STRATEGY ANALYTICS
Research, Experts, and Analytics

Mobile LBS: Status Update & Platform Assessment

Report Snapshot

This report provides Strategy Analytics' high-level outlook for handset-based location-based services. Rising GPS penetration, the growing popularity of taxi-sharing, carpooling, and ride-sharing apps, third-party content integration into popular map applications, and the emerging wearables device category provide opportunities for growth and development in mobile LBS. This report also includes an update of our assessment of global location-platform leaders, HERE, Google, TomTom and Apple.

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Media & Services

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1. Executive Summary

There has been a consistent rise in in regular mobile map use over the past eight years, as consumer dependence on mobile maps and directions has grown. Notably, users indicated a substantial rise in regular mobile maps and direction use in 2015 across China, Western Europe and the USA.

- 43% of all respondents across all surveyed countries claimed to use their smartphone to access maps and get directions on a regular basis, compared with 42% in the US, 33% across France, Germany and the US, 60% in India and 50% in China.

Growth of the mobile LBS continues to be fuelled by the rising base of GPS and WiFi enabled devices in lower-tier devices, the rising popularity of taxi-hailing, car-sharing and ride-pooling applications, the increased integration of travel-related services into mobile applications, and the emerging wearables segment:

- **Rising GPS penetration:** High accuracy device positioning technology is becoming increasingly ubiquitous, as GPS and WiFi penetration on ultra-low and entry-tier devices continues to rise. According to Strategy Analytics' SpecTRAX and PriceTRAX, the share of handsets integrated with GPS radios in the ultra-low (sub US$35) price range has strongly risen from 16.2% in July 2015 to almost 25% at the end of September 2016.

- **Urban mobility trends:** Strategy Analytics expects the growing adoption of taxi-hailing and car-pooling apps from both passengers and drivers will drive increased demand for location based services which underpin those applications, such as routing information and guidance, geocoding (and reverse geocoding), and other location-based content, among others.

- **All-in-one journey planning:** The integration of third-party services, such as taxi-hailing, and table bookings, into mobile map apps creates a one-stop-shop which makes the applications more useful and convenient for its users, while creating revenue opportunities for mobile map app providers, such as Apple, Google, and HERE.

- **Wearables:** Strategy Analytics expects rising sales in wearable devices combined with strong developer interest in creating apps for wearables to provide an incremental boost to for the LBS market. Ten percent of developers highlighted wearables as very important to develop for. 35 out of 300 of the developers we surveyed claimed to have launched an application for Apple Watch already with 40 claiming to have developed, but not launched on the same platform.

Overall, our assessment of the leading mobile location platforms has not altered significantly since our previous report on location-based services, with HERE maintaining its leadership over Google, while TomTom and Apple continue to play catch-up.

2. Key Trends in Mobile LBS

Since last years' report on mobile location-based services we have seen notable activity from providers of LBS, such as TripAdvisor, Uber, and major car makers. These companies have been keen to strengthen their location-related capabilities through greater investments and acquisitions:

- **August 2016:** TripAdvisor acquired CityMaps, a social mapping start-up, which offers over 100,000 city guides, providing user reviews for venues, dining, nightlife, entertainment and accommodation.

- **July 2016:** Uber announced plans to double down on its investment in mapping, with emphasis on improving data related to traffic patterns along with precise pick-up and drop-off locations. Uber has deployed mapping cars in the US and Mexico, with intentions to expand into other markets. Further investment adds to its acquisition of mobile mapping platform DeCarta in March 2015 and technology from Bing Maps in June 2015.

- **July 2016:** In July 2016 Daimler's MyTaxi merged with rival taxi-booking service, Hailo, in order to compete with US centric car booking services such as Uber and Lyft. With both companies operating in separate markets to each other the combined entity has greater improved scale from day one.

- **May 2016:** Apple made a significant investment of $1 Billion in China-based ridesharing service, Didi, which also secures it a seat on Didi's board. Apple's will benefit as the ride-sharing market takes off in markets targeted by Didi, but also help Apple build relationships in China, an important iPhone market.

During the first half of 2016 car makers have also made strategic investments in taxi ordering applications, as they seek to guarantee vehicle distribution and service-related opportunities in the future. For example, General Motors (GM) made a $500 million investment in Lyft, while in May 2016 VW invested $300 million in taxi application Gett, and Toyota invested an undisclosed sum to Uber.

A detailed examination of car sharing and other mobility service is covered in the June 2016 report, "Automakers Explore Car Sharing, Ride Hailing, and Other Connected Mobility Programs," published in our Automotive Multimedia and Communications (AMCS) service.

2.1   Reported Mobile LBS Use and Adoption

In addition to continued activity in the LBS-sector we continue to see evidence of rising adoption and usage of mobile location-based services reported by providers:

- **Oct 2016:** HERE claims that its consumer facing application, HERE WeGo, has accumulated over 30 million downloads since launch in July 2016.

- **Oct 2016:** Navmii claims over 37 million miles are driven by its users each month, with 3.8 million searches conducted and over 26.5 million downloads.

- **Sept 2016:** John Hanke, CEO of Niantic Labs announced its augmented reality (AR) location-based smartphone game, Pokémon Go, had reached 500 million downloads, with over 4.6 Billion Km covered by game players. Pokémon Go should breathe life into the LBS games sector.

- **Sept 2016:** Baidu reported a 7% year-on-year increase in mobile map users to 348 million at the end of September 2016.

- **Sept 2016:** Yelp reported just over 69.3 million mobile web users, up 7% year-on-year, with the number of devices accessing the Yelp app up 27.1% YoY to break 23 million, with 70% of page views generated via the app.

- **June 2016:** Location-based service provider, Sygic, claims over 130 million drivers use its vehicle navigation application, up from 100 million during December 2015.

- **March 2016:** AutoNavi, claims it reached over 500 million mobile map users at the end of January 2016, and increased the number of active users by 100% during 2015. TomTom reported 4 million downloads of its TomTom Go in-car navigation application.

