CONNECTED DEVICE PAYMENTS

MARKET OPPORTUNITIES, TOP STAKEHOLDERS, AND NEW USE CASES FOR THE NEXT FRONTIER IN PAYMENTS

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KEY POINTS

- **The Internet of Things is ushering in a new era for payments companies and manufacturers.** The rapid expansion of the Internet of Things (IoT) offers an opportunity to facilitate payments beyond mobile phones, cards, and point-of-sale terminals, on a broad and diverse ecosystem of internet-connected devices.

- **More transactions could eventually pass through connected devices than smartphones.** We estimate there will be 24 billion of these devices by 2020, with 5 billion of them being consumer-facing. This represents a massive expansion of touchpoints where payments could be enabled.

- **Card networks have developed a basic framework to enable commerce in everyday devices.** Visa and MasterCard are creating the underlying infrastructure to support the standardization of payments integration and stake themselves out as the key connected payments gatekeepers. Their payment platforms are universal, allowing digital payments to grow without being tied to the success of a particular manufacturer.

- **Consumer-facing IoT companies have much to gain from enabling payments in their devices**, including improving the value of the device, being able to cross-sell products through the device, and laying the groundwork for future opportunities to earn incremental revenue. For payments companies, connected payments offer a new revenue stream and an opportunity to gain market share ahead of competitors.

- **Wearables, connected cars, and smart home devices will be the top devices for connected payments.**
  - Wearables like the Apple Watch have already integrated payments functionality as an essential use case and can be used to make both online and in-store payments. **We forecast that 62% of global-shipped wearable devices will be payments-enabled by 2020.** Wearables allow people to make payments without reaching for a phone or wallet.
  - Internet connection within cars will become ubiquitous over the next decade, and the integration of payments will rise in tandem. **We expect 381 million connected cars will be on the road in 2021.** Connected car payment pilots have been spearheaded by Visa and retailers like Pizza Hut; these pilots place an emphasis on loyalty integration.
  - Smart home products help device makers collect data about usage and performance, which can then be used to help consumers automate the ordering of essential goods and even manage their credit card accounts. **We estimate 3% of smart home devices shipped in 2016 will have payment capabilities. By 2020, we estimate that will grow to 10%.**

[Download the charts and data in Excel »](#)

INTRODUCTION

The rapid expansion of the Internet of Things (IoT) offers payments companies an opportunity to expand beyond mobile phones, cards, and point-of-sale devices, to a broad and diverse ecosystem of internet-connected devices. As the underlying technology of these devices grows more sophisticated, and as the cost of their technological components — including sensors, data, and connection — drop, device makers will increasingly be able to integrate commerce capabilities into their products.

We define the IoT as the network of internet-connected objects able to collect and exchange data using embedded sensors. Consumers, businesses, and governments are connecting all sorts of everyday objects to the internet in order to analyze and automate various parts of their environments.

The marriage of the IoT and payments — the transfer, storage, and management of monetary value — is what we refer to as "connected payments."

- We define connected payments as any process in which monetary value is transferred, managed, or stored using a consumer-facing IoT device, which includes any standalone internet-connected device that a consumer can monitor and/or control from a remote location. Some examples of connected-device payments include paying for something at a store with a smartwatch or fitness band, purchasing fuel from the dashboard of a car, and buying groceries through a digital display on a refrigerator.

- We divide consumer-facing IoT devices into three major categories — wearables, connected cars, and smart home products.

In this report, we'll look at the connected payments ecosystem, who the key stakeholders are, and how they stand to benefit from payments integration across IoT devices. Then we'll take a look at the three major IoT product categories and how payments integration is developing in each.

CONNECTED PAYMENTS DEMAND

Although smartphones have been viewed by payments companies as the next big opportunity, the IoT represents a much more massive ecosystem of connected devices with the potential for payments integration.

- **We forecast that there will be 24 billion connected devices installed globally by 2020, up from nearly 7 billion today.**

- For context, there will be more than two connected devices for every smartphone in the world by the end of 2016.

- While the majority of these devices will be used by governments and enterprises, **there will be over 5 billion consumer connected devices installed by 2020**. This represents a massive expansion of touchpoints that could eventually offer payments functionality.

Consumers are already showing interest in connected payments.

19% of North American adults were "very interested" in connected device payments as of Q2 2015, according to Accenture. This is a significant share considering that the Apple Watch had only just entered the market when the survey was taken. At the time, it was one of the only mainstream connected commerce devices. Interest has likely increased since then.

Consumer Sentiment Toward Connected Device Payments
North American adults, Q2 2015

