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# Excellence in end-to-end automotive software development

Over the next 5 to 10 years, challenger original equipment manufacturers (OEMs) are increasingly likely to derive more recurring revenue from software and connected services than from hardware unit sales.

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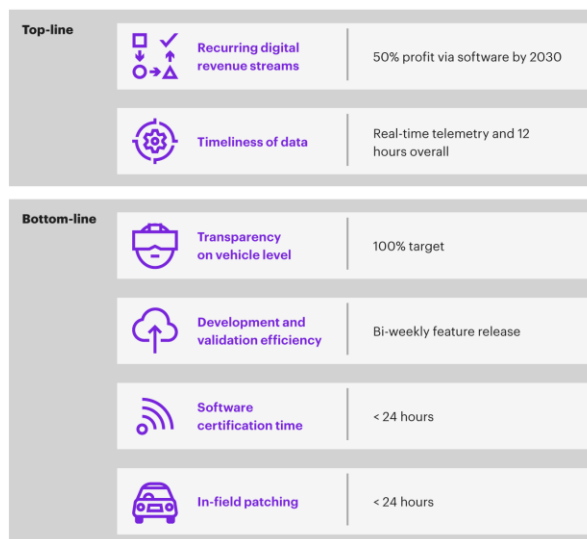
This transition is accelerated by establishing new business models such as features-on-demand (the capability to remotely add improved options such as seat heating, better headlights, and increased engine horsepower), which by itself could provide 30+ percent additional revenue potential by 2025, according to our market perspectives on car software service monetization gathered during our automotive software benchmarking exercise.

To meet these targets and remain competitive in a sector crowded with challengers and new entrants, traditional OEMs must [strengthen their software capabilities](#) and enable their

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architecture toward the [software-defined vehicle](#). The goal is to have a high-performance continuous integration/continuous deployment (CI/CD) software pipeline that can automate builds, regression testing, and global over-the-air (OTA) fleet deployment within 24 hours (see figure 1).

Figure 1  
**Certain metrics can help challenger OEMs master vehicle software development excellence**



Source: Kearney analysis

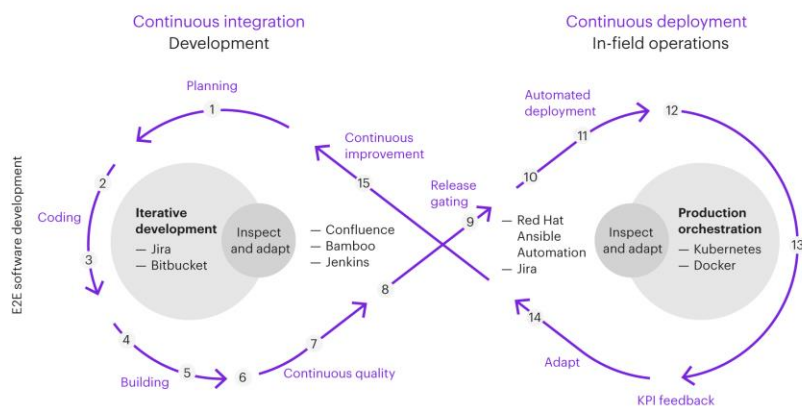
Fueled by our software experience, insights from various challenger OEMs with a deep dive on Tesla, and software company benchmarks, we designed an end-to-end software development approach that addresses the top and bottom lines. It provides the required baseline to enable new software-driven business models while [saving costs](#). The example of a leading electric vehicle company clearly demonstrates the advantages of this structure. When they had to recall 53,000 vehicles due to concerns over the rolling-stop function, they were able to

deploy an over-the-air software fix in 24 hours, resulting in zero physical recall costs.

## The shift from process-focused to continuous delivery models

To build these capabilities, traditional OEMs need to shift from the typical “V” model to a continuously evolving delivery model synced to in-field operations. Our end-to-end software development approach includes 15 software excellence enablers that empower traditional OEMs to transform and remain competitive (see figure 2).

Figure 2  
**15 software excellence enablers can empower traditional OEMs to transform and remain competitive**



Source: Kearney analysis

## 15 automotive software excellence enablers

### Development:

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1. End-to-end integrated requirement engineering
2. Feature-driven agile software development
3. Feature-driven software design and architecture
4. People-empowered software development
5. Integrated ticket-based toolchain collaboration
6. Monolithic in-field branching structure
7. Release-ready end-to-end testing and integration

**Delivery:**

8. Compliancy of regular in-field software updates
9. Standards and software safety
10. In-field continuous integration pipeline
11. Bi-weekly feature releases
12. Global scalable over-the-air architecture



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## **Continuous improvement**

13. Software and feature-driven monetization

14. Value-adding data collection

15. Real-time digital twin representation

Embedding this approach has a huge impact on the speed, quality, and cost of software development. Referencing our Automotive Software Benchmark Index, we also see that it enables challenger OEMs to build software organizations with 1,500 full-time equivalents (FTEs) developing operating systems and connected services on an annual budget of less than €500 million with an in-house make ratio of more than 80 percent.

## **Three key enablers of end-to-end automotive software excellence**

Three specific enablers stand out for helping OEMs achieve major differentiation. First, feature-driven software design and architecture enables continuous software updates and reduces risk of delayed feature releases. With the mentality that everyone can contribute, an efficient resource pool, and the elevated role of the integration engineering team, the development, integration, and validation of the feature can all



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go hand-in-hand. This is why highly qualified integration engineers are the most in-demand talent for challenger OEMs.

Next, a people-empowered software development approach means that 1,500 FTEs are sufficient for all software-related functions. The choice of developers, lean teams set up by the best engineers, and the ability of a single committee to make technical and financial decisions are essential to success.

Lastly, release-ready end-to-end testing and integration allows more than 80 percent of the in-field fleet to receive any kind of software update within 24 hours. In urgent cases and with more restrictive variant prioritization, this can come down to as little as eight hours. The five stages of testing—functional, integration, system, regression, and acceptance—are all steered automatically by tools such as Jenkins and require no manual coordination.

## **On your way to end-to-end automotive software development excellence?**

We understand the complexity of such a transition and its interlinkage with hardware development. We also know that a simple copy and paste of existing models from one to another company will not succeed. Our transformation approach enables you to establish the software development capabilities your company needs, making software development both ready to scale and a competitive advantage.

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To discuss access to our software features database please contact [socialmedia@binarycore.com](mailto:socialmedia@binarycore.com)

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