- **Dec 2015:** Carmaker Daimler claimed that mobile devices account for two-thirds of transactions made through its online Car2Go car-sharing service. Car2Go claims 16 million Car2Go transactions in the three months ending September 2016.
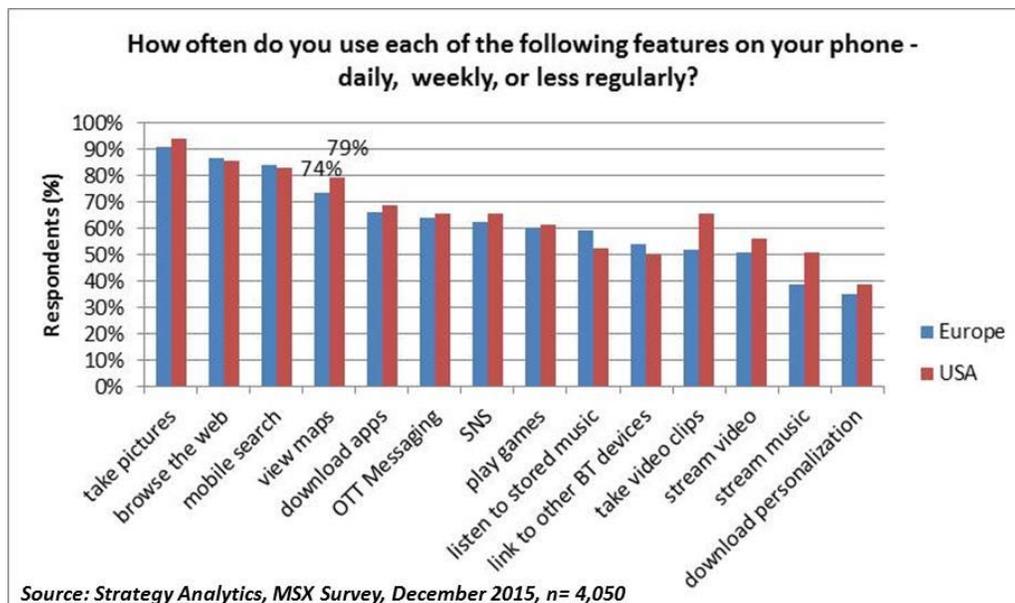
2.2   Mobile Maps & Direction Use in Context

The use of mobile maps for self-location, finding directions and navigating the world is commonplace. However, given the need for maps and directions are typically required when users are looking for directions to new places our survey data shows just 53% use mobile maps is daily or weekly.

To put the widespread adoption of mobile maps into context the use of smartphones to view maps and get directions ranked the fourth most widely used mobile service after taking photos, browsing the web and mobile search, based on consumer research conducted in France, Germany, the UK and the US, Exhibit 1. Across those European countries 74% of survey respondents indicated they use their smartphone to get maps and directions on either a daily, weekly or less regular basis versus 79% in the USA.

The use of smartphones to access maps and directions is also popular in China and India, where 89% and 85% of respondents claimed to use these services either on a daily, weekly or less frequent basis. However, maps and direction adoption is less widely used than a larger number of other applications, which include the alternatives listed for Europe and the US, but also include over-the-top (OTT) messaging, listening to music, and streaming video and access to social networking sites (SNS).

Exhibit 1: Overall Mobile Map & Directions Use in Context: Asia, Europe, and the US

How often do you use each of the following features on your phone - daily, weekly, or less regularly?

Source: Strategy Analytics, MSX Survey, December 2015, n= 4,050

There has been a consistent rise in in regular mobile map use over the past eight years, as consumer dependence on mobile maps and directions has grown. Notably, users indicated a substantial rise in regular mobile maps and direction use in 2015 across China, Western Europe and the USA.
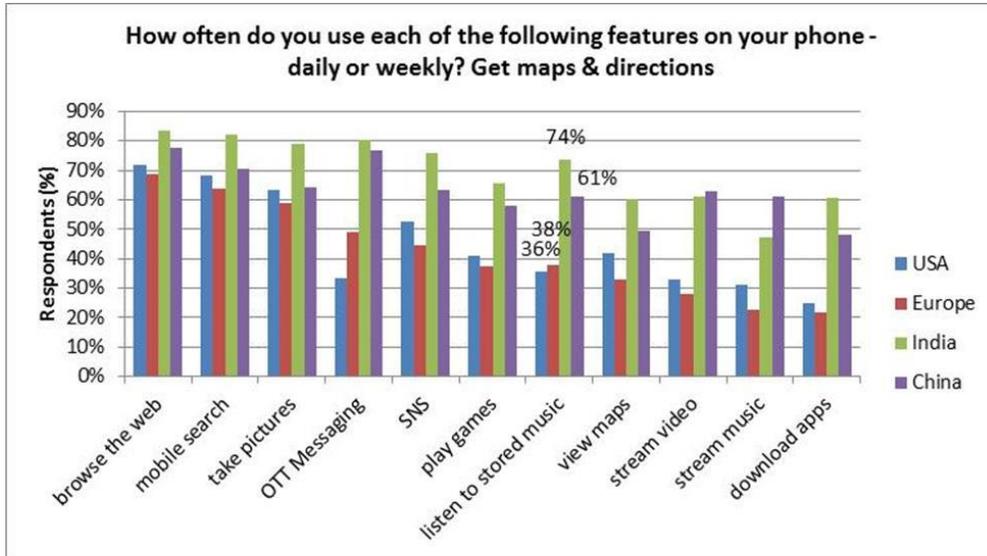
The use of mobile for accessing maps and getting directions is needs based. For example, consumers will access mobile maps when they need to travel to places and locations they are unfamiliar with, or if they are searching for places near to their current location. Therefore, it is not a surprise that our survey data indicates that regular use of mobile maps and directions, which we define as daily and weekly use, fared less favourably than some communications and entertainment applications, such as accessing social networks (SNS), OTT messaging, playing games and listening to mobile music, Exhibit 2.

- 43% of all respondents across all surveyed countries claimed to use their smartphone to access maps and get directions on a regular basis, compared with 42% in the US, 33% across France, Germany and the US, 60% in India and 50% in China.

However, mobile users are becoming increasingly reliant on mobile maps to meet their personal navigation requirements. Strategy Analytics survey data shows the number of users regularly accessing mobile maps is on the rise across all markets, with a significant rise in regular use during 2015, Exhibit 3.

Exhibit 2: Regular Mobile Map & Directions Use in Context: Asia, Europe, and the US

How often do you use each of the following features on your phone - daily or weekly? Get maps & directions