■ Not Interested   ■ Neutral   ■ Very Interested

19%
30%
51%
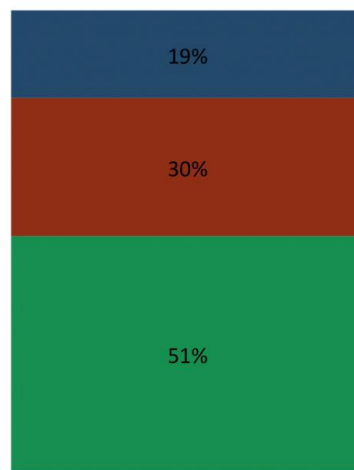
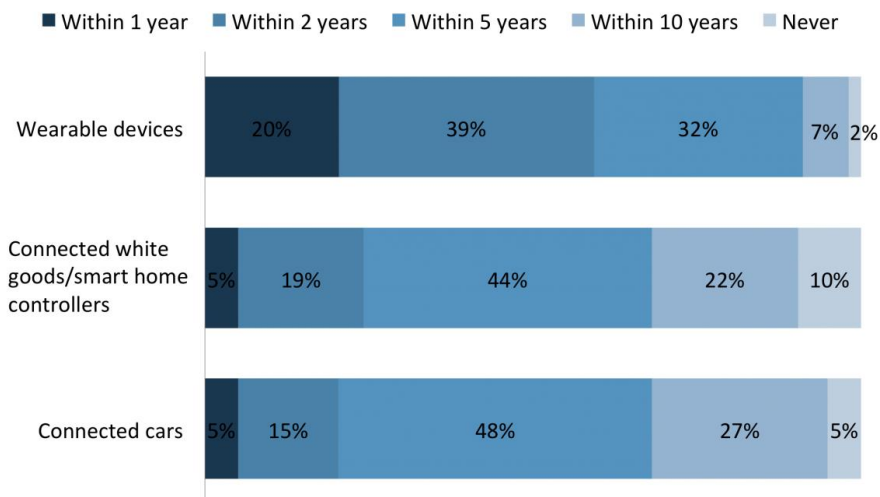*Source: Accenture 2015 North America Consumer Digital Payments Survey*

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And executives expect consumers to start using connected devices for payments in the near term.

- **Wearables:** 59% of underlined surveyed global banking and insurance executives expect wearables to become a common payment device for consumers within two years.

- **Smart home devices:** 24% of respondents said they believe consumers will commonly make transactions using appliances or smart home controllers in the next 2 years.

- **Connected cars:** 20% of executives said they think people will pay for things through their cars in two years.

- Very few executives believe that these types of devices will "never" become commonplace payment devices.

Timeframe In Which Select IoT Devices Will Become Common Financial Transaction Methods
Global banking and insurance executives, December 2015

■ Within 1 year ■ Within 2 years ■ Within 5 years ■ Within 10 years ■ Never

Device	Within 1 year	Within 2 years	Within 5 years	Within 10 years	Never
Wearable devices	20%	39%	32%	7%	2%
Connected white goods/smart home controllers	5%	19%	44%	22%	10%
Connected cars	5%	15%	48%	27%	5%

Source: Cognizant, Marketforce and Pegasystems, eMarketer, n=500

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THE CONNECTED PAYMENTS STAKEHOLDERS

Given the sheer size and diversity of the connected device ecosystem, developing a consistent standard for transmitting payment data will be critical if IoT manufacturers are going to successfully and securely equip their devices with payments functionality.

The coming proliferation of consumer-facing devices and the complexities of providing payments capabilities will necessitate that companies seek to adopt a common standard for integration, security, and compliance. While device makers will have many different options for developing a consumer-facing interface for payments, the back-end of transmitting payments data requires too many partners and too many technical complexities related to handling financial data. It's similar to the need for a standard power outlet system — if every electronics device made its own type of power cable, it would be impossible to use any device anywhere.

To ensure payment capability is standardized, veteran card networks like Visa and MasterCard — two of the largest global card networks with connections to thousands of issuing banks — are acting as controlling stakeholders in creating the connected device payments infrastructure. **They are adding the critical security component needed to secure highly sensitive financial data transfers — tokenization — and otherwise applying much of the same technology and best practices they used to build the payment rails on which most card transactions are run.**

Beyond Visa and MasterCard, there are a number of other stakeholders that will play a role in bringing connected devices into the payments ecosystem and benefit from more devices becoming commerce-enabled, including issuing banks, payment processors, and chip manufacturers.

In addition, some companies are entering the connected device payments market by helping Visa and MasterCard onboard device manufacturers onto their commerce enablement platforms. These third-party companies consult with device makers to assemble the necessary hardware, software, and certifications needed to become payment-enabled, and include companies like Accenture, Coin, and Samsung.

The networks have developed a basic framework to enable commerce.

Visa and MasterCard are working with these strategic partners to help OEMs integrate the card networks' digital-based tokenization platforms into their devices. A key feature to note is that these payment platforms are built to be universal, rather than tethered to a specific platform, like iOS or Android. This allows digital payments to grow without being tied to the success of a particular manufacturer like Apple or Samsung. Instead, card networks are looking well beyond specific hardware providers and seeking to create a singular back-end payments standard that will be easy to integrate. This way, payment networks won't have to bank on which smart fridge or connected car will win out. Because payments is so complex and involves so many parties, it will be far simpler to adopt payments technology built by veterans.

Consumer-facing IoT companies stand to benefit from integrating payments into their devices for three reasons:

1. **It adds value to the consumer IoT devices they create.** Adding payment capabilities increases the device's overall value because it allows the device to do more. For those consumers who value being able to make a payment with a variety of devices — while reducing friction, in some cases — the added payment capabilities will give them more incentive to buy the product.

2. **It offers the ability to cross-sell products and services.** One of the primary benefits companies realize from connecting the devices they sell is immediate and quick access to device users. This enables companies to sell customers more products and services beyond the connected device itself. For example, Amazon can sell products directly through Amazon Echo, its smart home device, thereby driving more revenue from customers. Similarly, Apple's integration of Apple Pay into the Apple Watch will increase the touchpoints for a person using Apple Pay and, theoretically, increase the number of transactions made with Apple Pay.

