

Location Platform Index: Mapping and Navigation

Key vendor rankings and market trends: June 2019 update

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Summary

In brief

Ovum's Location Platform Index provides an ongoing assessment and subsequent ranking of the major vendors in the location platform market, with particular reference to the mapping and navigation space. The index evaluates each vendor based on two main criteria: the completeness of its platform and the platform's market reach. It considers the core capabilities of the location platform along with the information that the platform opens up to developers and the wider location community. The index provides an overview of the market and assesses the strengths and weaknesses of the leading players. It also highlights the key trends in the mapping space that vendors must keep up with if they want to stay ahead of the game.

Ovum view

- **There are fresh opportunities for location data and services in the consumer domain.** The deepening artificial intelligence (AI) capabilities of smartphones are enabling more immersive applications and experiences that can be further enhanced by location capabilities, such as the use of location to enrich augmented reality (AR) shopping applications or enhance contextual gaming. At the same time, AI assistants will draw more deeply on location data, not just on smartphones but also via AI assistants integrated with other connected platforms, including vehicles. Ovum predicts that the global installed base of AI assistants across all device types will grow from 2.39 billion in 2018 to 8.73 billion by the end of 2024.
- **The explosion in the Internet of Things (IoT) opens up new prospects for location services.** This is most conspicuous in the context of connected vehicles, IoT devices, and other touchpoints where mobility is core (e.g. tracking, monitoring, and autonomous driving), and also in the smart city context (e.g. planning, transport flows, smart meters, and grids). Ovum predicts that by 2023, there will be 1.5 billion low-power wide-area (LPWA) connections worldwide. The global installed base of smart meters will be close to 2 billion by 2023. The global installed base of connected vehicles will rise from 115 million at the end of 2018 to 308 million by 2022.
- **Data privacy issues in the location context are heightened.** Location data has always been sensitive, and this sensitivity is increasing as ever-more expansive and granular location data insights are surfaced, driven by the application of advanced machine learning (ML) models and a profusion of location data touchpoints, from users, sensor networks, and more.
- **Indoor mapping is an important mapping attribute.** Indoor mapping covers a wide range of potential use cases in the consumer, enterprise, and wider IoT domains. For example, indoor mapping technology can help guide and track consumers at indoor venues from shopping malls to stadiums. IoT use cases include tracking assets (e.g. equipment in a factory or hospital.)
- **Advanced mapping is critical for autonomous driving, and autonomous driving data is key to map enhancement.** Highly automated driving (HAD) and HD maps help advanced driver assistant systems (ADAS) and autonomous vehicles to operate, and the data surfaced by autonomous driving solutions is valuable for enhancing map accuracy. Mapping vendors

involved in autonomous driving, via their own solutions or partnerships, can benefit from this virtuous circle.

Key messages

- **Introducing a new, improved model.** This iteration of the index is based on a revised, improved model that includes new attributes for both the completeness and reach parameters. The new version of the Location Platform Index model also utilizes a more granular scoring system that has allowed Ovum to produce more nuanced rankings and better capture the differences between the platforms.
- **HERE is once again the highest-ranked location platform vendor in the index.** HERE has cemented its leadership position thanks to the continuous improvements it has made to its core Open Location Platform, doubling down on its efforts for developers, and a string of new initiatives including a renewed focus on data privacy.
- **Google retains its hold on second place.** Google's platform has seen few substantial changes since its May 2018 overhaul, but its strong overall position has enabled it to remain in second place. Google is strongest in the consumer vertical and needs to maintain this given its weakness in certain key verticals, although this iteration of the index has seen it make progress via partnerships in the automotive sector.
- **Mapbox joins the coveted leader segment.** Mapbox has been determined and consistent in its efforts to improve the completeness of its offering and extend its reach, particularly among developers, where it has a strong and loyal following. The launch of Mapbox Data Services means it has begun to capitalize on the vast quantities of data generated by its users and can better monetize the platform.
- **TomTom is still among the top players but is in a period of transition.** TomTom has sold its telematics business to concentrate on the automotive and enterprise segments, with a lens on the autonomous driving opportunity. Divesting the telematics unit should help TomTom strengthen its position in these new priority areas, but it will face intense competition from HERE and Google.
- **Apple loses ground and falls out of the leader category.** Apple's failure to innovate has weakened its position to the point where it has slipped from the leader category into the challenger segment. The company is in the process of building its own map data and has announced a redesign of Apple Maps, but this still a work in progress, so has not influenced its current score to a high degree. However, with improvements, Apple could bounce back into the Leaders ranks.

Recommendations for vendors

- **Ensure you are a maestro of big data orchestration.** To become a mapping leader, a vendor must be able to source, aggregate, and manage multiple data streams. Relying solely on sensor data or a few additional data sets will not cut it in the longer term. Vendors should invest in capabilities that improve their data orchestration abilities (notably ML) and form partnerships that give access to new types of data.
- **Become a data privacy champion.** Vendors that are able to elevate their trust credentials will be able to use these as a point of differentiation. Vendors should give enterprises and consumers more control over their data, whether or not regulations such as General Data

Protection Regulation (GDPR) require it. Transparency and simplicity are key – navigating data privacy should not be a labyrinth for customers, and encounters with policies and systems should be easy.

- **Deepen your AI capabilities.** Location services are being enhanced by AI like never before, as are analytics capabilities. AI smarts are a source of competitive advantage and vendors need to increase their AI capabilities. Investments in in-house technology or acquisitions are one route, but also look to collaborations with other players where feasible, or industry bodies and academic institutions. Many of the big developments in AI will be driven by collaboration and co-creation.
- **Invest in your developer community.** Given the right support, developers can be a source of mapping innovation and, as a result, differentiation. Motivated developers can also become platform evangelists, which brings obvious benefits for the platform owner in question. Vendors need to invest in the developer-onboarding process to make it simpler, faster, and more transparent. They must offer easy access to a range of high-quality APIs.
- **Vertical expertise is a source of strength.** Location and mapping data are essential to a widening range of industry verticals (e.g. autonomous driving, smart cities, transportation, and logistics) and a key enabler for many others (e.g. digital advertising, sport and fitness, retail, travel and hospitality, real estate, and media and entertainment). Specialization in industry verticals will help vendors differentiate and extend their reach.

Results summary

This iteration of the Location Platform Index has undergone significant changes compared to the previous version, which means that a direct comparison with scores from the previous version is not appropriate. Ovum has added several new attributes to the scoring process and changed the weightings of existing categories to better reflect changes in the location platform market. Ovum has also updated the scoring system by giving each platform a comparative score out of 5 for each scored attribute rather than a binary score based on whether the platform has that attribute or not. This has increased the detail in the scoring and enables the scoring system to better express the differences between each platform.

Ovum's Location Platform Index, June 2019

The results of the latest update of Ovum's Location Platform Index are shown in Figure 1. The index evaluates each location platform vendor based on two main criteria: the completeness of its platform and the platform's market reach. Both components play an equal role in determining the final rank of the vendor.

Figure 1: Ovum's Location Platform Index, June 2019: player ranking

	Rank	Player	Score
Leaders	1	HERE	7.47
	2	Google	7.36
	3	Mapbox	6.27
	4	TomTom	6.24
Challengers	5	Apple	5.01
	6	Microsoft	4.03
	7	ESRI	3.98
	8	Comtech	3.76
	9	Telenav	3.38
Followers	10	Garmin	3.23
	11	MapQuest	2.46
	12	AND	2.30
	13	Magellan	2.28

Source: Ovum

Reach and completeness

The index is based on two primary components: the reach and completeness of the location platform.

