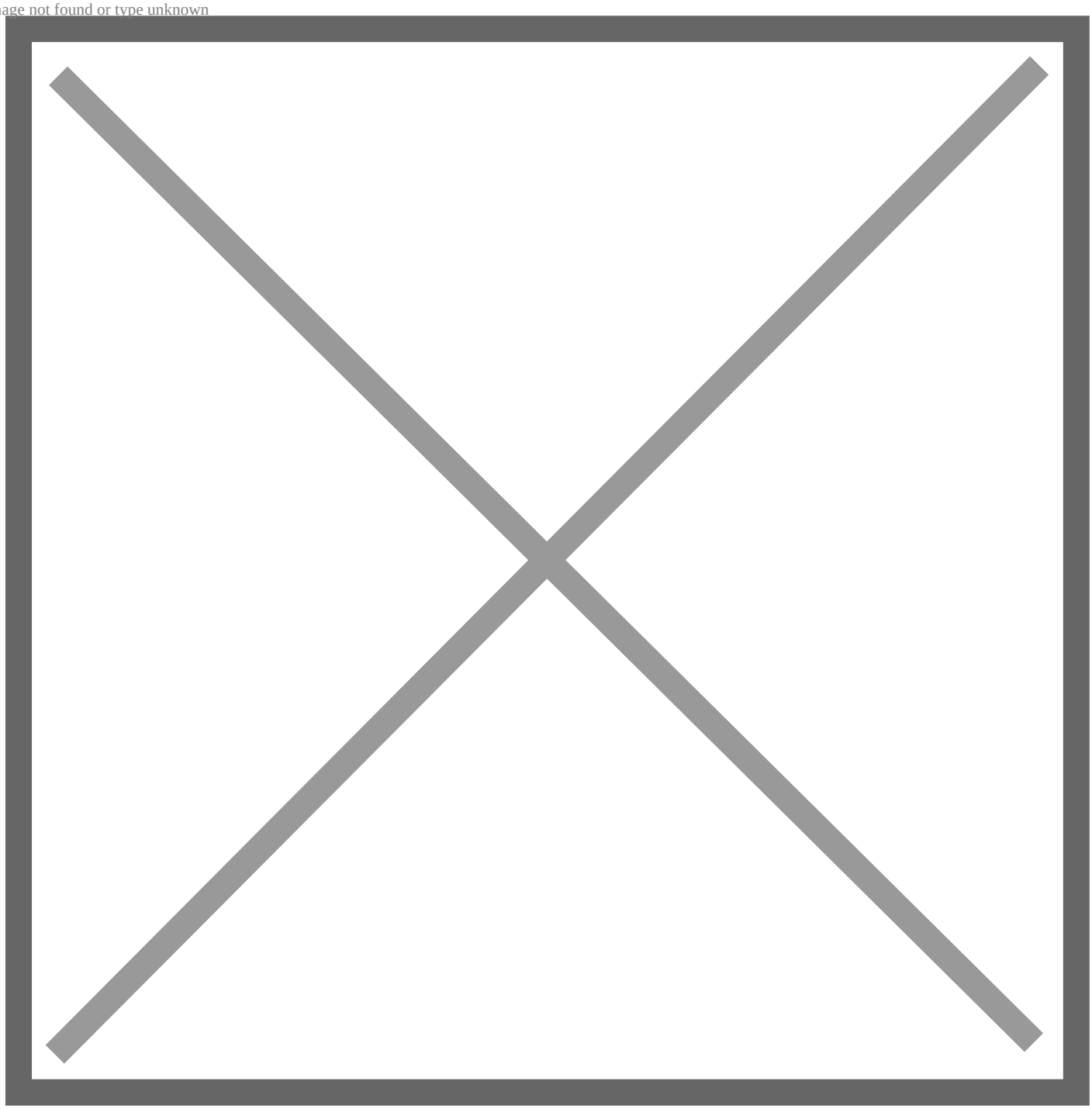
Digital Wizards: Here’s How Toyota Motor North America R&D Turns Clay Models into Fully Developed Vehicles

August 22, 2022

Image not found or type unknown



Pete Ljubevski is the group manager of Engineering & Data Innovation (EDI), a department within Toyota Motor North America Research and Development (TMNA R&D) that plays a key, though largely unsung, role in product development.

This team of “digital engineers” use computer-aided design (CAD) to bring designs to life, so they can ultimately be manufactured into parts and components of future vehicles.

Here, he pulls back the curtain a bit on their highly specialized work.

What does the EDI group do?

