

Embracing Digital Twins in the Automotive Industry: Interview with Ansys

20-Aug-2024 12:22 GMT

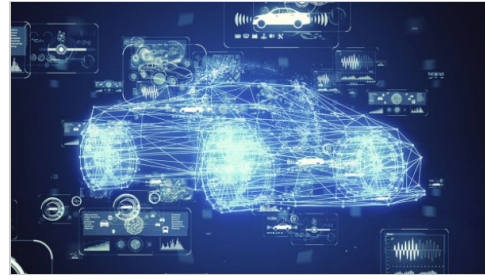
Matthew Beecham

S&P Global

Supply Chain and Technology, Automotive

Q&A with Ansys

A digital twin (DT) is a virtual replica of a physical asset that uses real-world data and models to improve operations and aid in decision-making. It incorporates real-time and historical data, as well as engineering, simulation and machine learning models. By creating a digital twin, the automotive industry can gain insights into the performance and behavior of physical assets, optimize operations and make more informed decisions.



Source: Getty/metamorworks

The use of DTs in the automotive industry is expected to become more widespread as the digitization of vehicles continues to advance. DTs have the potential to enhance product design, manufacturing processes and vehicle maintenance, resulting in improved products and a more efficient and reliable automotive industry. As this evolution continues, a key priority will be ensuring functional safety and cybersecurity across various automotive processes. By addressing these requirements, the industry can fully leverage the benefits of DTs while maintaining the highest standards of safety and security.

To delve deeper, S&P Global Mobility initiated discussions with leading players in the DT market, including IBM, Ansys, ABB, rFpro, Digiflec and PTC. All are at the forefront of driving architectural shifts and pushing back the technical boundaries. Representatives of each company share their thoughts on the evolving landscape of DTs.

To learn more about how Ansys is developing DTs, we spoke to Sameer Kher, senior director, research and development, digital twins at Ansys. Ansys' DT capabilities include model creation, simulation and analysis, data integration, predictive maintenance, performance optimization and decision support.



The following is an edited transcript of the conversation.

S&P Global Mobility: What are the most promising automotive use cases for digital twins?

Sameer Kher: In general, use cases that involve engineered equipment that is significantly

expensive to build or maintain, are good applications for digital twins. In automotive, electric vehicle batteries, EV or hybrid powertrains, motors for large commercial vehicles, are all good applications to build digital twins for.

What are the requirements for an original equipment manufacturer to effectively implement DT technology?

In order to implement DT, OEMs need to invest in appropriate infrastructure. Specifically, things like sensors, compute and communication infrastructure and storage infrastructure. Once this is in place, digital twin software (such as the software from Ansys) can be deployed to generate the insights that are necessary.

What are the primary challenges associated with implementing DT technology?

There are two key challenges. Firstly, costs associated with the infrastructure — this is typically capital intensive and slow to roll out. This also yields limited direct value short term (without the full DT deployment). Secondly, heterogeneity of data and communication formats across suppliers and OEMs — standardization efforts such as at COVESA or DTC will help with this.

How is the pricing structure for the DT scenario determined? Is it based on the complexity of the scenario, the size of the data, or the accuracy of the synthetic data (including the number of sensors used)?

The value that DTs provide varies widely depending on the use case. For example, a battery supplier may only be interested in managing warranty and replacement costs, while an OEM may be interested in providing digital capabilities to maximize range to their commercial customers. I suspect pricing will depend on value provided by the DT. Monetization will be via subscription or similar approach.

What is considered the new standard for vehicle development time, starting from the design freeze phase to production?

This varies significantly from company to company and generation to generation. Increasing adoption of technologies like digital twin and simulation helps customer shrink these times. For example, newer EV- focused companies that use modern simulation and digital twin technologies have development cycles in the 20-30 month range while more traditional companies are in the 50-month range.

Is DT technology primarily used in the infotainment and advanced driver assistance systems (ADAS) domains within the automotive industry? Or are there significant advancements expected in other domains like powertrain, chassis and body?

ADAS, powertrain, body and battery are all great use cases.

How does the sustainability of digital twins compare to traditional physical development in terms of CO2 emissions? What measures are taken to minimize the carbon footprint of digital twin technology?

First, it is important to recognize the sustainability benefits of digital twins. By studying the digital twin under actual working conditions, companies can see the product in action, over time, when subjected to the physical environment, without requiring wasteful physical prototypes. Even more importantly, digital twins enable true predictive maintenance. Instead of over-servicing or over-maintaining all type of machinery, companies can act “just in time” to address any product

performance issues. They can accurately visualize exactly when and where maintenance is needed, instead of over-engineering.

Of course, the additional compute necessary to create and deploy digital twins needs to be managed. At Ansys, we focus on ensuring that the software we create makes the best use of available compute resources. Our DT software generates runtimes that are lightweight and compact, can be deployed easily on edge devices and minimize the need for expensive compute on the cloud.