- Reach considers two main categories:
 - Users: This considers the geographic markets covered by the platform; the number of B2C, B2B2C, B2B, and auto OEM customers; and the vertical industries served.
 - Ecosystem: this looks at industry partnerships, geographic partnerships, the developer base, and the framework.
- Completeness reflects four categories:
 - Core data: This assesses core mapping data, data partnerships, data exchanges, and crowdsourcing capabilities.
 - Mapping & platform: This includes the depth of map coverage, AI capabilities, analytics, mapping capabilities, traffic information, and the ability to add further mapping capabilities.
 - Value-added services (VAS): This looks at the non-core elements of a platform, which are becoming increasingly important and enhance the overall proposition. It considers ADAS and automated driving capabilities, integration with payment services, support for digital assistants, and mobility.
 - Monetization: This assesses the ability of the platform to monetize the platform and the data it has.

Leaders

Figure 2 maps all the players in the index based on their reach and completeness scores. Leaders (shown in grey) are players with an overall score of 5.7 and above. They are positioned in the top right quadrant of the chart. Taken as a group, HERE, Google, Mapbox, and TomTom stand out for their dynamic service portfolios, their strong core mapping capabilities, their focus on growing customers in both the consumer and enterprise domains, and their focus on the developer community.

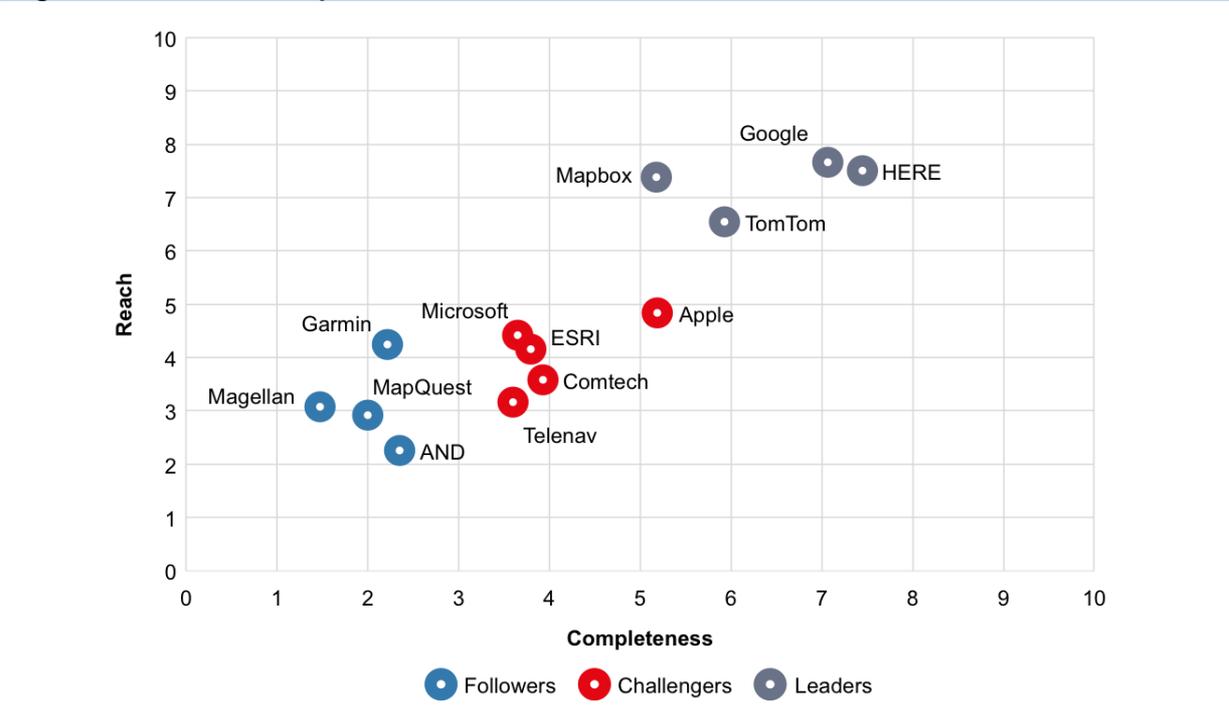
Challengers

Challengers (shown in red) are players with an overall score between 3.3 and 5.7. Competition among the top challengers is intensifying as they try to break loose from the pack and climb into the leader category. There has been considerable movement in this segment, with Mapbox breaking away into the leader segment and Apple moving in the opposite direction, slipping into the challenger segment having failed to innovate quickly enough. Garmin has moved downwards from the challenger segment to the follower segment.

Followers

Followers (shown in blue) are grouped in the lower-left quadrant and have a total score of less than 3.3. Most vendors in this category are now similar in terms of reach and completeness. The exception to this is Garmin, which although is no longer in the challengers pack, is nonetheless the highest-scoring follower due to a laser focus on the verticals it serves.

Figure 2: Reach vs. completeness



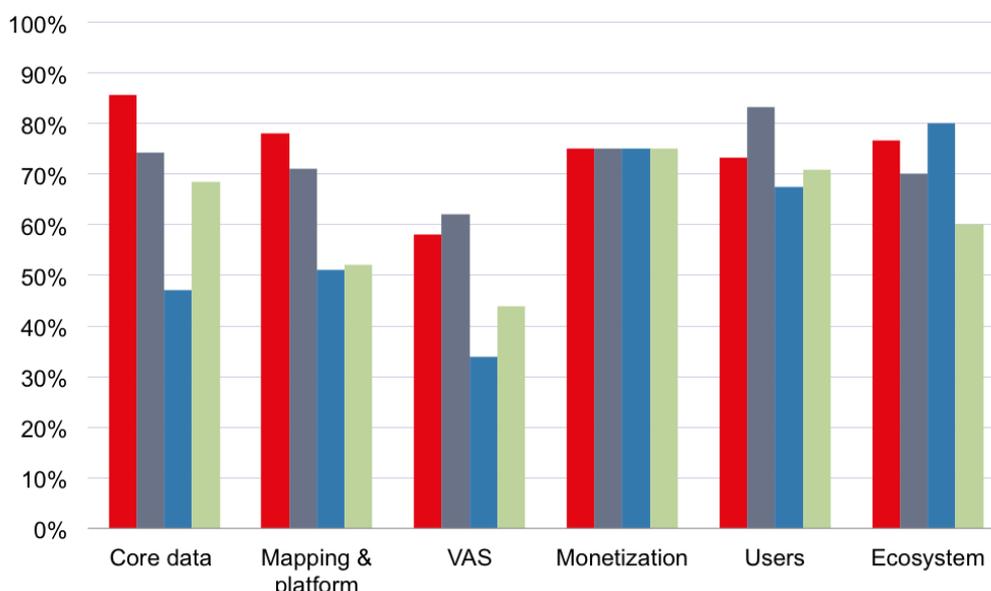
Source: Ovum

Leaders

The leader group consists of four companies: HERE, Google, Mapbox, and TomTom. Figure 3 shows their overall scores for reach and completeness, as well as their scores for the four criteria for how completeness is measured: core data, mapping & platform capabilities, VAS supported by the platform, the strength of a vendor's monetization strategy, the user base, and the wider supporting ecosystem. HERE and Google are longtime leaders in the location platform space, and competition between them remains intense. HERE remains in pole position in this edition of the Location Platform Index, having overtaken Google in the last edition. The major change in the leader segment is Apple's move into the followers group.

