



# THE FUTURE OF CONNECTED NAVIGATION

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THE TECH INTELLIGENCE EXPERTS™



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## EXECUTIVE SUMMARY

As automakers continue their push to deploy software-defined cars, connected navigation systems should be at the forefront, forming the core of a digital cockpit which imprints the automaker's brand identity on their customers' journeys. In practice, however, automakers are losing control over the in-vehicle navigation experience, and by extension, their own cockpits. A long-established dependence on a highly fragmented supply chain, and a tendency to duplicate existing efforts with each new navigation system has led to lengthy design cycles, and therefore navigation experiences that feel dated at launch.

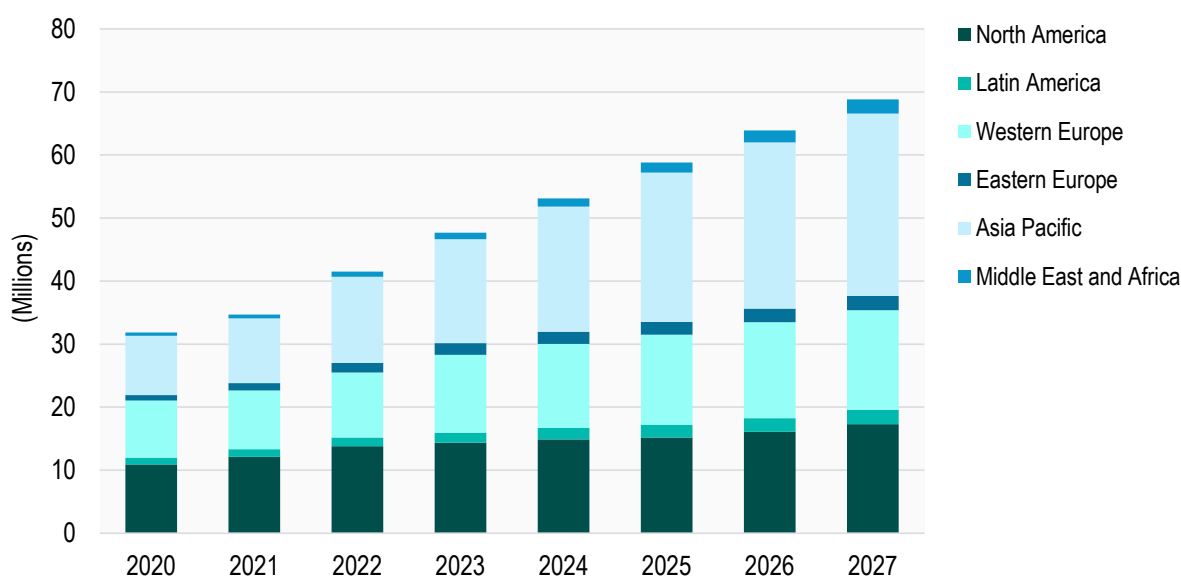
The instant obsolescence of the OEM's embedded navigation system has driven consumers to rely on smartphone mirrored alternatives, resulting in a disjointed experience that is isolated from on-board systems and commoditized from one automotive brand to the next. This compromises the automaker's objectives for their navigation systems, particularly in relation to recurring revenue generation and accelerating the electrification and automation of their brands.

In order to build compelling embedded navigation experiences that rival smartphone mirroring, automakers must adopt new approaches to navigation system development and deployment. While one size fits all navigation systems can enable faster roll-out of new navigation features, this can come at the cost of higher prices and a more limited scope for branding and differentiation. Ultimately, matching the rapid design cycles of the consumer's other digital devices will require an approach that favors pre-integration of location services and component re-use, while still retaining OEM ownership of the experience and therefore of the post-sales monetization opportunities.

## THE CURRENT STATE OF EMBEDDED NAVIGATION

The major technology trends of automation, connectivity, and electrification that are transforming the automotive industry have given rise to multiple new interpretations of what a car is: an energy storage solution, a smart mobility asset, or the oft repeated cliché of a “smartphone on wheels.” At the most fundamental level, the passenger vehicle remains a mobility tool—the primary means of getting from point A to point B for most people. Therefore, it would be expected that connected navigation services, which are designed to make the process of getting from point A to point B safer, more convenient, more efficient, and enjoyable, should form the centerpiece of an Original Equipment Manufacturer’s (OEM) branded, digital experience.

CHART 1 **NEW CARS SHIPPING WITH CONNECTED NAVIGATION SYSTEMS BY REGION**  
World Markets, 2020 to 2027



(Source: ABI Research)

However, this is not the case in practice. While the adoption rates of connected navigation services are high at the Point of Sale (PoS) (over 68% of new vehicles in the United States in 2021), most consumers do not continue subscribing to connected navigation services once the free trial has elapsed. In mass market segments, around 84% of consumers will drop their connected navigation services subscription as soon as the free trial has expired, while in premium vehicle segments, the length of the free trials tends to match the length of a typical lease. Consumers have a lackluster engagement with the embedded connected navigation experience, so smartphone mirroring has filled the gap, with smartphone-based navigation apps mirrored on the head unit display via Android Auto or Apple CarPlay.