Source: Strategy Analytics, MSX Survey, December 2015, n= 4,050

Exhibit 3: Mobile Map & Directions Use across All Countries

How often do you use each of the features on your phone? daily or weekly - maps and directions
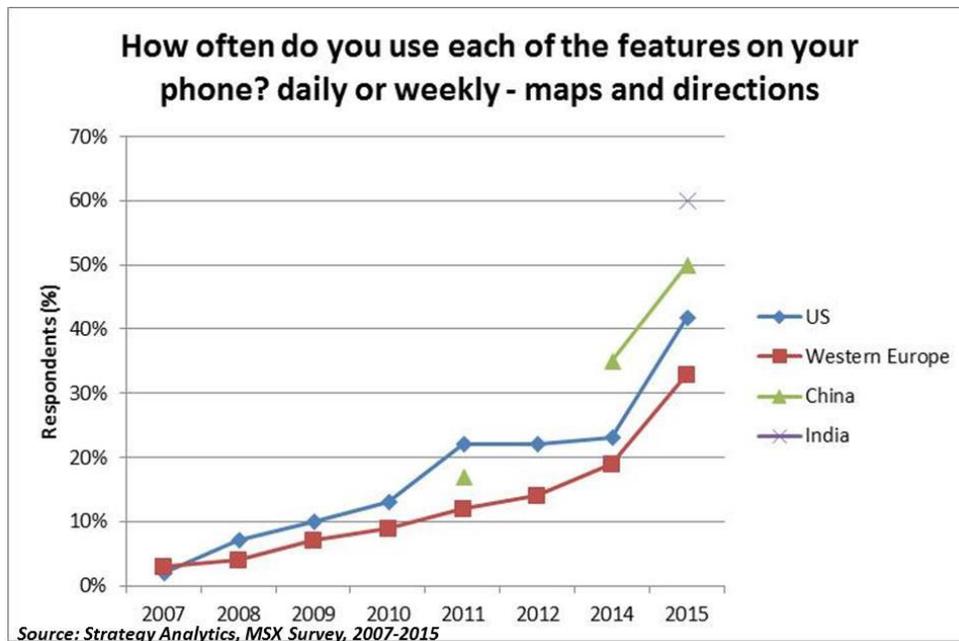
Source: Strategy Analytics, MSX Survey, 2007-2015

2.3   Mobile Location Capability to Boost Emerging Market Opportunities

Automatic handset (and therefore user) positioning is important for providing real-time mobile LBS services such as turn-by-turn navigation, but also to enhance the delivery of contextually aware services, such as location-based news and weather information, and local search, among others. Technologies such as GPS, Wi-Fi and Bluetooth are all currently being used to locate handsets and to provide proximity-based services.

### 2.3.1   GPS handset penetration rises in the entry tier

While GPS and WiFi are ubiquitous on premium and high-tier mobile phones, over the past year the share of handsets integrated with high-accuracy positioning has increased notably in the ultra-low price tier, providing a continued boost to providers of mobile LBS apps and services in emerging markets.

Accessibility of high-accuracy positioning services continues to rise as GPS penetration grows in both the ultra-low (sub US$35) and entry-tier (US$36-99) handset price bands. Data from Strategy Analytics' SpecTRAX and PriceTRAX databases shows that on a shelf-share basis the penetration of GPS handsets is almost 100% across on mobile phones priced US$191 and above, Exhibit 4. Notably, at the other end of the scale the share of handsets integrated with GPS radios in the ultra-low (sub US$35) price range has strongly risen from 16.2% in July 2015 to almost 25% at the end of September 2016. This compares to a penetration of just over 10% GPS penetration reported in the ultra-low category in last years' report. At a global level Strategy Analytics' Emerging Device Strategies (EDS) service forecasts the ultra-low handset tier will account for just below 13% of global handset sales by 2022. During the same period there has been a modest rise in the share of handsets in the entry-tier (US$36-99) enabled with GPS, rising from 72.4% to 76.3%.

With both Wi-Fi and Bluetooth 4.0 used for both location and proximity-based services, our database indicates a greater share of handsets support Wi-Fi over Bluetooth 4.0, across all price–tiers. Compared to GPS, Wi-Fi penetration has increased modestly for each price-tier during the 12 months ending September 2016. However, across the same period SpecTRAX and PriceTRAX indicate a greater rise in the share of handsets in both the ultra-low and entry-level tiers that are integrated with Wi-Fi from 26.2% to 33.5% and from 76% to 81%, respectively. Rising GPS and WiFi in the entry and ultra-low handset tiers continues to offer further growth opportunities, albeit in emerging markets, for developers and publishers of services that rely on autonomous device location.

Exhibit 4 Rising Penetration of GPS Handsets by Price Tier
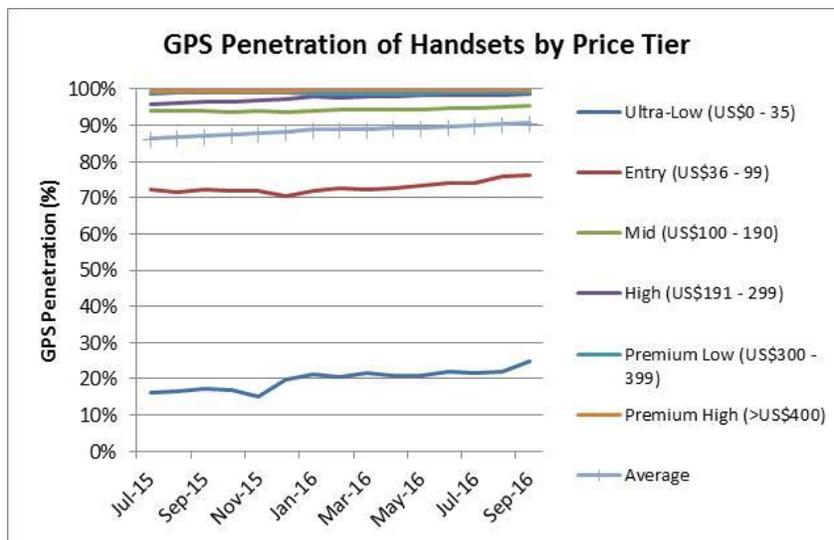
2.4 New Trends in Urban Mobility

Significant investment in ride-hailing services such as Uber, Lyft, and Didi, underlines the extent to which these new entrants are challenging traditional players in the transportation space by leveraging mobile technology. The shift in demand for urban transport towards mobile-centric services is a boost for LBS, with mobile playing an increasingly important role for journey planning and the administration of services.

The rising growth of taxi-hailing apps, like Uber and Lyft, along with evidence of an increasing membership of car-sharing in cities, points to changing behaviours in consumers' mobility habits. Taxi-hailing apps are thriving because they solve several pain points associated with conventional taxi services. Ride-sharing apps like Uber and Lyft offer a convenient method for passengers to request a ride via smartphone apps; journeys can be paid for with cash, or payment cards in person, or card details stored on file; users can share their location, track the progress of their driver, and assess wait time; and these apps provide more competitive rates for journeys than licensed taxi and cab firms. While companies like Uber and Lyft face regulatory scrutiny, because they challenge establish business models and labour laws, they are posting healthy growth and receive impressive valuations from investors:

- **Oct 2016:** Car sharing application BlaBla claims 35 million members and 12 million users per quarter across 22 countries. The mobile app has been downloaded 21 million times.

- **Sept 2016:** Carmaker Daimler claims its "myTaxi" app has generated over 3.4 million users across 43 cities, and has generated 7 million transactions during 2016.

  – At the same time, Daimler reported its car sharing service, Car2Go, which is available across 30 cities, has 2.1 million members and has generated 16 million transactions since the beginning of 2016, equating to 8 transactions per user.