3. **It enhances future opportunities.** Many consumer-facing IoT devices are often brought to market quickly, and companies may lack a long-term plan to continually monetize the device. By adding payment capabilities to the device at an early stage, the device maker has more opportunities to monetize in the future.

Payments companies have two key reasons to pursue this market:

1. **New revenue sources:** Payment processors and networks earn revenue by charging per-transaction fees. These companies could collect incremental transaction fees if consumers start using connected devices in lieu of cash, or if they make more payments with devices than they would with a credit card, assuming the devices offer greater convenience.

2. **Early entry opportunities:** Manufacturers have been competing to make internet-connected devices like appliances and cars for decades, but the integration of commerce capabilities into these devices is still nascent. This means that payments companies have ample opportunities to partner with device makers and lead in connected device payments. Companies that explore this market early could gain an advantage and eventually control a sizable market share.

Ultimately, payments companies like Visa and MasterCard that control the network and standards will see the most upside. However, while card networks are likely to (and already do) play a key role in adding payments functionality to nonpayment devices, we believe that issuers, acquirers, and gateways will continue to play a role in the ecosystem.

- **Processors:** Processors — like Stripe — that help route payments from merchants to a cardholder's bank for authorization face a huge opportunity to secure business from e-commerce companies that integrate their apps into various connected device platforms. A lot of digital retailers benefit from high average order values, which could boost processing revenue on a per-transaction basis. For instance, the average order value placed on Instacart was $80 in February 2015, compared to $52 at Whole Foods. Contracts with high-growth digital retailers could help processors lift their overall revenue. However, e-commerce is a more concentrated industry than brick-and-mortar retail. If a small crop of merchants controls digital purchases on connected IoT devices, processors will be forced to compete for relatively few high-volume contracts. Processors will need to win contracts with those top-tier merchants, or risk losing out on a ton of potential volume, while their competitor sees significant gains.

- **Retailers:** Retailers with popular apps could see huge sales gains if connected devices influence consumers to make more digital purchases. If a retail giant like Walmart sees increased digital activity through connected device payments, this could lead to incremental sales if average order values are higher than in-store and they're able to integrate loyalty or other features to drive purchase frequency.

- **Device makers:** Consumers in the near future might opt to register their payment credentials on a diverse set of devices. This would reduce customers' loyalty to a single device, such as a smartphone, and make them more open to using new payment devices. This could create new entry opportunities into the payments industry for OEMs, though it would also limit their usage to niche cases, thereby limiting revenue opportunities since consumers wouldn't be relying on a single device for all their commerce needs. People are already adopting multiple devices — US and UK families own seven connected devices on average, according to Cognizant.

HOW CONNECTED DEVICES ARE PAYMENTS-ENABLED AND SECURED

In order for a device to become payments-enabled, it is most often outfitted with an NFC chip to support contactless payments (if necessary) and a Secure Element to store tokenized payment data.

While payments integration is not functionally that different for connected devices as compared to mobile payments, manufacturers face a major security challenge as they look to bring commerce to a wide variety of devices built by many different manufacturers.

Connected devices already offer an opportunity for hackers to steal information and remotely control a consumer's environment. For example, a hacker who accesses a car can read all of the data in that car's dashboard and then take control of it — as two hackers demonstrated last year at Blackhat. By integrating financial information and payments into these devices, they'll become even more attractive targets to hackers. In 2015, 22% of global data breaches involved the access of financial data, according to Gemalto's Breach Level Index.

Distribution Of Global Breach Incidents, By Type
2015

Nuisance, 4%
Existential data, 10%
Account access, 11%
Financial access, 22%
Identity theft, 53%
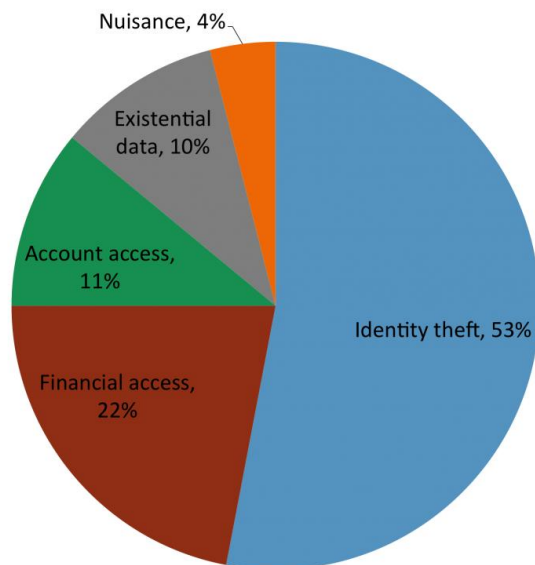
Source: Breachlevelindex.com

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Tokenization is the core technology that card networks are using to ensure payments data remains protected.

Tokenization is a security mechanism that is most often used to secure mobile payments. It refers to the replacement of sensitive card data such as a card number (PAN) with a new, randomly generated value, which secures the transaction by making sure that card details are not transmitted digitally.