Figure 3: Leaders' scoreboard

	HERE	Google	Mapbox	TomTom
Total	7.47	7.36	6.27	6.24
Completeness	3.72	3.53	2.59	2.96
Reach	3.75	3.83	3.69	3.27



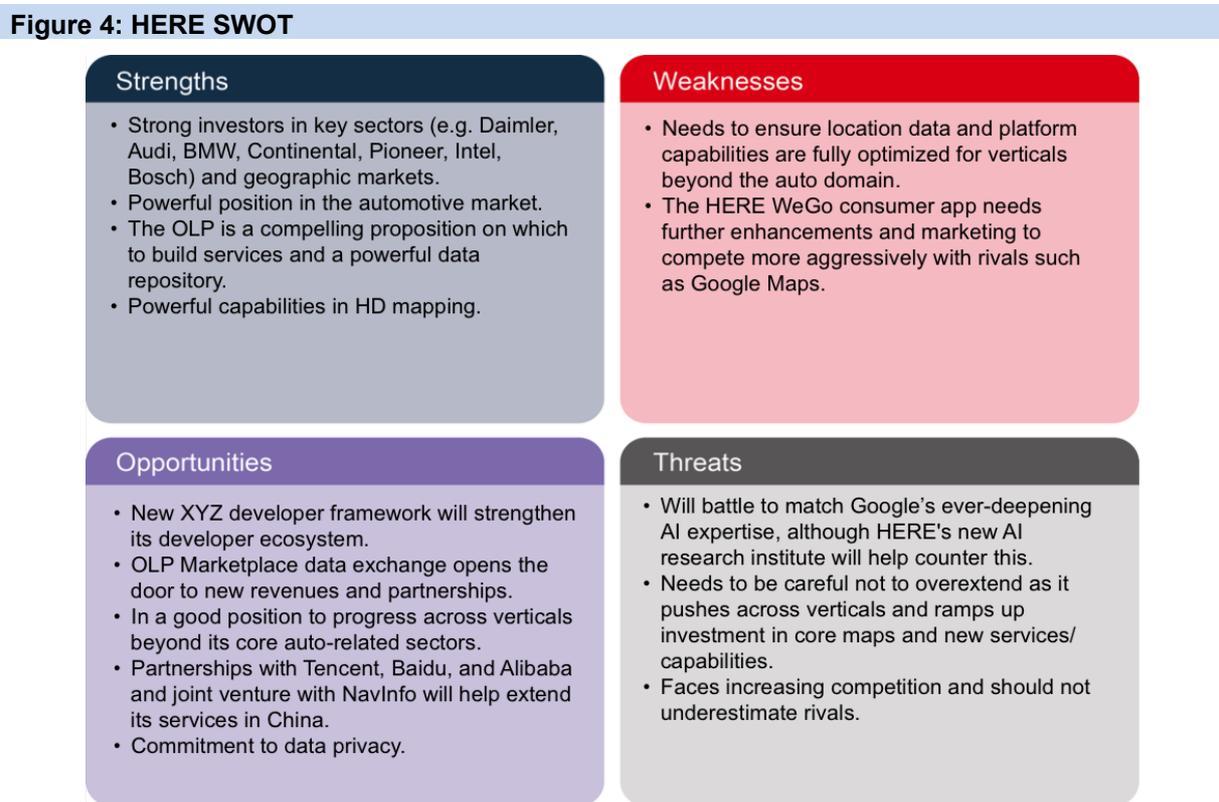
Source: Ovum. Note: Rounding is used in summing the total score.

HERE

Summary

HERE is once again the highest-ranking vendor in the index, with an overall score of 7.47, maintaining its lead over Google. A summary of HERE's SWOT analysis is shown in Figure 4. An important area captured in this iteration of the HERE SWOT is its focus on data privacy, flagged under the "Opportunities." HERE is looking at ways to provide enterprises and consumers with more control over their data. In the consumer domain, this includes examining how to encourage and reward consumers for participating in the data economy, and how blockchain could be used as a foundation to support this. HERE is also looking at how consent management and preference management could be part the Open Location Platform (OLP) proposition. The vendor's ultimate goal is to drive the

creation of an open, standardized framework for data privacy in the location domain that others could join. However, HERE is not the only player in the index to champion data privacy – TomTom also has solid credentials on this front. This means that HERE will have to come out with a compelling proposition if it wants to differentiate itself in data privacy.



Source: Ovum

Key developments

- XYZ, the new location data management service, moves from beta to general availability. Developers and knowledge workers can access XYZ via an enhanced pricing model (Freemium or Professional plans).
- Core HERE Location Platform Services are made available via Microsoft Azure Marketplace as serverless functions. This is similar to HERE’s tie-up with Amazon Web Services (AWS) Marketplace, which has helped the vendor reach 3 million developers.
- Invests €25m in a new AI research institute in Austria.
- Continues its push into the advertising technology (adtech) sector with the launch of HERE Advertising Data Services, a more joined-up proposition that shows promise.
- Goes live with the OLP Marketplace data exchange. Six customers have already signed up, while four more are in the process of onboarding. HERE has a pipeline for over 100 prospects.
- Launches HERE Cellular Signals, an aggregated data set that provides up-to-date information on mobile network performance across roads in 196 countries. This should prove compelling to operators optimizing 5G deployments.

- Launches HERE Navigation on Demand, a software-as-a-service (SaaS) navigation and connected service solution that comes with Amazon Alexa pre-integrated.

Selected highlights

Deepening investment in AI will strengthen HERE's position

HERE is investing €25m in a new research institute dedicated to leveraging geolocation data to train and develop ML/deep learning models that will advance capabilities in location services, mapping, autonomous vehicles, and smart cities. The new international Institute for Advanced Research in Artificial Intelligence (IARAI) is based in Austria and headed by Dr Sepp Hochreiter and Dr David Kreil, world experts in ML and data science, respectively.

The AI research institute is in part a bold move to shift capital to solving new and future challenges. HERE will continue with its internal investments in AI but also invest via the research institute – it rightly recognizes that it needs to collaborate to move the needle of advanced AI developments where co-creation models will be critical. HERE will provide the institute with data sets and its own expertise. The initiative is a long-term play, but one that should reap rewards and strengthen the vendor's position. The institute will give it greater access to cutting edge AI capabilities, and the intellectual property produced by the institute can be patented and used by HERE for next-generation services. We would expect the institute to focus on self-healing maps, high-level automation, and computer vision-related projects (among other things).

HERE makes further strides in the advertising market

HERE is expanding its reach across a range of verticals, but the adtech sector is still relatively new for the company. Location data is a sought-after asset for advertising and a key enabler for a wide range of use cases. But it is a highly competitive vertical for location data/solutions, and one where rivals such as Google and Mapbox are active and successful. HERE already has propositions that can be used in adtech (e.g. HERE Places Footprints for the US market), but earlier this year it launched a better articulated offering in the shape of HERE Advertising Data Services. This is a web service API that gives the advertising community access to several location data sets via a single API, including HERE Places (over 120 million points of interest [POIs] for over 400 categories) and 2D Footprints (a data set that shows the shape and size of buildings).