- **June 2016:** Lyft claims 11 million rides in the US in April 2016, up four times on the year before, with seven cities driving over 0.5 million rides per month. In January 2016 Lyft received a $500 million investment from General Motors.

- **June 2016:** Avis, which owns the car sharing service ZipCar, claimed to have nearly 1 million members at the end of 2H 2016.

- **May 2016:** Apple made a significant investment of $1 Billion in China-based ridesharing service, Didi, which also secures it a seat on Didi's board.

- **May 2016:** Israeli start-up Gett received $500 million in funding from Volkswagen Group, as car makers position to become key suppliers of vehicles and vehicle related care services to these initiatives.

A more detailed examination of car sharing and other mobility service is covered in the June 2016 report, "Automakers Explore Car Sharing, Ride Hailing, and Other Connected Mobility Programs," published in our Automotive Multimedia and Communications (AMCS) service.

Strategy Analytics expects the growing adoption of taxi-hailing and car-pooling apps from both passengers and drivers will drive increased demand for location based services which underpin those applications, such as routing information and guidance, geocoding (and reverse geocoding), and other location-based content, among others.

2.5   From Maps & Navigation to All-in-One Travel Planning Apps

Since our previous report there has been a clear move by Apple, Google and HERE to integrate third-party travel-related services, including ride-hailing, carpooling, and restaurant and hotel room reservations, into their applications.

In addition to wayfinding and navigation, map applications from Apple, Google and HERE are each become aggregators for third-party travel related services, as they aim to become one-stop-shops for users' travel planning needs.

- **Apple:** In iOS10, announced in June 2016, Apple introduced app extensions to enable third-party apps to integrate into Apple Maps, and with Siri. When the app extension for a specific application like OpenTable or Yelp is enabled, Apple Maps can be used to search and then book a restaurant from within Apple Maps. Users will need to have apps from those providers installed on their iPhone, and opt-in to use the extension in Apple Maps, to be able to see third-party integrations. Similarly, iOS10 includes app extensions for ride-sharing services like Uber, enabling users to book and pay for taxis from within Apple Maps. Apple claims these extensions are open to all developers globally.

- **Google:** In March 2016 Google introduced the option to compare ride-sharing/ taxi hailing services against alternatives including car, bike, pedestrian and biking into Google Maps (Android and iOS). Google has partnered Uber (globally), 99Taxis in Brazil, Ola Cabs in India, Hailo in Spain and the UK, MyTaxi in Germany and Spain, and Gett in the UK. If users have these ride-sharing apps installed on their smartphone Google Maps will enable

users to compare estimated journey times and fares for these services. Clicking on an app will open up the ride-sharing app and enable users to book the ride. In September 2016 Google announced two new partners in the US, Gett and Lyft, and Google claims Google Maps will display options from 9 ride sharing partners in over 60 markets. Google claims to have introduced contextual (location) awareness, and will provide the ride-sharing possibilities even when users are searching in pedestrian or transit modes – thus creating monetization opportunities for ride-sharing partners.

- **HERE:** In its revamped consumer application, HERE WeGo, launched in July 2016 and already reaching more than 30 million downloads to date, HERE introduced travel options from Daimlers' car-sharing service, Car2Go**,** as an additional transport option. The application will display the nearest cars to the users location along with an estimated cost of renting the car to get to the destination, and the car's fuel level. Users with the Car2Go app can then launch the Car2Go app and reserve the car. HERE has implemented taxi information, including fare, wait time, and a call button from taxi providers in 17 cities and intends to add more geographies. Car2Go is currently available in 9 countries and 28 cities. Overtime, HERE plans to integrate additional car sharing providers as well as expand their coverage to other mobility modes such as ride sharing, taxi hailing, traditional taxi and long distance bus. By doing this HERE will allow users to find the best possibility to reach their destination while will create monetization opportunities for their mobility partners.

The integration of third-party services, such as taxi-hailing and table bookings, into mobile map apps creates a one-stop-shop which makes the applications more useful and convenient for its users, while creating revenue opportunities for mobile map app providers, such as Apple, Google, and HERE.

Making map apps more useful: Integrating relevant content and functions from third-party travel-related apps has potential to make mobile map applications more useful to users, and provide additional reasons to use these map applications. Providers must be wary that adding complexity may put off users, and therefore providers of map-based applications should seek to strike a balance between integrating with travel-related services, while simultaneously maintaining ease of use.

Adding convenience for users: Mobile map applications can solve the inconvenience associated with firing up multiple apps for journey planning by integrating functions that enable users to book tables at restaurants, reserve a hotel room, and hail a cab ride, among other things. Apple's map extension appears to enable users to complete their entire journey planning process from Apple Maps, while Google and HERE conveniently hand users off to partner apps.

Revenue opportunities: By enabling integration via extensions mobile maps are evolving into hubs for third-party travel-related services. If a sizeable volume of bookings and referrals are generated by map applications we expect these hubs to take a share of the booking referral fees. To put the scale of the bookings market into context, Priceline, a global leader in travel-related bookings which operates brands like Booking.com, Priceline.com, Kayak, OpenTable, Adoda and Rentalcars,com, generated over $55.5 Billion in gross bookings in 2015, on which it generated just over $9.2 Billion in revenue. Expedia, a global leader in travel-related bookings generated $60.8 in gross bookings, delivering just above $6.6 Billion in revenue.

At this early stage in partner integrations it is notable that competing taxi-hailing services (Uber, Lyft, and Gett) are prepared to directly compete with each other by providing wait time and fare information within Google Maps. With over 1 Billion users Google Maps clearly provides a significant channel to market that cannot be ignored.

2.6   Wearables Remain a Growth Opportunity

Strategy Analytics maintains that rising sales of wearable devices along with strong developer interest in creating location-centric applications for wearables will deliver an incremental rise in overall demand for digital maps and mobile location-based services.

- **Wearable device shipment growth:** Strategy Analytics has [increased its forecast for wearable devices](link) growth (smartwatches, smart glasses, fitness bands, and others) over the next five years, with unit sales increasing from over 82 million at the end of 2016 to approach 270 million by 2022. Smartwatch sales will rise as a share of overall sales to account for over 55% at the end of this period, with smart glass sales accounting for nearly 23%. Wearable devices remain in an embryonic stage of development, with the market expanding slowly beyond the early adopter phase. Strategy Analytics expects it will take time for broader consumer demand for wearable devices and use cases to develop. Furthermore, given the strong interest in wearable devices from the developer community we believe the wearable device segment should not be ignored by enablers and providers to the mobile LBS market.