How will OEMs and suppliers ensure brand differentiation and maintain brand equity in a market where digital twins may lead to more homogeneous vehicles?

If we look at other industries (like consumer electronics), we can see a more advanced version of DT adoption in action. Brand differentiation is still strong and driven by the types of software and hardware features that are available and enabled for users. Overall, we expect DT adoption will improve the quality and capability of products while reducing downtime and other waste.

What proportion of the design, testing and validation processes rely on digital twin models compared to physical prototypes?

This varies widely across companies — but one thing is for sure. The proportion of digital twin models to physical prototypes is definitely increasing rapidly.

What are the key aspects of digital twins that everyone in the auto industry should be aware of? Also, what cautionary advice would you give to those who are hesitant to embrace digital twins?

Most organizations start with the assumption that a predictive digital twin can be built using data and data-based models alone. In reality, domain knowledge, clean data and more importantly failure mode data are all critical to building meaningful digital twins. Using a combination of simulation-based models, which incorporate physics and domain knowledge, and AI/ML models machine learning, which incorporate data and allow the model to evolve, lead to the most effective digital twins.

CONTACTS

The Americas

+1 877 863 1306

Europe, Middle East & Africa

+44 20 7176 1234

Asia-Pacific

+852 2533 3565

www.spglobal.com/mobility

Copyright © 2024 S&P Global Inc. All rights reserved.

These materials, including any software, data, processing technology, index data, ratings, credit-related analysis, research, model, software or other application or output described herein, or any part thereof (collectively the “Property”) constitute the proprietary and confidential information of S&P Global Inc its affiliates (each and together “S&P Global”) and/or its third party provider licensors. S&P Global on behalf of itself and its third-party licensors reserves all rights in and to the Property. These materials have been prepared solely for information purposes based upon information generally available to the public and from sources believed to be reliable.

Any copying, reproduction, reverse-engineering, modification, distribution, transmission or disclosure of the Property, in any form or by any means, is strictly prohibited without the prior written consent of S&P Global. The Property shall not be used for any unauthorized or unlawful purposes. S&P Global’s opinions, statements, estimates, projections, quotes and credit-related and other analyses are statements of opinion as of the date they are expressed and not statements of fact or recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security, and there is no obligation on S&P Global to update the foregoing or any other element of the Property. S&P Global may provide index data. Direct investment in an index is not possible. Exposure to an asset class represented by an index is available through investable instruments based on that index. The Property and its composition and content are subject to change without notice.

THE PROPERTY IS PROVIDED ON AN “AS IS” BASIS. NEITHER S&P GLOBAL NOR ANY THIRD PARTY PROVIDERS (TOGETHER, “S&P GLOBAL PARTIES”) MAKE ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE PROPERTY’S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE PROPERTY WILL OPERATE IN ANY SOFTWARE OR HARDWARE CONFIGURATION, NOR ANY WARRANTIES, EXPRESS OR IMPLIED, AS TO ITS ACCURACY, AVAILABILITY, COMPLETENESS OR TIMELINESS, OR TO THE RESULTS TO BE OBTAINED FROM THE USE OF THE PROPERTY. S&P GLOBAL PARTIES SHALL NOT IN ANY WAY BE LIABLE TO ANY RECIPIENT FOR ANY INACCURACIES, ERRORS OR OMISSIONS REGARDLESS OF THE CAUSE. Without limiting the foregoing, S&P Global Parties shall have no liability whatsoever to any recipient, whether in contract, in tort (including negligence), under warranty, under statute or otherwise, in respect of any loss or damage suffered by any recipient as a result of or in connection with the Property, or any course of action determined, by it or any third party, whether or not based on or relating to the Property. In no event shall S&P Global be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees or losses (including without limitation lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Property even if advised of the possibility of such damages. The Property should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions.

The S&P Global logo is a registered trademark of S&P Global, and the trademarks of S&P Global used within this document or materials are protected by international laws. Any other names may be trademarks of their respective owners.

The inclusion of a link to an external website by S&P Global should not be understood to be an endorsement of that website or the website’s owners (or their products/services). S&P Global is not responsible for either the content or output of external websites. S&P Global keeps certain activities of its divisions separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain divisions of S&P Global may have information that is not available to other S&P Global divisions. S&P Global has established policies and procedures to maintain the confidentiality of certain nonpublic information received in connection with each analytical process. S&P Global may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P Global reserves the right to disseminate its opinions and analyses. S&P Global Ratings’ public ratings and analyses are made available on its sites, www.spglobal.com/ratings (free of charge) and www.capitaliq.com (subscription), and may be distributed through other means, including via S&P Global publications and third party redistributors.