HERE aims to disrupt with Navigation on Demand solution

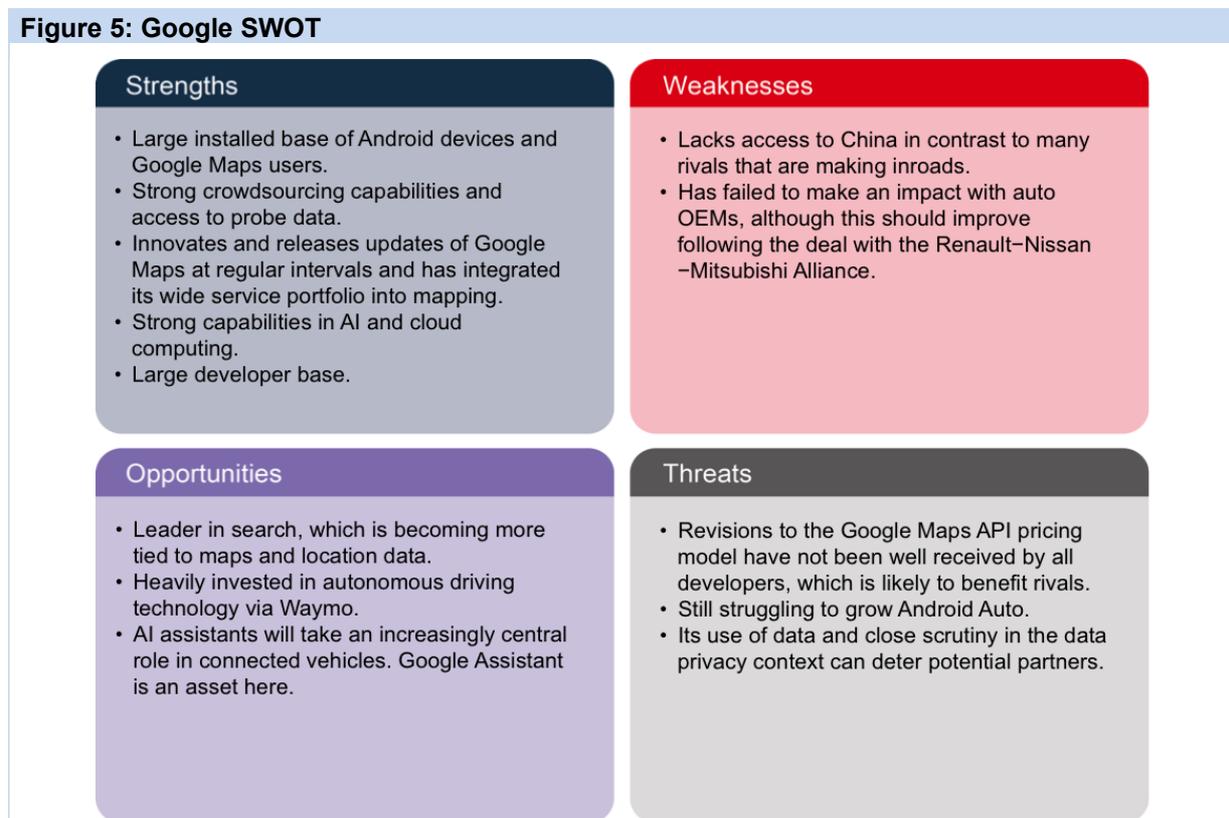
HERE Navigation on Demand is aimed at auto OEMs and designed as an off-the-shelf solution that auto makers can customize to make a wide range of configurations, rather than having to rebuild the in-vehicle user interface for different models. The Navigation on Demand solution is positioned as a SaaS model powered by HERE's OLP. Auto OEMs can tap into the OLP to create additional functionality for Navigation On Demand, based on their own or third-party data. The solution can be ported to widely used operating systems and embedded in a car maker's infotainment system or mirrored from a mobile phone. HERE Navigation On Demand gives auto OEMs a high degree of control, and as such is potentially disruptive for standalone apps such as Google's Android Auto and Apple Car Play. The Amazon Alexa AI assistant is pre-integrated into HERE Navigation On Demand, giving users a popular, voice-driven user interface. Amazon and HERE will be exploring other ways to provide additional contextual functionality going forward.

Google

Summary

Google remains in second place, with an overall score of 7.36. Its mapping business has been relatively quiet since the overhaul of the Google Maps Platform in May 2018. This is not surprising, as it was a major restructuring of the platform that was also accompanied by a controversial new pricing model for Google Maps APIs. Since then, Google has been focusing on making incremental improvements to the platform. It has also been steadily enhancing the Google Maps consumer app with some attractive – rather than ground-breaking – new features that should nonetheless increase the app's appeal. Maintaining consumer traction is important for Google, as one of its major strengths is the sheer size of the Google Maps consumer base (as noted in Figure 5) – 1 billion monthly active users (MAUs) with the potential to rise further, given the growth of Android devices.

Figure 5: Google SWOT



Source: Ovum

Key developments

- Google shares solid statistics about the Google Maps Platform: 25 million updates daily, data for over 150 million places, routes that cover 40 million miles of road, and maps that cover 99% of the world.
- Releases new gameplay features for Google Maps platform in a bid to increase the appeal of its location services to the gaming community.
- Releases upgraded Places SDK for the Google Maps Platform.
- Makes a slew of enhancements to the Google Maps consumer app, including new commute features and a redesigned Explore tab with more assistive, personalized AI-driven functions.

- From 2021, Google Maps will feature in vehicles produced by the Renault–Nissan–Mitsubishi Alliance, following an Android OS integration agreement.
- Google's sister company Waymo partners with the Renault–Nissan–Mitsubishi Alliance to explore autonomous driving opportunities.

Selected highlights

Incremental improvements to the Google Maps Platform

The overhaul of the Google Maps Platform in May 2018 saw its 18 mapping and location-related APIs grouped into three core products: Maps APIs, Routes APIs, and Places APIs. Since the overhaul, Google has made incremental improvements. For example, it has released a new, improved Places SDK that includes access to new data points such as opening hours and the total number of reviews for each place. The upgraded Places SDK also gives unlimited requests per day (QPD), which should please developers.

2018 also saw Google introduce its vertical solutions on the Google Maps Platform for gaming, ride-sharing, and asset tracking. The new gameplay features for the Google Maps Platform are designed to help developers better adapt games to locations and their context via biome data (information about a location's land cover type), elevation, and pathfinding. The focus on gaming is a natural fit for Google, given the rise of location-enriched gaming and the market dominance of Android smartphones. Google has revealed that in the last year, five games have been launched on the Google Maps platform, while three of the top 10 Google ARCore games in the last year have been built on the Google Maps Platform.

Google makes inroads with auto OEMs

The agreement with the Renault–Nissan–Mitsubishi Alliance is significant for Google, which has struggled to gain traction with auto OEMs for Google Maps. This is largely because many car makers do not want to cede control of in-vehicle services to Google and other consumer tech giants, and also because they are uneasy about how firms such as Google could leverage vehicle and driver data. Under the partnership with the Renault–Nissan–Mitsubishi Alliance, Google will integrate the Android OS into infotainment and cloud-based systems across multiple models (from 2021). This will give vehicle owners access to Google Maps, automotive apps on Google Play, Google Assistant, and more. It is literally a big deal for Google, as Renault, Nissan, and Mitsubishi together sold 10.6 million vehicles in 200 markets in 2018 and are targeting sales of more than 14 million vehicles a year by the end of 2022.

In June 2019, the relationship between Google and the Renault–Nissan–Mitsubishi Alliance took another, even more significant turn when it was announced that Groupe Renault and Nissan were partnering with Waymo to explore driverless mobility services for passengers and deliveries in France and Japan, and later in China. Waymo is Google's sister company focused on autonomous driving, and as such, leverages Google's advanced mapping capabilities.