When a consumer inputs their PAN into a device to enable payments, a Token Requestor — which can be any company that the networks are partnered with, like Apple, Samsung, or Coin — queries the card network about retrieving a Device Account Number, or token, that stands in for the consumer's PAN. The card network then seeks approval from the consumer's issuing bank to create the token. If approved, the Token Service Provider — Visa or MasterCard in this case — creates a token, and the Token Requestor provisions the token onto the device.

## How A Connected Device Is Payment-Enabled

Source: Visa

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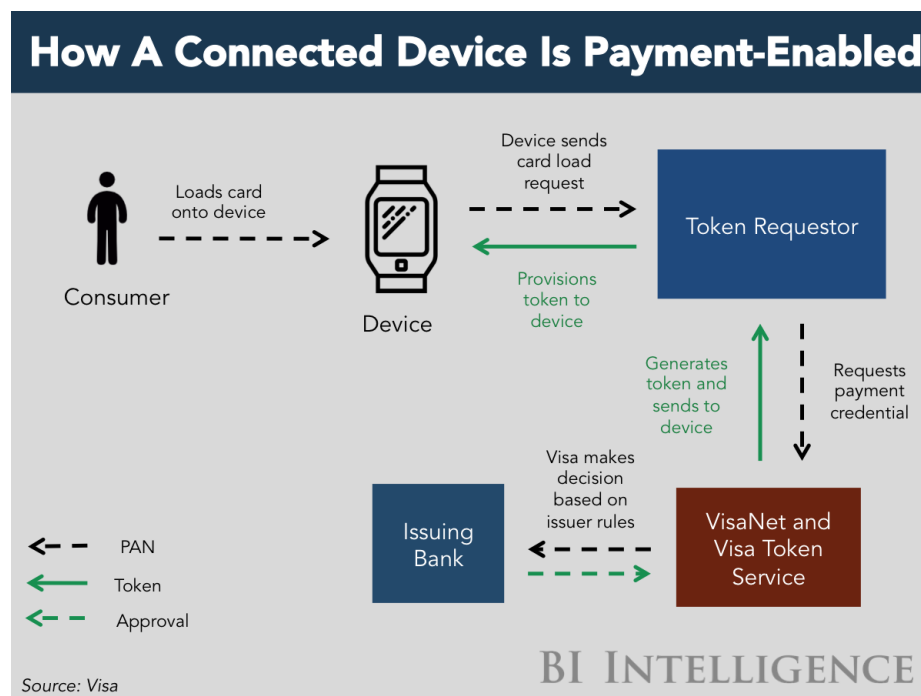
This process is not IoT specific and can be implemented with any device that can store and enable tokenized payments. **This broadens the potential ecosystem of payment devices from mobile phones to include any kind of device. Visa disclosed at Mobile World Congress 2016 that it has already certified 170 devices from 70 different manufacturers to accept payments through its Visa Ready initiative for IoT devices.**

Despite the limitless potential of connected device payments, we've chosen to focus our report on the three consumer-facing verticals that have seen the most activity so far — wearables, connected cars, and connected home devices.

WEARABLES

Estimated Global Wearable Shipments
In millions

Source: BI Intelligence estimates, 2015

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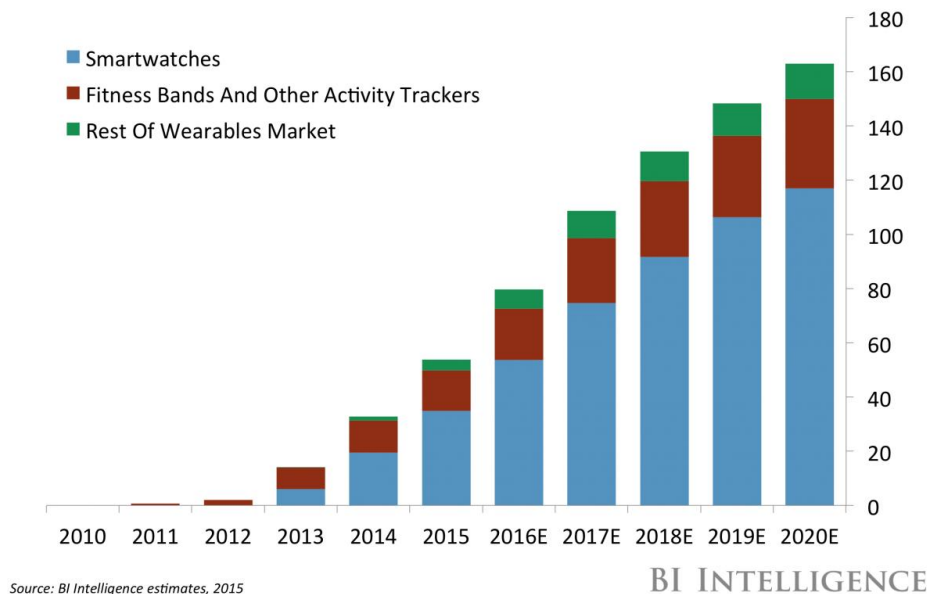
Wearables offer the clearest use case for payments among connected devices.

Smartwatches like Apple Watch have already integrated payment functionality and can be used to make both online and in-store payments.

In 2020, we estimate 162 million wearables will ship, up from 53.8 million shipped in 2015. By our estimates, 71% of the wearable devices shipped in 2020 will be smartwatches, 20% will be fitness trackers, and 9% will be other wearables.