- **Developer interest:** Our [annual developer survey](link) uncovered wearable devices as the fourth most important device to develop for after smartphones, tablets and PCs. Ten percent of developers highlighted wearables as very important to develop for. 35 out of 300 of the developers we surveyed claimed to have launched an application for Apple Watch already with 40 claiming to have developed, but not launched on the same platform. We continue to expect robust levels of interest in developing apps for wearable devices to lead to compelling and innovative use-cases and contextually aware location based services (LBS). As noted in our previous report Apple, Google and HERE have launched their respective map applications on smartwatches, but Apple enables third-party to leverage Apple Maps via WatchKit, while the Google Maps Android API runs on Android Wear devices. HERE supports Samsung's Gear S2 natively, but not WatchOS or Android Wear. TomTom develops its own branded fitness watches and trackers, which include some location-based features (e.g. route tracking), but not maps and navigation.

Global Wearable Device Sales by Type: 2012-2022
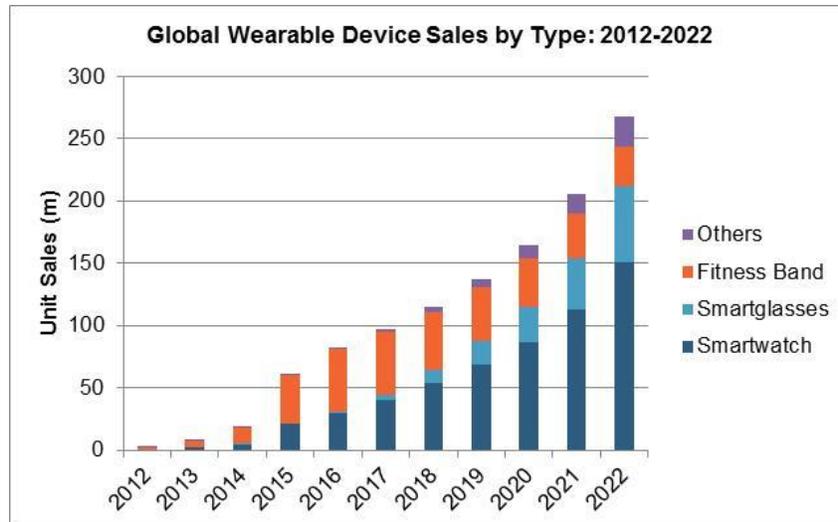
As we noted in last years' report, we expect notifications, alerts and the ability to glance for location relevant information to provide convenience benefits over handset-based LBS.

- **Enhanced usability:** Smart watches and glasses provide an alternative and potentially more user friendly interface than smartphones for pedestrian navigation and route guidance notification. In the case of the smart watch, glancing at a watch face to get directions, offers greater convenience over taking a smartphone out of a pocket or bag, and can improve the user experience. With smart glasses, the navigation or route guidance screen is in direct sight, and offers greater convenience, potentially.

- **Location-awareness:** While early implementations of LBS on smartwatches rely on pairing wearable devices with a smartphone via bluetooth, wearable devices could also be used as standalone devices for LBS. A rising share of wearable devices incorporate location and proximity technologies such as GPS, cellular, Bluetooth and WiFi, without relying on pairing with smartphone companions. The tracking of vulnerable people (e.g. children, elderly, or disabled) using wearable devices is one obvious use-case, as is its use to check-in to venues and share location with social network members.

While building consumer apps and features to work on wearable devices will become table stakes for developers, we predict wearable apps are unlikely to create significant revenue growth opportunities.

The two most popular business models for smartphone applications include advertising and in-app transactions. Our view of how these business models will apply to apps running on wearable devices is as follows:

- **Advertising:** Given the limited real-estate on the screens of wearable devices, Strategy Analytics believes display advertising, which accounts for a significant share of mobile advertising activity, is unlikely to translate to wearable devices. We expect many consumers will be unwilling to accept display advertising displayed smartwatches and in smart glasses. However, mobile marketing delivered in the form of notifications or alerts

from desired brands or relevant nearby businesses represents a better fit - where users have opted-in to receive those messages. Overall, we expect user tolerance to push-based advertising on wearable devices via notifications to be limited.

- **In-App transactions:** Linking notifications and alerts highlighted above with the ability to make immediate transactions via wearable devices could create some incremental opportunities with LBS applications. However, overall, we don't expect wearable devices to provide the catalyst for growth in in-app transactions for consumer LBS.

3. Location Platform Benchmark Update

Digital mapping and location platforms are at the heart of many popular consumer location-based services (LBS), including all-in-one map applications, turn-by-turn navigation services, people tracking apps, and ride-hailing or carpooling use-cases, among many others. Location platforms enable app developers of all sizes to build applications that leverage maps, geo-coding (and reverse geocoding), multi-modal routing and navigation, and local search, among other capabilities, without building these capabilities in house.

These location platforms not only address mobile phones, but all connected devices that have either direct or in-direct access to user's location coordinates, such as connected cars, but also wearable devices like smartwatches. As such, the requirements for each of these devices continues to be shaped by increased consumer usage of these services, but also industry trends, including autonomous/ assisted driving and the Internet-of-Things (IoT). For example, navigating from home to the front of a shop may have met the majority of consumer needs five years ago, but with increasing dependency on mobile navigation consumer needs will be evolving to aisle-level directions.

This analysis of the location platforms, Apple, Google, HERE and TomTom, focuses on the relative strengths and weaknesses of these in supporting both own-branded and third-party mobile location-based services.

Our overall assessment of the leading mobile location platforms has not altered significantly since [last-years comparison](#), with HERE maintaining its leadership over Google, while TomTom and Apple continue to play catch-up.

While the have been some developments within the location-platform market, for example the acquisition of AOL, and its MapQuest business, by Verizon, and Uber announcing its intent to double down on its investment on digital mapping, there has been little change to the structure of the industry.

Exhibit 6 provides a comparison of the capabilities of the major mobile map platforms across seven distinct dimensions, which includes map and navigation country coverage, indoor (or venue mapping) map reach, the capacity to operate in offline mode, the number of mobile platforms supported, map visualization, and local search capability. The purpose of this radar diagram is to demonstrate the relative strengths and weaknesses of the map platforms of each of these key location industry players, and to highlight where improvements can be made to their overall offerings. The accompanying table below Exhibit 6 summarizes our score for each capability, with the number in parenthesis indicating the score we provided in the report last year for comparative purposes.