Mapbox

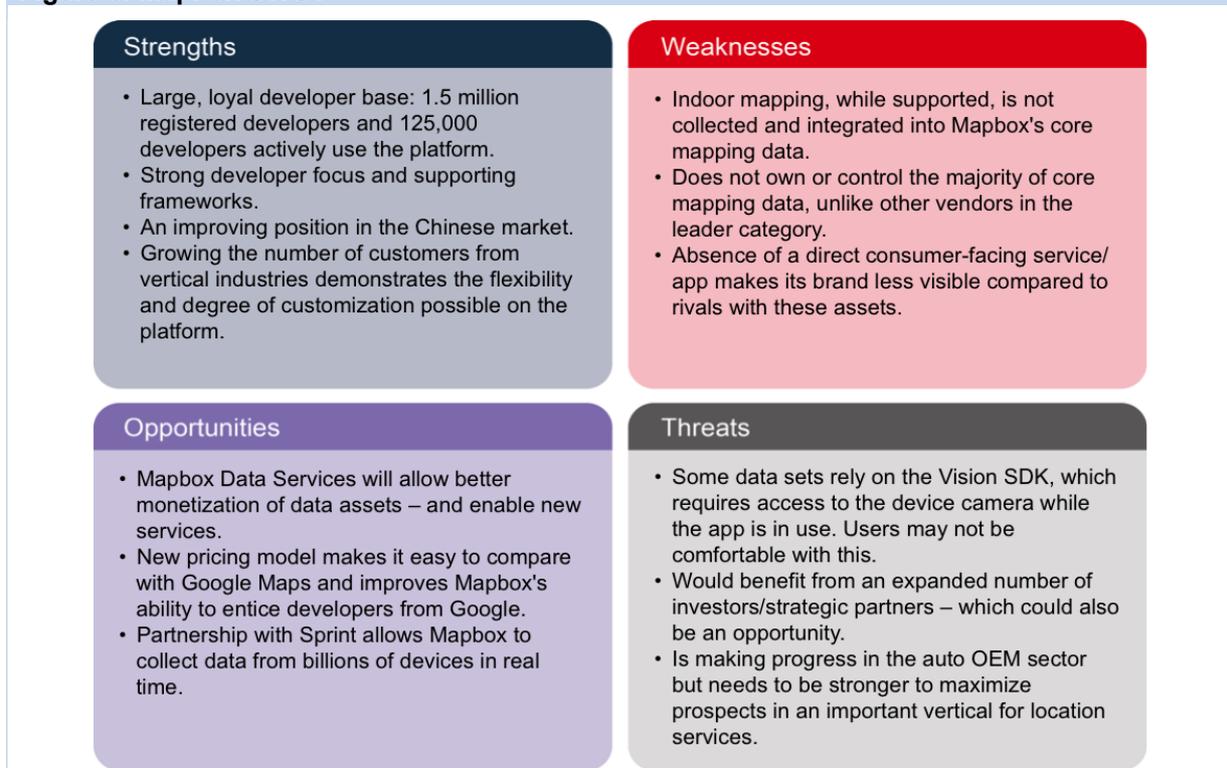
Summary

The Mapbox SWOT analysis is shown in Figure 6. The firm has consistently improved its scoring in the index, and in this iteration has moved into the leader group, overtaking TomTom to take third place with a score of 6.27. Mapbox's platform has been built around developer needs, with clear pricing and

a wide array of APIs and SDKs, which has helped it achieve the highest score in the ecosystem category. As well as making sure its platform appeals to developers, Mapbox has worked on making pricing attractive to enterprise customers.

600 million active users use Mapbox's offering, via 45,000 mobile applications built with Mapbox services. These end users generate more than 320 million miles of driving data every day for Mapbox's traffic data products. Every day these devices generate 14 billion anonymous, aggregated sensor readings that are used to deliver precise traffic data and ship over 100,000 daily changes to maps on any connected device. Mapbox has over 1.6 million registered developers using the platform. Mapbox has made a point of centering on developers in building its platform and development tools.

Figure 6: Mapbox SWOT



Source: Ovum

Key developments

- Mapbox launched Data Services in June 2019. This allows it to monetize the massive amounts of anonymous data collected from users of the platform.
- Improves its pricing structure to better enable comparison with Google Maps – a move designed to lure developers from the Google Maps Platform.
- Partnered with Zenrin in March 2019 to improve mapping data in Japan. Zenrin has data covering 99% of Japanese roads and neighborhoods.
- Announces an integration partnership with Spatial Networks, a geospatial intelligence and technology company. This partnership integrates Mapbox Atlas, a live location platform, with Spatial Networks' Fulcrum app, which creates mobile forms and enables quick and easy data collection.

- Announces integration partnerships for Mapbox Atlas (the firm's live location platform) with Spatial Networks and New Light Technologies.
- Opens up Vision SDK to all developers following April 2019's Shanghai Auto Show.
- A partnership with Chinese search company Sogou and automotive entertainment system vendor Pateo has the potential to put the Vision SDK in the hands of millions.
- Partners with Sprint to provide mapping and location services to the telco's 5G Curiosity IoT network, which could potentially reach millions of IoT devices.

Selected highlights

Data products boosted with new Mapbox Data Services launch

In June 2019, the company launched Mapbox Data Services to combine data from a variety of sources to provide quality data for its maps and navigation products. Mapbox Data Services will also allow it to better monetize the data that is generated on the platform.

The Data Services offering currently consists of: Boundaries, Traffic Data, and Speed Limits (the latter still in private beta). Mapbox Boundaries is a data set of administrative, postal, and statistical boundaries that can be visualized by a variety of geographic area types. Mapbox Traffic Data is a continually updated data set that covers typical and live traffic. Mapbox Speed Limits is a speed limit and street sign data set for the US. Mapbox says that there is currently no single data source for this information, since street signage is controlled by a variety of agencies from the federal level to the local level. Using its Vision SDK Mapbox, it is able to collect this data directly from devices by analyzing the street scene and using AI to identify street signs. This is enabling Mapbox to create an exclusive database of street signs, which it can then sell to Mapbox customers as well as customers of other mapping platforms. Going forward, it has plans to broaden its Data Services with Mapbox Buildings – a data set of 3D and 2D building outlines. However, a challenge for this kind of proposition is that it is replicable by other platforms and there are similar offerings available in other countries; in the UK, for example, Ordnance Survey added speed limit databases on street signs from data supplier Basemap.

Mapbox predicts that its new pricing structure will save money for 75% of its customers

In May 2019, Mapbox announced changes to its pricing structure to improve value for customers. All Mapbox APIs and SDKs are now available on a pay-as-you-go basis, so businesses do not need to commit in order to access services. Volume discounts are applied automatically, though if a company is willing to commit to an annual volume, Mapbox is willing to negotiate increased discounts. In addition, Mapbox has increased the free tier, making trialing services cheaper and easier. It is also removing commercial restrictions so that developers can build for public consumption or internal use for the same price.

Mapbox has made pricing better reflect use cases and the metrics already used by customers, which has meant aligning some of its pricing structure with Google's. This step will make it easier for Google Maps customers to compare Mapbox's pricing structure and make it easier for the company to lure Google Maps customers.

The new pricing structure goes into full effect in November 2019, but it can be opted into today.