- **We forecast that 62% of global-shipped wearable devices will be payments-enabled by 2020.**

- This will be driven largely by smartwatches — 54% of total wearable shipments will be payment-enabled smartwatches in that year, 6% will be payment-enabled fitness bands, and the remaining 2% will be other payment-enabled wearables like eyewear and connected clothing.

FORECAST: Share Of Global Shipped Wearable Devices Payment-Enabled
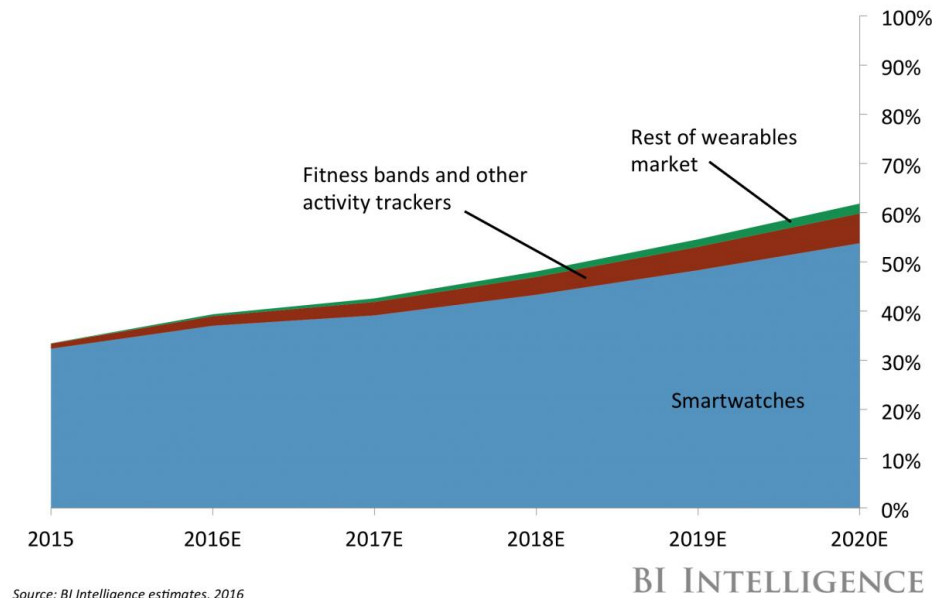
Wearables increase the convenience of making a mobile payment by enabling a consumer to pay for something with a flick of the wrist. The devices are usually connected to a smartphone app and need to be within range of the phone to transmit payment data. Only 3.3% of wearables had standalone connectivity in 2015, according to Cisco. Fitness bands like Jawbone's UP4, and even analog watches by device makers like Swatch, also support payments using NFC technology embedded in the devices. The UP4 requires users to load their payment details in the UP mobile app, however, users don't need their phone with them to make a contactless payment with the device.

Wearable manufacturers are starting to invest in payments.

For example, US fitness band maker Fitbit recently acquired the wearable platform assets, including personnel and intellectual property, of US fintech firm Coin. Fitbit's interest in Coin is its NFC payments platform that was developed for adding payment capability to wearable devices like fitness trackers and smart watches.

Wearables have so far supplemented smartphone-based in-store payments, since many wearables remain tethered to the smartphone. Moreover, there are many more smartphones in consumers' hands right now so wearables inevitably account for a smaller share of mobile payments. However, surveys suggest that once more people own wearables they may be even more inclined to use them to make payments than the phone.

The Apple Watch, which was released in 2015, has become one of the most prevalent smartwatches and is helping Apple expand the use of Apple Pay, the firm's in-store mobile payments platform. Apple shipped an estimated 12 million Apple Watch devices globally in 2015, compared to just under 232 million iPhones during the year. Although the Apple Watch represented just 5.2% of iPhones in 2015, a majority of Apple Watch owners — 61% — use the device to make payments, according to a survey from Fluent, indicating the value of wearable payments.

And wearables are already extending beyond the phone.

Card networks and other stakeholders are now pushing boundaries and experimenting with the integration of payment platforms on other wearable and portable devices.

- **Ringly:** Smart jewelery manufacturer Ringly partnered with MasterCard to allow its customers to make payments with their MasterCard using a ring. The ring leverages NFC technology to transmit payment data to terminals, similarly to how smartwatches do. Although it's unclear how well the device will sell, it could offer additional convenience for shoppers — it doesn't require shoppers to take out their phone or wallet, and it presents an alternative accessory to wearing a watch.

- **Olympics ring:** Visa introduced an NFC-enabled wearable payments ring that it plans to prototype with Team Visa athletes at the Olympic games in Rio de Janeiro this summer. The ring, which includes a Gemalto micro-chip and NFC-enabled antenna, can be tapped at NFC-enabled terminals to make payments. The ring will be linked to a contactless prepaid Visa card that athletes will be able to reload via an online portal, Chris Dean, a senior director of innovation and strategic partnerships at Visa, told BI Intelligence.

- **General Motors key fob:** GM and MasterCard created a payments-capable key fob, which would be useful for drivers making payments at a gas station's convenience store, for instance, and could later be used in other capacities among those who have taken to the technology.