This has the overall effect of compromising the OEM’s ownership of the core connected infotainment service, with knock-on impacts for several OEM objectives for their connected cars.

## THE LEGACY APPROACH TO DEVELOPING AND DEPLOYING CONNECTED NAVIGATION

A combination of factors has led to the current state of the connected navigation market. Uptake of connected navigation services are high at the PoS due to the fact that most vehicles shipping today with a connected infotainment system will feature embedded navigation as standard. This navigation experience is made up of software modules and location services, delivering a connected navigation experience that includes destination search, route guidance, and traffic information services.

However, the typical automotive connected navigation experience falls far short of most consumer expectations. A significant contributing factor is the lengthy automotive design cycle, with each new generation of vehicle taking between 3 and 5 years to design and introduce to market. Most OEMs will look to coincide the launch of a new navigation system with the launch of a new model, in order to drive sales of the newly introduced vehicle versus being a competitive option.

This means that a new generation of vehicle, representing the latest and greatest from an automotive brand, will come to market with a navigation experience that is as much as 5 years old. While the navigation system's design, user interfaces, and location content and services might have been state-of-the-art at the beginning of the vehicle design cycle, it already feels dated, and proves increasingly obsolete over the course of 7 or 8 years during which the vehicle model is sold.

For consumers, moving between the digital experiences offered by their consumer electronics, with their regular update cadences, and the user experience of a navigation system from half a decade ago is jarring, to say the least.

While tying the launch of a new navigation system to the launch of a new model contributes to the instant obsolescence of most embedded navigation experiences, the automotive industry's legacy approach to developing new navigation systems is inherently protracted. When developing a new connected navigation system, automakers rely on a complex and fragmented supply chain—sourcing hardware and software components, third-party telematics services, and engineering services from a variety of different suppliers. For example, an automaker may source map content from one supplier, traffic information services and Point of Interest (POI) databases from another supplier, and a route guidance software module from yet another supplier, while leveraging a software engineering services supplier to develop new Human-Machine Interface (HMI) elements.

## THE IMPACT ON AUTOMAKER OBJECTIVES

Relying on this legacy, fragmented supply chain has the inevitable effect of relegating a new connected navigation system to instant obsolescence. By failing to provide a compelling embedded navigation experience, consumers are reluctant to pay for access to the OEM's navigation experience, and the automaker cedes control of the head unit to mirrored, third-party experiences. This has a negative impact on several OEM objectives.

## DIGITAL DIFFERENTIATION

For most OEMs, the primary objective of connected infotainment is to differentiate their brand from their competitors. In the same way that automakers can compete by the refinement of their suspension or the quality of their interior, the digital domain provides a further avenue for automakers to establish their brand identity. As the centerpiece of any connected infotainment system, a dated navigation experience compromises the whole of the automaker's digital identity.

With a lackluster embedded navigation system pushing consumers to use smartphone mirrored navigation solutions, automakers risk conceding control of the head unit real estate entirely. As most vehicles support smartphone mirroring, the navigation experience risks becoming commoditized between different brands and models.

## RECURRING REVENUES

A dated connected navigation experience, driven by lengthy design cycles, limits an automaker's ability to extract recurring revenue from its vehicles in two ways:

- **High Infotainment Subscription Churn Rates:** Consumers are reluctant to dig into their pockets to pay for continued access to an antiquated navigation experience. Even in premium vehicle segments, churn rates for connected infotainment services can be as high as 50% or 60%.
- **Limiting Revenue-Generating Touchpoints:** With consumers relying on mirrored applications for their navigation and route guidance, OEMs risk smartphone mirroring forming the basis of the entire infotainment experience. Ideally, the connected navigation experience should encourage regular engagement between the driver / passenger and the embedded infotainment experience, maximizing the potential for revenue-generating touchpoints.

## ENABLING ELECTRIFICATION

Navigation and location intelligence will be key to enabling sustainable adoption of Electric Vehicles (EVs) over the ambitious horizons set out by automakers and various national governments. EVs require a next-generation connected navigation experience, with access to information services covering live charging station availability, companion applications to enable smooth journey planning, and a map data-enriched powertrain to maximize range. Without an enticing and compelling overall navigation experience, consumers will not take full advantage of the connected services that enable them to successfully migrate from an Internal Combustion Engine (ICE) to an EV powertrain model.