Partnerships in China enable greater uptake of Vision SDK

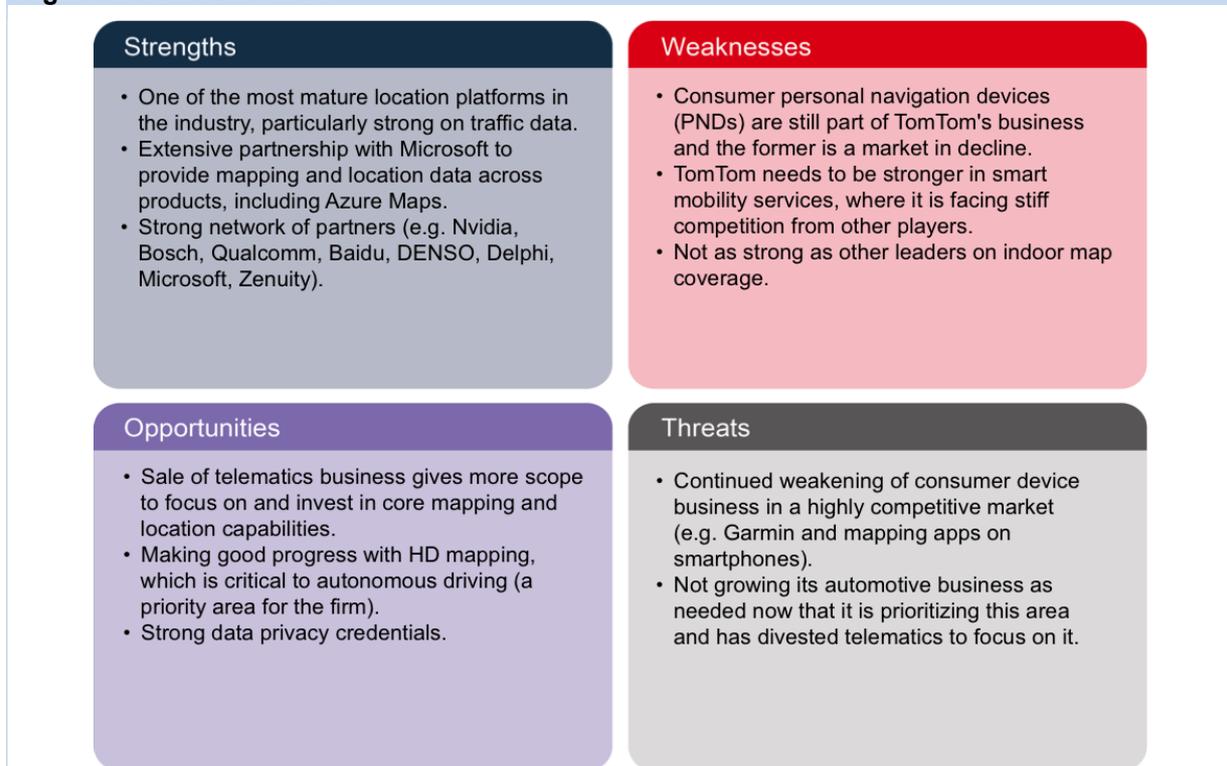
At the Shanghai Auto Show, Mapbox announced two major partnerships in China. The first is with search company Sogou, which has over 300 million MAUs, and the second is with Pateo, a vendor of integrated automotive infotainment systems. The Sogou partnership injects Sogou's mobile app with AR navigation powered by Mapbox's Vision SDK. Pateo is using the Vision SDK to add lane-level guidance, AR navigation, and driver assistance to its products. These partnerships will allow Mapbox to collect more data in China, improving maps in the country and potentially enabling it to release the kind of street sign and speed limit data set that it has started developing in the US.

TomTom

Summary

TomTom remains comfortably in the leader category, with a score of 6.24. The vendor is going through a period of transition following the sale of its telematics business to Bridgestone for €910m. It divested its telematics business to concentrate on the automotive and enterprise segments. TomTom plans to invest more in its core location platform and advanced mapping capabilities, and, associated with this, to ramp up its efforts in autonomous driving. This is both an opportunity and a threat for TomTom – as noted in the SWOT analysis shown in Figure 7. Divesting its telematics business will give it more scope to focus on priority areas, and in theory should make it more agile. But it will face intense competition in HD mapping from HERE and Google, with the former proving particularly strong in this space and the latter being advanced in autonomous driving (via Waymo).

Figure 7: TomTom SWOT



Source: Ovum

Key developments

- Announces that it has closed deals with multiple top 10 carmakers for HD mapping – and forms HD mapping–related partnerships with DENSO, Delphi, and Elektrobit.
- A raft of new or expanded mapping and navigation deals with Nissan, Fiat Chrysler, and Volkswagen Group. TomTom will also be providing traffic services to Audi in China and Japan.
- Wins its first customer for TomTom IQ Maps via a deal with MG India, which is also using TomTom navigation components in the MG Connected Car.
- Provides its mapping and location data across a range of Microsoft services including the new Microsoft Azure Maps. TomTom will also be using the powerful Microsoft Azure cloud platform to host its own services.
- Collaborates with Moovit and Microsoft to create a multi-modal transport platform for developers that leverages TomTom's real-time driving and parking data.
- Upgrades its mobile SDK to give free, no limitations access to TomTom maps and traffic information for Android and iOS devices. But for additional features fees apply (e.g. routing and search).

Selected highlights

TomTom's deepening relationship with Microsoft brings multiple benefits

TomTom's expanded partnership with Microsoft is far-reaching and should bring multiple benefits to TomTom – and, of course, Microsoft. TomTom will provide mapping and location data not just for the new Azure Maps, but also for Bing Maps, Microsoft Windows, AI assistant Cortana, and other Microsoft products going forward. This deal could not have come at a better time, given that TomTom mapping data customer Apple is now building its own map data. Although Apple is still a TomTom customer for the time being, we would expect it to lessen its reliance on TomTom as it consolidates its own map data.

Azure Maps is designed to enhance the value of the Microsoft Azure cloud platform and will enable enterprises and developers to create a range of location- and mapping-related services spanning IoT, mobility, logistics, and asset tracking. TomTom's decision to make the Azure cloud the preferred platform for hosting its own services is a good move, as the powerful computing capabilities of Azure should boost performance.

TomTom continues progress in HD mapping

Given TomTom's strong focus on autonomous driving, it is important to consider its progress in HD mapping, which is good. TomTom HD maps now cover 400km of roads across the US, Japan, South Korea, and Europe, which are some of the leading markets for autonomous driving. In March 2019, it announced that it had closed deals with multiple top 10 auto OEMs for HD mapping – although it has not revealed names. In January 2019, it announced that its maps for automated driving are powering over half a million Level 1– and Level 2–enabled automated vehicles on the road today. It is worth noting that TomTom invests a lot in research and development (R&D): in 2018 it spent €299m, which was over 40% of its total revenues.

On the HD mapping partnership front, TomTom is collaborating with DENSO, a Japanese leader in ADAS technology. As part of this agreement, DENSO will provide processed sensor data for TomTom's AutoStream map delivery system, which will help increase the accuracy of TomTom's HD maps on the fly. TomTom has also teamed with Elektrobit (a supplier of embedded and connected

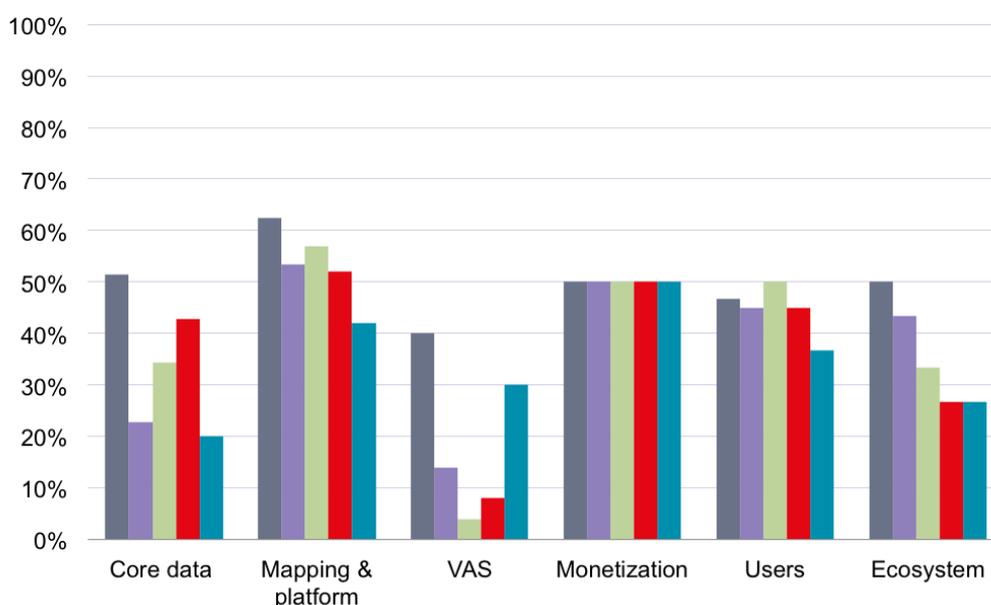
software products for the automotive industry) to release an HD map horizon for autonomous driving. But this capability is not unique to TomTom; HERE has an advanced proposition in the form of Electronic Horizon.