- **Nymi band:** MasterCard is also working with Nymi to support payments on the company's wrist-worn wearable that authenticates a user's identity through their heart rate pattern.

- **Clothing:** Prototypes of payment-enabled clothing like gloves and dresses have been tested by MasterCard in partnership with designer Adam Selman.

As with mobile payments on smartwatches, consumer adoption of cutting edge wearables will likely be confined to early tech adopters and super-users — at least initially. And the breadth of experimentation will inevitably mean that some of these ideas will turn out to be nonstarters. However, integrating commerce into commonly worn objects could fundamentally disrupt the way consumers pay for things in the future.

Wearables could also fortify the growth of NFC.

If more wearable manufacturers add payment capabilities, this could create a virtuous cycle in which consumers begin to make more contactless payments, prompting more retailers to upgrade their POS systems to NFC, and thereby enabling consumers to develop routine and more frequent use.

Wearables push the "ease-of-use" value of mobile in-store payments even further by not requiring that an item — like a phone or a wallet — be taken out to pay.

CONNECTED CAR

Estimated Global Connected Car Shipments
In millions
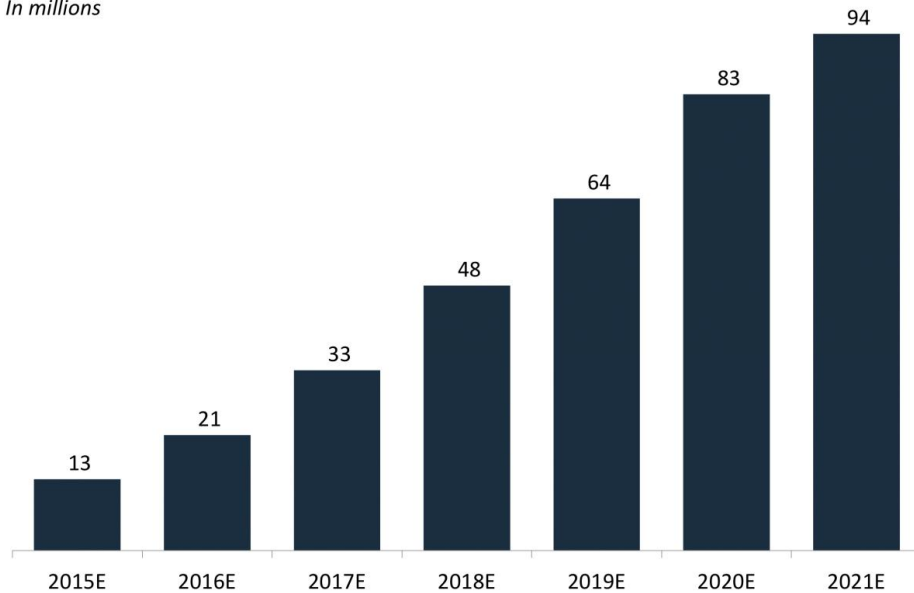
Source: OICA, KPMG, ITU, Google Consumer Baromter, GSMA Intelligence, BI Intelligence estimates, 2016

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Card networks view the car as a key hub for powering commerce.

Cars are becoming connected to the internet through mobile networks, creating an opportunity for transactions to be enabled on these internet-connected platforms. In-car payments could be a compelling use case because they add convenience for drivers and could help them multi-task more effectively. For example, someone could pay for parking or fuel using a voice-activated app synced with a car's digital dashboard system.

In-car payments enable the purchasing of digital goods through the apps and operating systems housed on the car's infotainment center.

- We define in-car payments as payments that occur in communication with a car's operating system. This can be enabled through a SIM card installed in the car or by using a tethered smartphone's SIM card connection.

- The two most common means of executing in-car payments thus far have been voice-activation and a checkout button on the car's central interface from Visa. Car payments require that a user be able to operate a vehicle safely while conducting a transaction, so low friction is critical.

Some connected cars have "infotainment" systems on their main dashboard displays, which are screens that display applications similar to a tablet.

Many automakers run their own proprietary infotainment operating systems, such as FordSYNC. There are also operating systems, offered by tech companies, that are integrated into the car's native platform, such as Apple's CarPlay and Android Auto.

We believe internet connection within cars will become ubiquitous over the next decade, and the integration of payments into these vehicles will rise in tandem:

- **381 million connected cars will be on the road in 2021.** We expect 94 million connected cars to ship that year — that equates to 82% of total new cars shipped, up from 13 million shipped in 2015.

- **And consumer usage of the connection within cars is rising fast.** By 2021, we expect that roughly half of the connected cars on the road will be attached to a mobile data subscription plan paid for by the car's owner.

Visa has tested early use cases of in-car payments through its Visa Checkout button, which relies on tokenization to ensure sensitive information isn't transmitted to the retailer. One of the first launches came through a partnership with Pizza Hut in 2015. The two companies unveiled a new automobile software that lets drivers order and pay for Pizza Hut from the dashboard of their cars using voice-recognition technology.

Here's how it works:

- **Ordering:** The driver verbally gives a Pizza Hut order to the software program installed on the car's dashboard.

- **Payment process:** To initiate the transaction, the driver pays using Visa Checkout on the dashboard, which already has the driver's payment and billing information stored.

- **Loyalty:** Drivers get every tenth pizza for free, as indicated on the dashboard. By automatically tracking rewards opportunities and visually presenting a customer's progress, drivers could be encouraged to make repeat purchases until they get a free pizza.