## NEXT-GENERATION CONNECTED NAVIGATION TRENDS

In order to move embedded navigation to the next level, automakers must not only investigate ways to engage with their supply chain more efficiently to support the current navigation feature set, but must also look to rapidly develop and deploy new navigation experiences. This will enable automakers to compete more effectively with mirrored solutions and to leverage a compelling navigation experience to support broader objectives related to recurring revenue and electrification.

## DELIVERING A COMPELLING DIGITAL EXPERIENCE

The digital domain in the vehicle is rapidly expanding to occupy more of the entire driving experience. In particular, the transition from connected infotainment to a broader digital cockpit architecture is transforming the entire vehicle cockpit, resulting in a car that is defined more by software than by hardware. The navigation system is one of the few connected infotainment experiences that stretches across the head unit and digital dashboard.

Therefore, in order to deliver a compelling digital experience that defines a brand and differentiates against competitors, it is vital that the core embedded navigation experience meet the consumer's expectations for digital experiences. Not only must it position the vehicle favorably against competitors, but it must also, at a minimum, exceed the navigation experience readily available to the consumer via ubiquitous smartphone mirroring.

## DRIVING RECURRING REVENUE STREAMS

The traditional automotive business model, which has defined the industry for a century, sees automakers relying primarily on product sales, with few initiatives targeted at the extraction of revenue from vehicles already on the road. However, the increase of connected and software-defined cars is opening up new avenues for automakers to generate revenue from the vehicles that they have already shipped. Leveraging Over-the-Air (OTA) methods to deliver new functions, and providing consumers access to new cloud-based services are just two of the opportunities open to automakers. Examples of this trend toward recurring revenues include the following:

- Stellantis is targeting €4 billion in annual revenue by 2026 and €20 billion by 2030 generated from software-enabled product offerings and subscriptions. According to Stellantis, satellite radio and connected navigation make up the majority of its services revenue today.
- Ford is aiming to generate US\$20 billion from software and services by 2030.
- General Motors (GM) is projecting future annual software and services revenue opportunities in the US\$20 billion to US\$25 billion range.

GM's OnStar is one of the most successful and best-established connected car divisions, and currently generates annual revenue in the region of US\$2 billion, one-tenth of the opportunity it ultimately looks to achieve. Therefore, there is no denying the challenge facing automakers in transitioning to become software and services providers, but the potential upside is equally compelling, insulating automakers from fluctuations in the new vehicle sales market, and building a revenue opportunity tied to the installed base of a billion vehicles.

However, this ambition will be impossible to achieve if a dated navigation experience pushes consumers out of the OEM's embedded infotainment system and into the mirrored domain that is accounted for almost exclusively by Google and Apple.

## SUPPORTING THE NEXT WAVE OF ELECTRIFICATION

The automotive market is reaching a tipping point, with electric powertrain vehicles maturing from a niche opportunity serving enthusiastic first adopters to a genuine option for the mainstream consumer. EV sales growth has consistently outperformed ICE vehicles for many years, and the trend is expected to continue as multiple stakeholders push to make electric powertrains the dominant mode in the course of the next 10 to 15 years.

It is vital that OEMs recognize that their future EV customers will be very different from their current EV customers, requiring the support of connected services and companion applications in order to make their transition to EV ownership a success. Range anxiety is among the chief concerns for new EV adopters, so it is essential that the embedded navigation system include a new set of features, including the following:

- Information services conveying live availability and pricing information for public charging infrastructure
- A companion application to enable the consumer to plan journeys according to the vehicle's state of charge, adding waypoints at charging stations as needed
- Enriching the powertrain with map attribution, including road geometry and the inclination to optimize vehicle range

Failing to support the new EV consumer with these services could result in the driver making sub-optimal use of their new vehicle, reflecting poorly on the OEM's brand in the eyes of the driver. In the commercial vehicle space, these EV-specific services are essential to guaranteeing uptime and enabling the vehicle to fulfill its appointed task (transit, goods delivery, etc.).

Not only must OEMs rapidly develop and deploy these services in concert with their suppliers, but they must also incorporate them into a broader and more engaging connected navigation offering with which the consumer can interact as effortlessly and seamlessly as with their other consumer electronics.

## ENRICHING VEHICLE FUNCTIONS WITH LOCATION INTELLIGENCE

A major virtue of an embedded navigation system is the ability to augment multiple vehicle functions with map data and location intelligence services. One application is the use of data on road geometry to maximize powertrain efficiency. Map and location-centric data can help maximize safety. For example, static data related to road boundaries and delineation can help semi-autonomous vehicles stay within the lane of travel, while live information services related to road accidents, static objects on the highway, and lane closures can help drivers anticipate potential hazards, navigating around them when possible.