Exhibit 6 The Relative Strengths & Weaknesses of Major Location Platforms
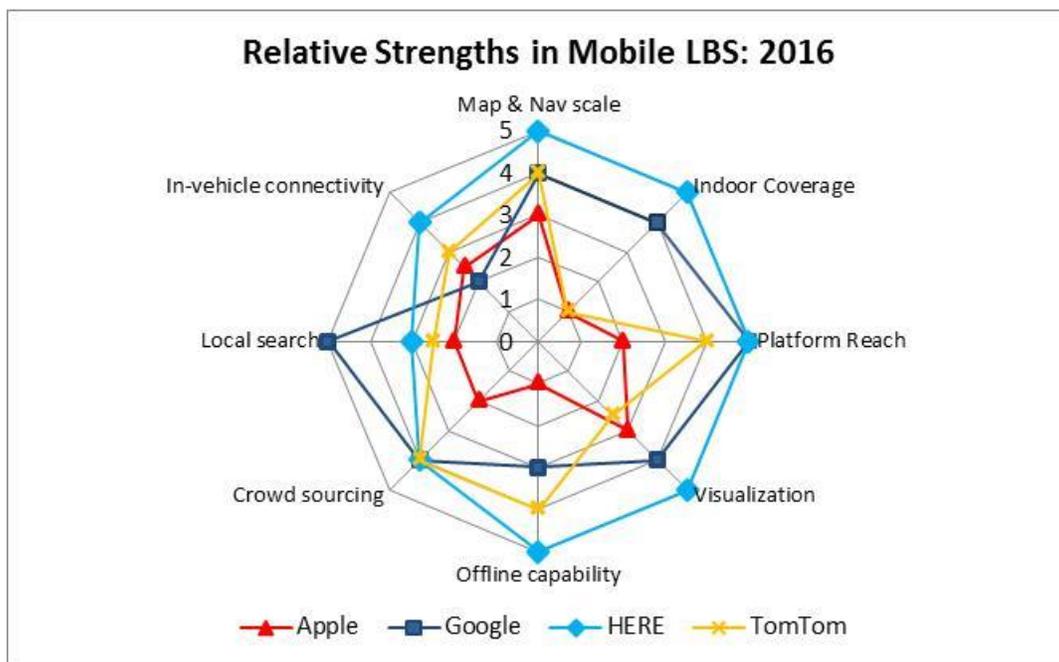
Capability	Apple	Google	HERE	TomTom
Map & Nav scale	3(4)	4(4)	5(5)	4(5)
Indoor Coverage	1(3)	4(3)	5(5)	1(4)
Platform Reach	2(2)	5(5)	5(5)	4(5)
Visualization	3(3)	4(4)	5(5)	3(3)
Offline capability	1(3)	3(2)	5(5)	4(4)
Crowd sourcing	2(2)	4.5(4)	4(4)	4(4)
Local search	2(2)	5(5)	3(3)	2.5(2)
In-vehicle connectivity	2.5(4)	2(2)	4(4)	3(2)

Map and navigation country coverage: LBS providers are seeking to reach a global audience, and therefore providing comprehensive country coverage across maps, routing, navigation and search remains an important capability for the customers of location platforms. In this update we have placed greater emphasis on the number of "navigable maps" to measure competing platforms against country coverage, but also to provide guidance on the richness provided by each platform. On this basis we have ranked HERE as the leader, covering 136 navigable markets with industry leading 779 map attributes and offering total of 41 content products on top of the map, followed by TomTom. While TomTom claims to offer navigable maps for 135 countries it providing developers with access to 118 of those via its online map service. TomTom, Google and Apple were unable to provide statistics to demonstrate the richness of their location platforms. Google did not share the number of navigable quality maps with us, so we assume its country coverage is on parity to the number of countries it provides navigation for, which is 110. Apple covers the least number of countries of its competitors, providing turn-by-turn navigation in just 59 of the 181 countries which it provides maps for. We expect growing reliance on mobile maps by users, which in turn

will increase demand for detailed, up-to-date and accurate maps. As such, Strategy Analytics expect that, increasingly, LBS providers will differentiate in terms of their ability to maintain map accuracy and the speed at which they deliver map updates to end users. To address this need, in December 2015 both HERE and TomTom announced plans to deploy platforms which provide real-time map updates, with HERE delivering this through its Open Location platform.

Indoor venues: HERE remains for leader in indoor map venue coverage, with over 14,000 venues mapped in 87 countries, and claiming to cover floor level detail for each. HERE also provides positioning software to device makers that include indoor location technologies, including Wi-Fi and Bluetooth. Micello currently claims to cover 25,000 indoor venues across 80 countries, and is also considered a leading provider, albeit specifically for indoor LBS. Google comes in next, claiming it has mapped over 10,000 indoor locations globally. Despite TomTom holding a license to evaluate Micello maps this agreement has ended, and TomTom has decided to build its own indoor venue maps. TomTom is aware its coverage of indoor venues lags that of Micello and HERE, but from 2017 it aims to ramp up venue coverage. Like HERE, TomTom will work with venue owners to do so, and we expect TomTom to improve on this current score in future. Currently, Apple remains the weakest provider with respect to indoor maps, and it does not provide indoor maps through Apple Maps or via Apple MapKit. On reflection, in last year's assessment we gave Apple greater credit for its indoor support than it deserved, so have downgraded its score this time. Through its Apple Connect program Apple hopes venue owners will share maps of their venues with Apple. In November 2015 Apple launched an application, called the Indoor Survey App, to enable business owners to map their premises using a combination of cell-tower and Wi-Fi signals, and sensors (e.g. the M9 motion coprocessor on iOS8) on the iPhone to survey buildings. We believe it will take some time for these new indoor initiatives from Apple to bear fruit, and it is unlikely crowd sourced maps using the sensors on smartphones alone will deliver a more reliable or high-quality venue map than one provided through a dedicated venue survey. Furthermore, Apple has made it challenging for third-party developers to leverage Wi-Fi positioning on the iPhone, pushing them towards its iBeacon Bluetooth beacon as an alternative. However, because Wi-Fi offers positioning as an additional use-case to its main purpose of providing internet connectivity, Wi-Fi enjoys a greater penetration of venues than Bluetooth beacons currently.

Platform Reach: Google, HERE and TomTom provide comparable platforms reach, both via their own mapping apps, but also in terms of supporting developers to build mobile LBS. Reflecting its strategy to enable the broadest possible access to its platform, HERE offers a mobile SDK that gives any developer access to its map data and location services for use in their own natively-built apps and services. Foxconn is the latest company to take advantage, developing the KARDI NAVI app for Taiwanese users. In contrast Apple only supports maps on its own devices. Consequently, we award full marks to each player, except for Apple. [Android and iOS account for over 95% of the global smartphone installed-base](#), though clearly the share between each platform in each country will vary. In China local map providers, Alibaba, Baidu and Tencent each provide mobile maps services. Google Maps, HERE WeGo and TomTom GO are each available on Android and iOS. Samsung offers HERE as an alternative to Google Maps on its Android devices. Wearable devices remain a niche category vis-à-vis smartphones, but Strategy Analytics expects wearable device sales to rise from 82 million at the end of 2016 to almost 270 million by 2021, with smartwatches accounting for over half at the end of the period. Google Maps is supported on Android Wear and Apple's Watch OS while Google has integrated a Google Maps API into Android Wear, enabling developers to create map-based apps for this platform. HERE supports Samsung's Tizen OS, and has made HERE WeGo available for the Samsung Gear 3. HERE does not support native Watch OS currently. Not surprisingly,

Apple Maps is only supported on Watch OS. TomTom offers its own range of smartwatches, but does not offer support native development for map services on smart watches via its map platform.