- **Pick-up:** After the order is placed, the platform gives the driver directions to the Pizza Hut. Once the car reaches the pick-up location, it uses Bluetooth technology to communicate the vehicle's parking spot to beacons inside the Pizza Hut store. The pizza is then delivered to the driver by staff.

Visa is also testing connected payments options related to essential services like fuel and parking.

- **Fuel payments:** Visa partnered with ParkWhiz to let Honda drivers pay for their gas using Visa Checkout on the car's dashboard.

- **Parking:** Honda drivers can also use the ParkWhiz app to pay at any meter in ParkWhiz's network based on the exact duration they were parked.

In-car payments will become more popular as more retailers buy in.

Pilots like the one Visa ran with Pizza Hut could help drive incremental sales for retailers through higher average ticket sizes and higher conversion rates. We've seen this same trend with mobile ordering apps from retailers like Taco Bell and Starbucks. For example, a Taco Bell customer might tack on additional toppings to an order if the toppings are clearly displayed in the app, or a Starbucks customer might add food to an order while passing through a product-suggestions page. This ultimately benefits both the retailer and the payment provider through higher purchasing volume.

If these trends hold for early applications of in-car payments, it's likely that other chains, including grocers, will test connected car integrations with payments functionality, which would give drivers more ordering options and more opportunities to develop a habit around making purchases through the car.

Card networks like Visa are in a position to grab a major share of in-car payments because of their partnerships with car companies like Honda. If they can build on these relationships, then more and more car manufacturers will choose them as their payments partners. This signals an opportunity for card networks to create the consumer-facing platforms that consumers use when making connected car payments.

Connected cars offer a special opportunity to card networks because they provide enough real estate on the car dashboard to highlight the card networks' own branding. This can help a company like Visa develop further loyalty among consumers, while building its reputation as a front-end and back-end platform for connected payments. Although it's improbable that Visa would force drivers to pay exclusively with Visa cards, it still helps the network's brand to offer payment options with its logo displayed.

In addition, while Visa Checkout dominates car payments for now, other checkout options from providers like Apple, Google, and PayPal could offer solutions for in-car payments. As with mobile commerce, consumers will probably end up with multiple ways to pay in their cars. Certain checkout providers will become top-of-wallet — the main option on a checkout platform — while others may be integrated with specific retailer programs.

CONNECTED HOME

Estimated Global Smart Home Device Shipments

Source: BI Intelligence estimates, 2015

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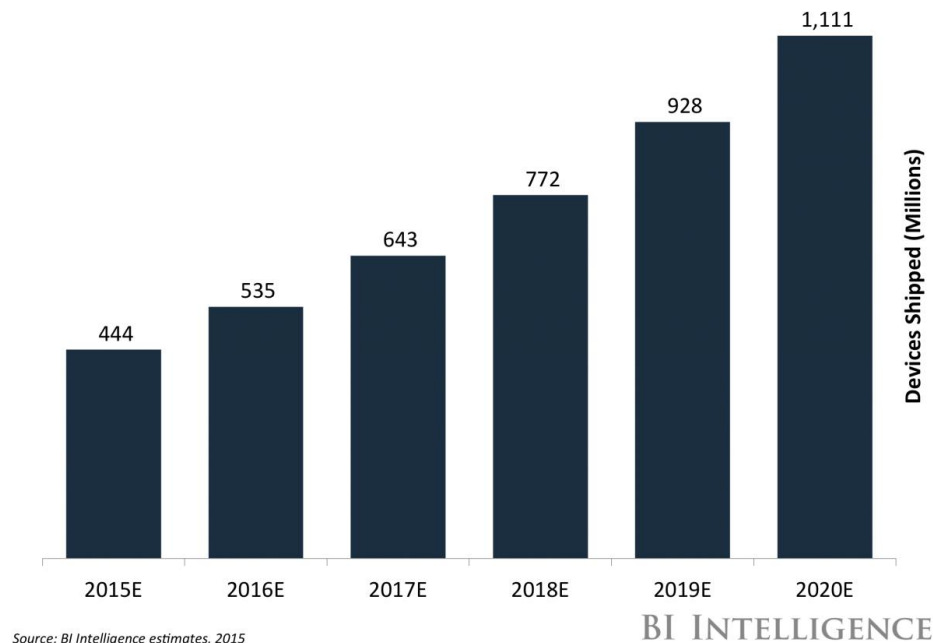
Smart home devices — like the Nest Thermostat, Canary, and Amazon Echo — are becoming more prevalent throughout the US. These devices, which range from smart door locks to smart refrigerators, automate areas of the home while collecting and processing data. Device makers are continually finding new ways to connect common household devices to further automate consumers' lives.

Connecting household products to the internet can help device makers collect data about usage and performance. For example, the maker of a water pitcher can use data about how often its water pitcher is used to make improvements to future models or send alerts when the filter should be replaced.

Now, payments are being integrated into these devices to help consumers automate the ordering of essential goods and even manage their credit card accounts. We define smart home payments as payments made with any standalone smart home product.

We expect the smart home market to continue to grow steadily over the next five years as prices drop, old household devices need to be replaced, and the technological fragmentation problem is fixed.