The inherently tighter integration of embedded navigation systems not only allows for other vehicle systems to be augmented with map data and location services, but also means that the navigation system can more meaningfully merge other onboard systems into the navigation experience. For example, map visualization could incorporate Advanced Driver-Assistance Systems (ADAS)/Autonomous Vehicle (AV) elements, such as pertinent road information captured by onboard cameras, or the vehicle route forecast by the planning and motion control module of an AV software stack. The embedded navigation system then becomes a key HMI tool to facilitate the driver's interaction with a wide range of onboard systems.

The capabilities inherent in embedded systems will prove essential as OEMs look to offer a navigation experience that exceeds shallower, smartphone mirrored alternatives.

## BUILDING THE CONNECTED NAVIGATION FUTURE

### AN INDUSTRY CROSSROADS

There can be no doubt that the legacy approach to developing and deploying connected navigation systems is not fit for purpose, and is unsustainable in view of the myriad objectives that automakers have, either for their navigation systems or, more broadly, for their next-generation digital cockpits, which, in practice, will orient around the core navigation experience.

First of all, automakers must give more consideration to the entire lifetime of the vehicle from the outset, equipping the vehicle with enough capacity from a hardware perspective to accommodate future software updates.

It must also be recognized that a fragmented supply chain cannot satisfy the rapid turnaround times that automakers need to keep up with the standard set by smartphones and other consumer electronics. In order to keep up, OEMs must look to more consolidated navigation solutions that can go from drawing board to digital cockpit in a matter of months, rather than years. Furthermore, OEMs need to seek out suppliers that can iterate their navigation systems regularly, allowing the navigation experience to evolve over the course of the vehicle's lifetime, maintaining the navigation system as the focus for revenue-generating touchpoints over the years of the vehicle's operation.

In order to achieve this, end-to-end navigation systems must come with a greater degree of pre-integration, consolidating the number of suppliers involved in developing new connected navigation experiences. One option for automakers is Google Automotive Services, which includes both a Maps application and a number of other search and voice interface features. While this approach certainly provides a compelling experience beyond legacy automotive systems, it comes at the cost of a more limited scope for branding and differentiation, and fewer opportunities for post-sale monetization.

## BUILDING FUTURE NAVIGATION EXPERIENCES WITH HERE NAVIGATION

What the automotive industry requires is a bliss point between the legacy approach and the one-size-fits-all alternatives. A modular architecture that emphasizes OEM ownership and branding, while pre-integrating the content, software modules, services, and extensions that constitute an end-to-end navigation system will enable OEMs to develop systems that can keep up with consumer expectations and retake control of their vehicles' cockpits.

HERE Navigation provides automakers with a Software-as-a-Service (SaaS)-like platform for passenger vehicle and commercial vehicle navigation, incorporating core elements, such as map data, routing engines, etc., with a number of extensions, such as parking assistants, EV range assistants, etc. This empowers the OEM to configure the navigation experience in each vehicle, either to differentiate between models at the PoS, or after the vehicle has already been sold. The combination of services that constitute the connected navigation experience can also be reconfigured over time for each individual model, providing OEMs with a framework for life cycle management and post-sales monetization. Many of the pre-integrated extensions facilitate deeper integration between the navigation system and other onboard systems, enabling the OEM to build a compelling navigation experience that competes with brought-in mirrored solutions. HERE Navigation integrates services from a number of third parties, including AccuWeather, Plugsurfing, and APCOA PARKING, giving OEM customers the advantages of engaging with a wide array of suppliers, without incurring the usual friction and delays.

FIGURE 1 **HERE NAVIGATION EXTENDED SERVICES**



(Source: HERE Technologies)

**CASE STUDY:  
VINFAST**

*VinFast, a Vietnamese OEM active in the global markets has opted to leverage HERE Navigation to deliver EV-focused navigation experiences in North America and Europe. As a production-grade application (rather than a reference code), VinFast was able to rapidly build the white label solution, accelerating the time to market of its EVs in new markets. VinFast was also able to take advantage of HERE's EV routing extension and companion application to deliver a navigation experience tailor-made for an electric model.*

**CASE STUDY:  
VOLTA TRUCKS**

*Volta Trucks is a Swedish commercial vehicle OEM pioneering the last-mile electrification space, and will launch the Volta Zero in 2022, a commercial vehicle specifically targeted at freight distribution in urban centers. Volta leveraged HERE Navigation to rapidly develop a connected navigation system featuring the required, EV-specialized features, including EV range estimation. As the last-mile electrification space continues to develop, Volta retains the ability to quickly incorporate new features, including from third parties, due to HERE Navigation's inherent flexibility.*





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HERE, the leading location data and technology platform, moves people, businesses and cities forward by harnessing the power of location. By leveraging our open platform, we empower our customers to achieve better outcomes – from helping a city manage its infrastructure or a business optimize its assets to guiding drivers to their destination safely. To learn more about HERE, please visit <https://www.here.com/solutions/connected-driving>.

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