Visualization: We have not made significant changes to the scores provided last year, with all providers making incremental improvements. Map presentation and visualization remains a critical aspect in digital mapping and each platform provider has sought to improve the look and feel of their maps, particularly from the perspective of enabling improved access to location-based content enabled within their map service. For example, both HERE and Google provide on screen menus for users to quickly search for nearby amenities by category, e.g. looking for petrol or service stations, and places to eat, among others, without adding complexity to the map view. Google enables these searches to be conducted while Google Maps is in navigation mode while HERE WeGo reserves this feature for its map view. Furthermore, Google Maps now integrates into Google Calendar, enabling users to access the location of upcoming calendar events within maps. Bookings and reservation confirmations within Gmail are also integrated into the Google Map experience. Beyond these enhancements there is little change from the scores provided last year in this category, with HERE's City Lens, which can be used by third-party developers, providing a compelling and differentiated augmented reality (AR) based view.

Offline use: HERE remains a leader with its hybrid map platforms, supporting both global offline and online map and navigation. HERE delivers notifications to users via the OS notification platform when offline maps have been updated and need refreshing. TomTom also provides offline map capabilities. Google has improved the offline map capability of Google Maps in Android. Google Maps allows users to store maps on their handsets for 15 days, before attempting to provide a refresh when users are connected to Wi-Fi. Google claims its offline maps provide full search results and navigation. If the map is not updated between 15 and 30 days the offline map expires from the device, and the user is required to download a fresh version of the area. This ensures that Google Map users relying on offline mode have a version of their application that is no more than 59 days old. Apple does not support offline maps, though does provide some caching of maps to allow for basic, and very limited, use in the absence of connectivity.

Crowd/ social integration: Our scores for crowd-sourcing and social integration have altered marginally from last year's report. With evolving road networks, business locations and public transport routes, the need to keep map content accurate and up-to-date requires a continuous effort. Each location platform has enabled user communities (Google Map Maker, HERE Map Creator, TomTom MapShare Reporter) to notify the location platforms of changes to, or errors in, their respective digital maps. HERE claims it has integrated 33 million community edits across 2014 and 2015 while TomTom claims it receives around 200,000 reports per month via its community. Neither Apple nor Google have provided figures corresponding figures. While community derived map changes help location platforms to keep their maps up-to-date, these initiatives can be open to abuse. Therefore, platform providers must ensure that changes are verified by trusted partners. For example, Google suspended Map Maker in May 2015, following high-profile abuse by some contributors, and reintroduced the feature in August 2015, adding further safeguards and checks to verify edits from its community.

Beyond the communities the location platforms also enable users to report changes to point-of-information (POI), among other inaccuracies (such as place names, opening hours, etc). In July 2016 Google Maps introduced the ability for users to suggest edits to business and landmark information via the Google Maps app on Android, and also via Google Search on iOS and Android. Google Maps has moved to crowdsource descriptions of venues and

businesses, relying on a threshold number of user votes to verify whether suggested changes are accurate. We believe that relying only on a number of votes is not completely failsafe and will require close monitoring by Google. At this point in time Apple only supports notification of business listings through Apple Maps Connect. Apple Maps relies on TomTom and other partners to keep its map and POI data refreshed, but users are also able feedback errors from Apple Maps. TomTom enables users to report active speed cameras within its application, but not, map inaccuracies. Significantly, HERE is also pooling sensor data from its owners, Audi, BMW and Daimler, e.g. braking sensors, GPS, and video cameras among others, in order to enhance traffic information, hazard warnings and road sign details across its platform. Launching in 2017, these will be the first services powered by the Open Location Platform, described by HERE as the next generation of its platform. As part of that platform transition, the company's intention is to open up its technology stack to outside developers, giving them access to the same tools HERE's own developers use.

Local search: Local search enables users to find and navigate to landmarks, businesses (e.g. restaurants, bars, malls, service stations, etc.) and public venues. In our view Google remains the leader in terms of the comprehensive nature of its search capabilities. In 2011 Google announced its Google Places, its (point-of-information) POI database, is available in each of the 200 countries where it offers Google Maps, and also claims over 100 million places in its database. Google is a significant channel for local businesses to reach customers so many have claimed their businesses in Google Maps. Therefore, Google's remains more comprehensive in terms of covering smaller local businesses than its competitors. HERE provides POI information for 49 countries, and claims 75 million POI places and over 350 million addresses. Since our last update HERE has improved the ability to find local services in its consumer facing application through a floating "nearby" menu, which allows users to quickly find places to refuel their car, eat and drink and ATMs, among other popular search categories. TomTom also provides around the same number of POI at address-level details as HERE. Like HERE, TomTom also offers local search, but is not as comprehensively as Google, and claims over 60 million POIs across 50 countries. Apple doesn't report the number of POIs but within Apple Maps offers business reviews in 15 countries, and a quick search feature called "nearby" in 13 countries. Thus Apple provides significantly weaker country coverage for search that its competitors.

In-vehicle connectivity: Supporting users' in-vehicle navigation requirements remains important as many drivers use smartphone-based navigation applications as a replacement to on-board solution. In this aspect HERE maintains its leadership by supporting the breadth of use cases, from supporting car brands through in-dash navigation solutions (HERE Auto SDK), enabling car makers to offer their own navigation and mobility apps (HERE Mobile SDK), and offering its own branded urban mobility smartphone application (HERE WeGo) as an alternative. HERE is also an industry leader in automated driving technologies and provides several solution and service offerings to aid carmakers in their transition from manual to automated driving, (for example its HD Live Map). TomTom supports car makers with similar in-vehicle capabilities, including in-dash and via applications, though hasn't gone as far as HERE in enabling carmakers to link onboard with off-board capabilities. TomTom also provides a branded smartphone navigation app, called TomTom GO.

In contrast, both Apple and Google are actively promoting brought-in solutions, with Apple's CarPlay and Google's Android Auto interfacing with in-car controls to provide a range of navigation and infotainment services via the vehicle's infotainment and navigation screen. Apple claims CarPlay is and will be supported by over 160 models while Google claims Android Auto 215 models. However, we believe despite this CarPlay has higher attach-rates

among iPhone owners with Apple's vertically integrated approach providing a more reliable and predictable experience over Android Auto.