- **In 2020, we expect 1.1 billion standalone connected home devices will be shipped, up from 444 million devices shipped in 2015.** The bulk of smart home devices shipped will be connected light bulbs and small internet-connected sensors placed on windows for security purposes.

- **Approximately 15% of smart home devices shipped will include appliances, such as smart refrigerators, and entertainment devices, like the Amazon Echo and Google Home.** These devices are the ones that device makers will find most valuable in integrating payments because they're more consumer facing and often manage another good that the company can cross-sell to the device owner. For example, a connected printer's manufacturer can continually sell ink to a device owner because the printer can detect when the ink is low and alert them to the need for a refill.

- **We estimate 3% of smart home devices shipped in 2016 will have payment capabilities. By 2020, we estimate that will grow to 10%.** Over time, we expect a growing portion of global appliances and entertainment devices sold will have internet capabilities integrated into them. Further, we expect more mundane devices, such as cleaning products, paper towel holders, water pitchers, etc., will be introduced with integrated payment capabilities that allow the product maker to cross-sell products and services.

Here are a few of the top smart home devices and device categories that are being integrated with payments:

- **Amazon Echo:** The Amazon Echo is one of the most successful smart home products. It's a tubular speaker integrated with a voice assistant, similar to Apple's Siri. Although it originally handled more basic requests, it now allows Capital One customers to pay their credit card bills through an integration with the bank. This could help popularize voice-activated payments because of the low friction.

- **Amazon's Dash:** Physical buy buttons could help drive the payments-enabled device revolution. Last year, Amazon launched a one-click purchasing device for Amazon Prime members called [Dash](). The key fob-sized device is branded by select Amazon partners — such as Tide, Gillette, and Huggies — and it allows customers to re-order items with the push of a button. A number of other brands have since hopped onboard the program. And this year, Amazon launched the Dash Replenishment Service, which is integrated directly with products, enabling automated order refills through Amazon. With this service, the consumer doesn't have to remember to shop for these items at all. For example, an Amazon Dash integrated into a Brita water container can re-order new filters as soon as it detects that the current filter is expired. The device uses Amazon's payment service to execute the transaction and communicates with Amazon's fulfillment centers to deliver the new filters.

- **Appliances:** MasterCard and Samsung have created a smart refrigerator that includes an embedded tablet that can process and send grocery orders to FreshDirect and ShopRite. Although this device is convenient, its high price point, coupled with long upgrade cycles on refrigerators, suggests that the device won't see wide adoption in the near term.

As with wearables, smart home devices could give consumers many new ways to execute transactions, which would reduce attachment to a single payment instrument. That means OEMs beyond smartphone vendors like Apple and Samsung could launch commerce platforms and see success.

Smart home devices could also cause a seismic shift in the way consumers shop for essential goods. For example, a much larger share of grocery shopping may eventually be done digitally. Grocery is shifting online at a glacial pace right now — only 1.5% of US grocery sales occurred online in 2015, by our estimates. However, the convenience of shopping for groceries through a central hub like a refrigerator could help accelerate the share of grocery sales online.

HOW IT WORKS: SAMSUNG FAMILY HUB SMART REFRIGERATOR

Different grocery vendors for price comparison

Easy to locate buttons for adding items to cart and checkout

Large touchscreen where users can order groceries, select delivery times, and check out

SAMSUNG MasterCard

Despite this potential, the connected home market has been slow to take off for four reasons:

1. **Consumer demand is high but willingness to purchase is low.** Although 54% of Americans are excited about the possibility of integrating smart home features into their homes, very few Americans plan to purchase a smart home device in the next year, according to Icontrol's 2015 State of the Smart Home survey.

2. **Device prices are high.** A Nest Thermostat retails for $250 versus an unconnected Honeywell Basic Thermostat that costs $18. Over time, device prices will drop as the market gets new entrants and legacy device makers follow the market trend to connect the home products they create.

3. **Current devices in homes have a long replacement cycle.** Some appliances and devices have long life expectancies. For example, a refrigerator can last between 13 and 19 years, according to H&R Block. However, if more nimble solutions like Amazon Dash proliferate, the replacement cycle will contract.

4. **The smart home ecosystem is technologically fragmented, making it hard for consumers to install smart home devices.** There are many networks, standards, protocols, and devices being used to connect the smart home, adding costs, creating interoperability problems, and making it confusing for the consumer to set up and control multiple devices. On the bright side, there are efforts underway to fix this technological fragmentation.

These adoption barriers will limit early adoption of payment-enabled connected home devices, since adoption of these devices is dependent on the adoption of connected home devices generally.

THE BOTTOM LINE

- The rapid expansion of the Internet of Things (IoT) offers an opportunity to facilitate payments beyond mobile phones, cards, and point-of-sale terminals.

- More transactions could eventually pass through connected devices than smartphones. We estimate there will be 24 billion of these devices by 2020, with 5 billion of them being consumer-facing.

- Visa and MasterCard are creating the underlying infrastructure to support the standardization of payments integration and stake themselves out as the key connected payments gatekeepers.

- Consumer-facing IoT companies have much to gain from enabling payments in their devices, including improving the value of the device, being able to cross-sell products through the device, and laying the groundwork for future opportunities to earn incremental revenue.

- Wearables, connected cars, and smart home devices will be the top devices for connected payments.

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