Challengers

The next group in Ovum's index is made up of players that scored more than 3.3 but less than 5.7 when their scores for completeness and market reach were combined. This group consists of five companies: Apple, Microsoft, ESRI, Comtech, and Telenav. The scores for the challengers are shown in Figure 8. The challenger group has undergone the most changes in this iteration of the Location Platform Index; most significantly, Apple slipped down into this category from the leader segment and Microsoft moved up from the follower segment. Comtech has improved its positioning, taking fourth place in the challenger group, while Garmin has not, slipping down into the follower segment in this iteration of the index. We will now look in more detail at the top three challengers.

Figure 8: Challengers' scoreboard

	Apple	Microsoft	ESRI	Comtech	Telenav
Total	5.01	4.03	3.98	3.76	3.38
Completeness	2.59	1.83	1.90	1.96	1.80
Reach	2.42	2.21	2.08	1.79	1.58



Source: Ovum. Note: Rounding is used in summing the total score.

Apple

Summary

Apple's positioning has progressively weakened over the last few years, and in this iteration of the index, it has slipped out of the leader category and into the challenger category, with an overall score of 5.01. The company is in the process of building its own map data and has announced a redesign of Apple Maps, but this is still a work in progress, so has not influenced its current score to a high degree. The redesign may influence its score going forward depending on how the new capabilities on

a platform and service level play out. We are in no doubt that Apple is committed to improving its mapping and location offerings, as these are part of a wider strategy to decrease its reliance on hardware sales and ramp up the services side of its business.

Key developments

- Continues behind-the-scenes work building core mapping data from the ground up – and has driven 4 million miles in the process. The new map is now available now in select cities and states in the US.
- Previews its redesigned Apple Maps coming with iOS 13, which will feature the first fruits of its new maps data.

Selected highlights

Many features of the forthcoming Apple Maps suggest it is still in catch-up mode

Elements of the revamped Apple Maps were demonstrated at the firm's annual Worldwide Developers Conference (WWDC) in June 2019 – an event at which the company typically debuts new services and products.

The redesigned Apple Maps will have more detailed maps, which is to be expected given that Apple is building its own maps data. One of the more interesting new features flagged at WWDC was Look Around, which is similar to Google's Street View feature introduced in 2007. The new version of Apple Maps will also have a Collections feature, which allows users to create lists of favourite places and share them. Google already has similar, and has given its version of this feature a boost with the Explore tab in Google Maps. The new Apple Maps will be available in the US by the end of 2019, with other selected markets following in 2020, so the initial impact will be limited in the short term.

Microsoft

Summary

Microsoft was in the follower segment for some time prior to this iteration of the index, and its move into the challenger category is a significant achievement for the company. There are several factors behind its previous stasis, one of which is its failure to push the needle with tweaks to the consumer-focused Bing Map app or make much headway with the service in the enterprise sector. Although the product has improved, it is still weak compared to rival consumer apps from Google and Apple. The original enterprise-oriented Azure Location Services was a decent proposition, but again not as strong as rival location platforms. Azure Location Services has improved, however, with the launch of Azure Maps last year, which marked an overhaul of the original proposition, helping Microsoft's overall positioning in the index.

Key developments

- In February 2019, Azure Maps added two new SDKs. The first supports apps running on Android and allows map rendering (among other things). The second, Azure Maps Web SDK 2.0, is a new way of accessing Azure Maps.
- Azure Maps adds support for Azure Active Directory to keep mapping data secure within an enterprise.
- Mobility services were added to Azure Maps in June 2019 to power public transport and alternative transport routing.

- Released a preview of Bing Maps SDK for Android and iOS in May 2019, which allows developers to create maps across Windows, the Web, and mobile.
- Launches a more powerful routing for Bing Maps, which includes multi-itinerary optimization (e.g. multiple-day routes, multiple drivers, and service and dwell times).

Selected highlights

The recast Azure Maps is strengthening Microsoft's position

Azure Maps, which uses core mapping data from TomTom, was launched with several new or improved features, one of the most significant being geospatial functionality that enables mapping features to be integrated into applications on the Azure platform. Other key functions for the revamped Azure Maps include improved search (Geometry Search, Nearby Search, and Search Along Route), routing, rendering, time zone data, mobility, and traffic data.

Microsoft has looked to maintain the momentum behind Azure Maps with a steady drip feed of improvements, as noted in "Key developments" above. The Azure Maps Web SDK 2.0 allows native working with the Azure Maps service. The new SDK also adds support for gradient colors in lines, which can be used, for example, to visualize traffic levels. A new map style was also added, as well as an image compositor to allow maps to be rendered faster.

June 2019 saw the introduction of support for Azure Maps Spatial Operations, which analyzes location information to give users updates on events happening nearby. The same month also saw the release of mobility service APIs in partnership with Moovit, which allow Azure Maps customers to provide navigation using public transport and mobility service data.

ESRI

Summary

ESRI's flagship product ArcGIS, a specialist analytics and mapping tool, has been on the market since 1999. Given its highly specialized product, ESRI works closely with vendors that might be considered competitors. ESRI is the GIS market leader, with customers in over 30 industries globally, including all 50 US state governments.

The vendor has a strong base of enterprise clients and a strong developer community, which together help boost its reach score. ESRI offers several pricing plans to suit a range of developers, including a "freemium" option that enables developers to access and use basic developer tools at no cost. This is important in attracting developers to the platform, as it allows developers to trial the system while providing ESRI with an upsell opportunity for the paid-for plans. ESRI also continues to innovate by adding e-commerce services and analytics to its platform.

Key developments

- In May 2019, ESRI announced updated retail, real estate, and economic development data.
- Retail, real estate, and government workflows are also improved to allow for custom infographics, ML and AI capabilities, 3D visualization, and modeling tools
- In May 2019, ESRI announced partnerships with BAE Systems, Harris Geospatial, HawkEye 360, and Microsoft for satellite data, as well as a new imagery tool ArcGIS Excalibur.

Selected highlights

Solid incremental improvements with data sets and advanced features

ESRI has continued to add new data sets to its core ArcGIS product to give users access to the most up-to-date demographic, spending, and segmentation data. ArcGIS Excalibur is designed to make it easy to search and discover imagery for maps, display the images with various settings and filters, and mark them up to enable users to add text and graphics to their maps. Excalibur also makes it easier to keep track of tasks by adding projects to streamline the imagery workflow.