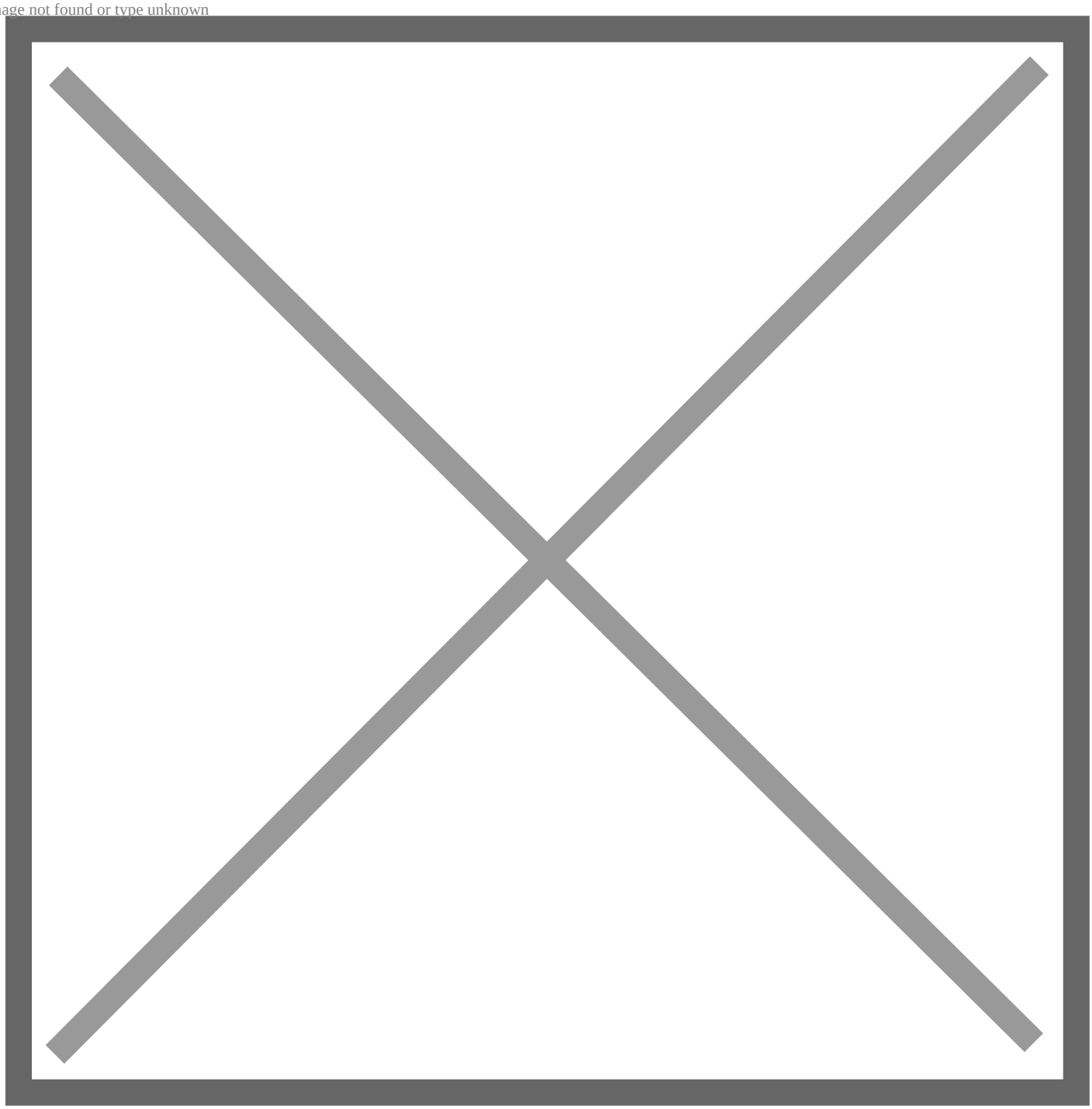
We are a digital and physical solutions provider for TMNA R&D. That means we take the sketches and clay models produced by CALTY Design Research (CALTY), TMNA’s design firm, and break them down into their individual parts and components — developing and fine tuning them in 3D so that our manufacturing plants can begin making the tooling for production. We’re talking about things like bumper covers, bodyshells, grilles, seats, instrument panels, and even the battery packs for electrified vehicles.

We also are responsible for checking the quality of the vehicle data we are developing to ensure it meets Toyota’s appearance and manufacturability requirements. We have a group that fabricates rapid prototype parts to support our engineering needs during the development process and helps TMNA R&D enable advanced development and new mobility concept initiatives.

Is most of this work handled digitally?

Yes, most of our work occurs between 1.5 to three years before the start of vehicle production. We work very closely with the engineers to make sure we get all the details right before tooling begins.

Image not found or type unknown



What are some of the other key steps in the CAD process?