3.1 Overall Assessment

For the third year running HERE continues to outperform its competitors by providing superior levels of country coverage for both navigable maps, and indoor venues. Additionally, HERE provides superior hybrid offline functionality, and a comprehensive approach to supporting in-vehicle navigation.

Furthermore, with HERE now owned by carmakers Audi, BMW and Daimler, HERE is beginning to leverage sensor data from connected fleets of these vehicles to allow it to improve the accuracy of its road maps and build next generation connected vehicle services related to traffic, e.g. safety and parking among others, more cost effectively and, potentially in near real-time. Therefore, In the case of traffic probe data HERE states a 64% increase in probe volume will lead to significant improvements in the quality of traffic data. HERE remains a trusted brand in the automotive market, with Jaguar expanding HERE Auto guidance software across a larger number of models and engagements with over 10 OEMs for its HD Live Map product, supporting automated driving R&D pilots. Overall, HERE's ownership by car-markers provides it with a distinct competitive edge over its rivals, which has potential to increase further as the consortia remains open to other carmakers.

Beyond automotive existing customers of HERE include leading internet players like Amazon, Facebook, Microsoft, and Yahoo, OEMs such as Samsung, and taxi app provider Easy Taxi, among others. However, one of HERE's ongoing challenges remains penetrating the long-tail of location-based and travel related mobile applications, which are typically supported by Google and OpenStreetMaps.

To meet the trend of growing use of app-based urban mobility services, HERE has opened up its consumer application, [HERE WeGo](), to integrate with third-party taxi hailing and car-sharing apps, like Daimler's [MyTaxi]() and [Car2Go](). While Apple and Google are also integrating ride-hailing apps like Didi, [Lyft]() and [Uber](), into their map services, HERE is also well positioned to do so also by leveraging the mobility apps from its owners. For example, Daimler owns a share of taxi hailing application called MyTaxi, and a car sharing service, called Car2Go which are both growing in user-base and transaction volumes, as highlighted in section 2.4 of this report.

To support full multi-modal travel options HERE has also added bike routing and ride-sharing capabilities to its platform and HERE WeGo app respectively. At the platform level HERE supports a comprehensive range of attributes, including visualization options 3D cities and venues, and augmented reality views via City Lens, though has not included this in its consumer app.

Another differentiator for HERE in the location sector is the provision of software covering A-GNSS, cell-tower and Wi-Fi-based positioning.

Google remains in second place despite enhancing its offline navigation feature and integrating with ride-sharing services Gett, Lyft, Ola, and Uber in several markets. Google remains the leader in business-to-consumer (B2C) mobile LBS, and continues to benefit strongly from being preloaded on Android devices, while also possessing a strong brand in consumer maps and search.

The sheer scale in use of Google Maps on mobile devices – which was last reported to be over 1 Billion downloads – has created a strong digital platform for local search, and also traffic information. Google is a significant channel for local businesses to reach customers and many business owners have claimed their businesses in Google Maps, with Google claiming over 100 million POIs in its database. This scale enables Google to offer superior country coverage for traffic, addressing 94 countries versus 50 for HERE and 38 for Apple Maps.

Since last year's report Google has made several enhancements to its mobile app and location assets. Like HERE, Google has integrated the ability to select "taxi-hailing" within its maps apps. In cities in the US, Brazil and India Google has integrated Gett, Lyft, Ola and Uber into Google Maps. Users with those apps installed on their smartphones will see fare estimates and pick-up times presented to them in the Google Maps app, positioning Google as an aggregator which enables users to select the cheapest or most convenient ride-sharing option for their journey. Furthermore, in September 2016 announced its entry into the urban mobility sector, through the launch of Waze Carpool, which enables any driver to share the expense of their car journey by sharing their car with others aiming to go to the same or similar destinations.

With respect to in-car connectivity, Android Auto has overtaken Apple CarPlay with respect to the number of car makers and models with which it is integrating with. However, we believe despite this CarPlay has higher attach-rates among iPhone owners with Apple's vertically integrated approach providing a more reliable and predictable experience over Android Auto. While bought in navigation solutions in the form of smartphone-based navigation is not aligned with the strategic priorities of car makers, their support is influenced by consumer demand to access popular navigation, communication and entertainment apps they use on their phones.

While TomTom remains a strong player in the automotive space its presence in mobile is relatively weaker. While competitor platforms have evolved to meet the demands of multi-modal and multi-environment navigation TomTom is moving more slowly and continues to prioritize automotive.

TomTom provides significant country coverage for navigable maps, which like HERE, is reflected by its continued strong relationship with automotive vendors, and the continued focus of its app, TomTom Go, on drive-based use case. At the platform level TomTom's support for multimodal routing and navigation also remains limited compared to both Google and HERE, with the absence of support for public transport, urban mobility and cycling use-cases. TomTom claims to be aware of the gaps in multi-modal options and is working to improve its support of wayfinding across pedestrian and public transit use-cases, in addition to offering more TomTom grade venue maps.

Despite this, TomTom has reported a few notable wins on mobile. In November 2015 TomTom announced its routing technology would be used in the Mercedes Me application to provide information relating to traffic delays, and estimated-time-of-arrival (ETA) for car journeys. In the same month TomTom announced a multi-year agreement to provide Uber with map and traffic data to support Uber's driver app. In March 2016 TomTom launched TomTom Go for the iPhone, which now covers both Android and iOS.

TomTom appears to be taking a different approach to indoor maps to Google and HERE, targeting business and enterprise use-cases and not consumer-centric indoor LBS. TomTom aims to increase the number of indoor venues surveyed significantly in 2017, though in this current benchmark has not shared the number of building covered.

Apple continues to play catch-up as a location-platform and mapping app. If anything we have downgraded Apple's score from last year to reflect the limitation of its map platform to its own operating system. The most significant improvement to Apple Maps is its opening up to third-party ride sharing and travel-related booking services.

Apple continues to be hampered by limited country support for key Apple Map features, which understandably is limited to markets where Apple has a significant installed base of users. Nonetheless, the lack in country scale remains a limitation vis-à-vis competitor platforms. Apple still does not provide indoor maps, but is relying on business owners to submit plans via Business Connect. We expect Apple to struggle to acquire indoor venue maps to match HERE and Google in terms of both coverage and quality.

In iOS10 Apple opened up Apple Maps to partner services such as ride-sharing apps like Uber and travel related services, such as Booking.com and OpenTable. Apple's integration with third-party services within Apple Maps goes a stage beyond the integrations we are seeing between other location platforms and LBS services in that Apple is enabling transactions, such as booking and payments, to be made within Apple Maps, instead of launching the apps of those providers.

Apple has continued to make acquisitions to boost the capability of its map platform. In iOS9 Apple added native support for transit (following previous acquisitions of transit services HopStop and Embark). To further boost its position in map-based visualization in September 2015 Apple acquired map visualization player MapSense.