of in-car payments



Source: STL Partners

Ecosystem players are utilising these technologies in varying ways to establish a trusted vehicle identity and facilitate in-car payments. In some instances the SIM in connected cars could be the hardware used as the secure element for the payment to fast-track the adoption of in-car payments (see Figure 6). For example, the Vodafone Digital Asset Broker (DAB) platform assigns the vehicle a digital identity, using the SIM card to authenticate and conduct automatic transactions via incorporated payment credentials on a SIM wallet. In other instances, AI algorithms could be utilised to analyse several different data points from the operational system of the car to create a unique vehicle ID to validate in-car payments for example, the Car IQ solution.

Leading players begin to adopt cutting-edge technologies

The in-car payment market is being led by two groups:

- **Automotive OEMs:** Leading automotive companies including Mercedes-Benz, Hyundai and Volkswagen are integrating this functionality into their software and using car data to facilitate payments. This could include setting up a payment platform integrated through their infotainment system or adding dedicated payment hardware to enable biometric authentication through fingerprint or facial recognition. OEMs can also use in-car payment data to gain insights into consumer trends and deliver personalised offers. For example, Mercedes-Benz partnered with Mastercard to adopt a cloud-based tokenisation approach for all payments made through its Mercedes-Benz User Experience (MBUX) multimedia infotainment system, with two-factor authentication carried out biometrically via an integrated fingerprint sensor in the vehicle.

> **"The certification and authentication element is key for in-car payments. If you are able to bring digital identity into the equation you can help turn the vehicle into a moving identification system for in-car payments"**
>
> *Mark Gerban, Senior Payments expert*

- **Global software players:** Apple and Google, for example, have developed dashboard operating systems for vehicles. By leveraging technologies such as Near Field Communication (NFC) and mobile wallet integration, drivers can use the vehicle's infotainment system to unlock their smartphones' features to initiate payments instantly. For instance, Apple CarPlay is available in over 600 car models and is compatible with most iPhone models. These software giants have the potential to take over this key functionality if automotive OEMs fail to launch their own innovative solutions. However, it is ultimately the automotive OEMs who are in the driving seat and have the potential to remove these software players. For example, General Motors is removing Apple CarPlay and Android Auto from its in-house infotainment system.

> **"There are broadly two types of technologies for in-car payments. Firstly, OEM-centred technologies which includes embedded SIM technology, car hardware and vehicle data. Secondly, over-the-top e-commerce through in-vehicle operating systems like Apple CarPlay, Android and Google Play which has the potential to bypass the OEM. In-car payments technology enablers like Pairpoint have the potential to bridge the gap between car, merchant ecosystems, and create a new dynamic digital customer relationship management tool for OEMs providing the ingredients for new business models."**
>
> *Jorge Bento, Chief Executive Officer, Pairpoint*

Future commercial success fuelled by wider ecosystem collaboration

Turning in-car payments into a reality requires multiple stakeholders with various roles within the ecosystem. Financial services players (Visa, Mastercard) make the payments possible and ensure secure and reliable transaction processing for customers. Telecom operators can play multiple roles in the ecosystem from providing the necessary connectivity infrastructure to communicate with payment processing systems to acting as an ecosystem aggregator.

Find out more in our report, Connected car: From mobile broadband to genuine V2X.

We are also witnessing the emergence of decdicated platform aggregators to build-out the required ecosystem (for example, tolling stations, parking providers). Hyundai, for instance, recently announced a partnership with Parkopedia to use its aggregation platform to help consumers find and pay for available parking spaces.

"There needs to be more emphasis on the fragmented complexity of the ecosystem of different companies that you need to enrol or onboard onto a payment system. The onboarding of partners is the tipping point for in-car payments."

Timo Lisk, Lead Principal Engineer, Infineon Technologies

Ecosystem collaboration will be needed to transitioned away from closed to open-loop payment systems to process payments between accounts that do not belong to the same financial institution. This will allow users to seamlessly use in-car payments across various makes and models of vehicles.

Conclusion: What next for the industry?

In-car payments are revolutionising the automotive industry by integrating convenient and secure transaction capabilities directly into vehicles. With a few taps on the vehicle's infotainment system or with voice commands, drivers can effortlessly complete transactions without leaving their seats. By leveraging emerging technologies such as biometric authentication, mobile wallet integration and SIM-based hardware, secure payments can be used for use cases including fuelling, parking and on-demand software updates.

Recommendations

Automotive OEMs and their partners should focus on these immediate steps:

- **Engage and onboard the largest providers in your target markets:** Ensure you are initially targeting three to five key ecosystem players who hold significant market share for their adopted use cases. For example, for fuelling this would include Shell, BP and Exxon Mobil. This could be done directly or in partnership with an ecosystem aggregator.

- **Establish a clear plan for all types of vehicle:** Ensure you have a clear plan both for the models you are developing but also for older vehicles. Older models are unlikely to have the innate technology built in to enable in-car payments so partnering with Apple/Android would be the easiest route to drive adoption. For newer models, OEMs must build their own applications and utilise cutting-edge technologies to complete with the leading software players.

- **Develop collaborative partnerships with complementary stakeholders:** Reach out to key complementors (payment service providers, financial institutions, ecosystem aggregators) with the particular skillsets you require, such as expertise in software user interfaces, data personalisation and cloud tokenisation. For instance, Car IQ has recently debuted a new OEM-dedicated integrated payment system that directly connects to the car's operating system, enabling OEMs to add additional payment services through the cloud. Partnerships such as this will help automotive OEMs drive innovation, expand service offerings and create new revenue streams through data monetisation, transactional fees and cross-promotion opportunities.

A message from our sponsor

The internet of things is evolving towards the economy of things, and in-car payments with an opportunity in excess of US$580 billion forecast by 2030 is one of the first killer apps. What is clear from this report is the size of the opportunity, the pace of transformation required to realise the opportunities, as well as the value in cooperation, collaboration and consolidation of content and services to accelerate progress. With over 40 million cars connected by Vodafone SIMs and Pairpoint platform purposely designed to pair merchants and automakers, drivers and brands, devices and services – we are demonstrating the power of linking in-car solutions with mobile.

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