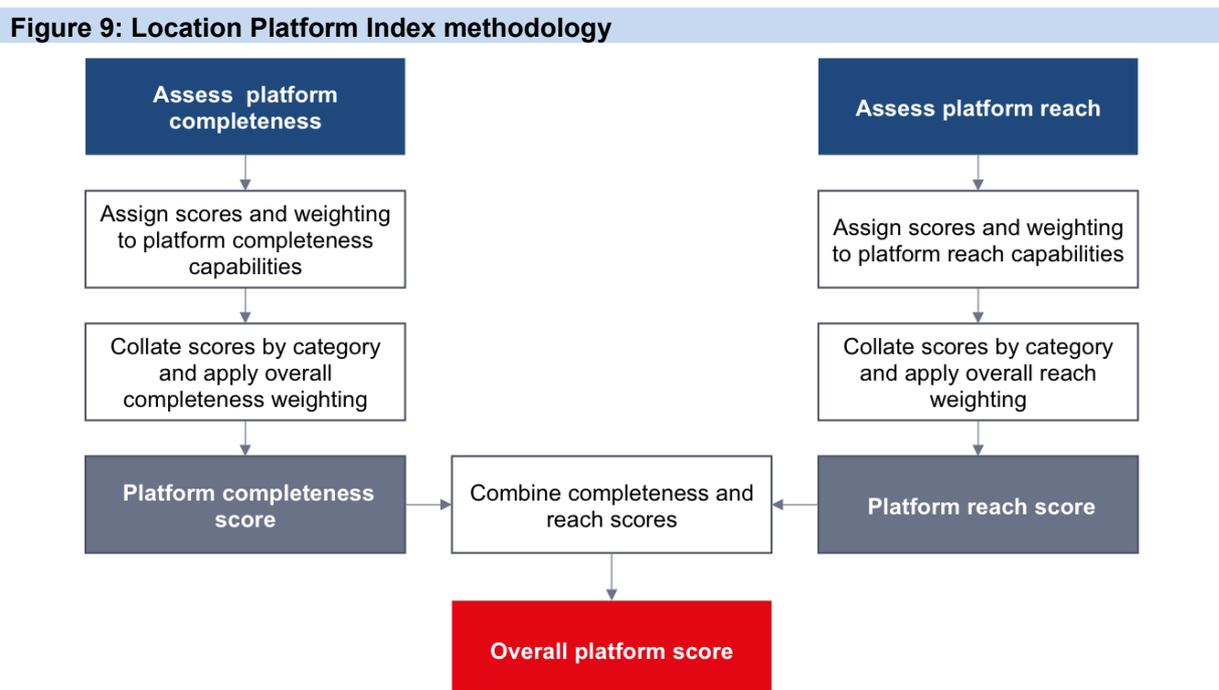
ESRI's new partnerships will allow it to add satellite imagery to its platform and make use of partner data. For example, ESRI customers will be able to use HawkEye 360 data to detect and geolocate the source of radio frequency signals.

Harris Geospatial has also created a tool to use multispectral and hyperspectral imagery within ArcGIS. Synthetic aperture radar (SAR) can create images even when the view is blocked by clouds or at night. ESRI expects that more SAR data will become available as both governments and companies grow their radar satellite fleets.

Appendix

Methodology

A summary of the methodology used for Ovum's Location Platform Index is shown in Figure 9. Data for the index is collected from a range of sources, including vendor briefings, product data, financial results, press releases, and related Ovum research and expertise.



Source: Ovum

The location platform score, which is expressed as a number from zero to 10, is a combined measure of the completeness of a vendor's location platform offering and the market reach of that platform.

Completeness includes a platform's core data, mapping functions, and VAS – provided directly or via partners. It also takes into account a player's monetization strategy. A full list of the attributes included in the completeness parameter and a corresponding explanation/example is shown in Figure 10. Each attribute is given a score in the range 1–5, depending on a vendor's capabilities. Each attribute also carries a weighting, which when combined with the actual score creates the total completeness score.

Figure 10: Location Platform Index completeness criteria

Core data	
Ownership of core mapping data	Does the company own the core maps data, or is the core map of a partner(s) used? (Please specify.)
Data analytics	What are the vendor's capabilities in this area – tools, functionality, and other enhancements?
Extent of data collaboration and partnerships	How many and what kind of partnerships are in place to enhance data capabilities, features, and functionality? (Excludes partnerships for access to core map data, or technology partnerships.)
Data exchange	Does the provider operate its own data exchange or is it part of one?
Crowdsourcing	What is the level of support for crowdsourcing capabilities?
Mapping and platform capabilities	
Depth of map coverage	What is the depth and detail of map coverage (as opposed to markets), e.g. miles of roads mapped?
Underlying AI capabilities	What AI technology and capabilities have been used to enhance the core platform?
Detail of traffic information	What level of traffic information does the platform have, e.g. support for real-time traffic updates, lane-level traffic information, other features?
Business listings/points of interest (POI)	What is the range and depth of POI information offered by the platform?
HD mapping	How advanced is support for HD mapping?
Indoor mapping	Does the platform offer indoor mapping capabilities, and how comprehensive is it?
Aerial mapping	Does the platform offer aerial mapping capabilities?
Support for voice commands	To what extent does the platform have the ability to interact with maps and related services via a voice interface/commands?
Over-the-air (OTA) updates	What solutions does the vendor have for OTA software or firmware updates?
Additional capabilities	Are any additional mapping functions and capabilities provided other than the above?
Value-added services (VAS)	
Advanced driver assistance systems (ADAS)	Does the platform offer functions/services based on ADAS?
Automated driving	What are the platform's capabilities, level of development, and level of support for automated driving?
Mobility services	Does the service offer integration with mobility services such as ride sharing, public transport?
Integration of payment/commerce services	Does the platform offer the integration of payment services or related commerce such as offers, promotions?
Integration with digital assistants	Is there integration with AI/digital assistants? E.g. the use of digital assistants to trigger mapping (via standalone digital assistants or those integrated into a vehicle).
Additional capabilities	Are there any other VAS that are not included in the above?
Monetization	
Business model	What business model(s) are in place, e.g. does the vendor rely solely on licensing or are there multiple revenue streams?

Source: Ovum

Reach is more narrowly focused than completeness. Reach considers the number of customers a vendor has (both consumer and enterprise), the size of the developer community that supports the platform, the developer framework offered to that community, the number of industries a vendor can address, and the number of auto OEMs that leverage the platform. A full list of the attributes included in the reach parameter and a corresponding explanation/example is shown in Figure 11. The scoring system is based on the same principles as before.

Figure 11: Location Platform Index reach criteria

Users	
Geographic markets	The number of countries where services are available
B2C, B2B2C (consumer customers)	The number of users of a consumer-facing service (if available)
B2B (enterprise customers)	The number of enterprise customers
Auto OEMs on the road	The number of auto OEM customers enabled by the mapping platform
Vertical industries served	The number of industries served e.g. retail, transport and logistics
Ecosystem	
Industry partnerships	Partnerships that give access to or enhance positioning in key industry verticals
Geographic partnerships	Partnerships that are designed to give access to new markets or to improve reach in an existing market
Number of developers	What is the size of the vendor's developer network?
Developer framework	What is the depth and breadth of the vendor's developer framework? E.g. number and range of APIs, flexible pricing and business models, range and type of developer tools offered.

Source: Ovum

Further reading

Location Platform Index: Mapping and Navigation, 1H18, CES006-000033 (August 2018)

Location Platform Index: Mapping and Navigation, 2H17, CES006-000012 (March 2018)

Location Platform Index: Mapping and Navigation, 2H16, TE0003-001029 (May 2017)

Location Platform Index: Mapping and Navigation, 1H16, TE0003-000970 (October 2016)

Location Platform Index: Mapping and Navigation, 2H 2015, TE0003-000901 (February 2016)

Location-Based Services: Moving Beyond Mapping to Encompass the Digital World, TE0003-000862 (August 2015)

Location Services: HERE is looking to be the go-to provider for advanced mapping, TE0003-000813 (December 2014)

Location-Based M-commerce: Trends, Opportunities, and Challenges, TE0003-000766 (July 2014)

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