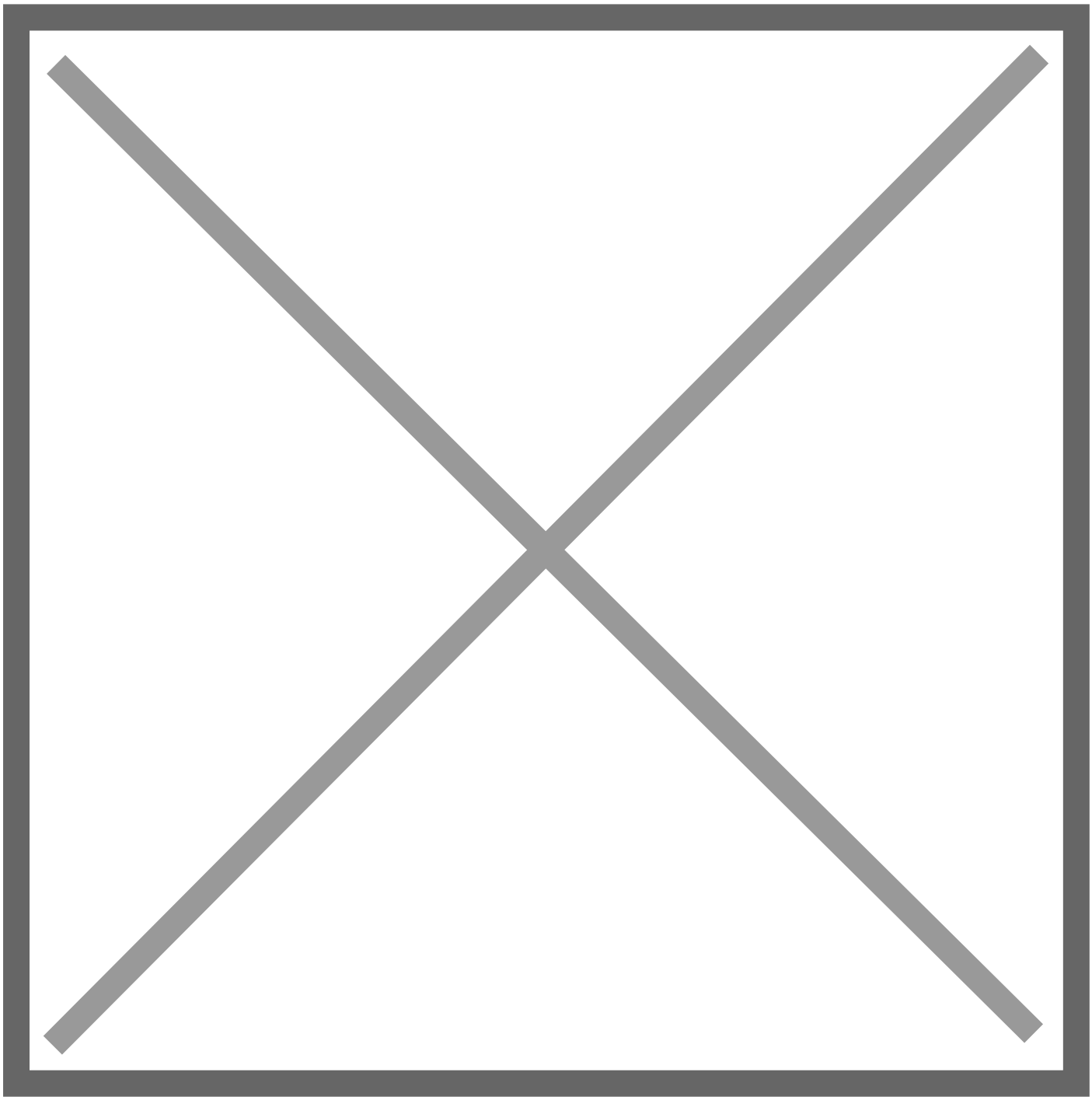
Well, while the digital vehicle CAD data can be very realistic, we also have the capability to go further by employing augmented reality and virtual reality tools to confirm we are on the right track. We can put a virtual 3D model of a component or an entire vehicle in a special room where — when looking through goggles — we can essentially see what we have created in a realistic and immersive environment.

If needed, though, our Innovation Lab can take it a step further and make physical parts using one of our 3D printers or, if required, via an injection mold. Engineers like to touch and feel the parts and see how they fit together. We'll even finish and paint the parts to production level to make them as realistic as possible.

How can you ensure the process is running smoothly?

Along the way, our Appearance Digital Assembly team will conduct quality checks to ensure everything is headed in the right direction regarding vehicle appearance. That includes two meetings before production where we provide feedback to stakeholders such as design, CALTY and the vehicle's chief engineer about vehicle appearance. If there is consensus that there is an appearance concern, we document that and track it until the issue has been resolved.

Meanwhile, our Powertrain CAD Modeling team collaborates with the powertrain engineers to help them design parts under their responsibility — including using software that can simulate and analyze how various components perform under stress.



What type of skills are needed in your department to move these projects along?

I think it’s fair to say that we are Toyota’s computer-aided design, augmented reality, and virtual reality part-making experts. We even have a team that focuses on developing custom apps and code to make working with these software packages more effective and efficient to the benefit of others. That includes our colleagues in Service Parts & Accessories Development, who use CAD to design and develop custom accessories as well as those who work in Advanced Production Engineering at Toyota Kentucky.

We've also begun to reach out to other teams across TMNA who might benefit from what we do as part of our company's initiative to break down barriers and collaborate across boundaries. Case in point: Toyota Vehicle Marketing and Communications has started using some of the photorealistic renderings we develop when conducting their external pre-production customer clinics and focus group activities. Our colleagues in public relations sometimes share our renderings of vehicle exteriors and interiors when introducing new vehicles to the automotive media. We're already doing this work, so why not make it available to others so they don't have to replicate it?

Is this concept of collaborating part of Toyota's DNA?

Absolutely. And while our primary focus is on developing new vehicles, our portfolio of mobility-related projects is growing. For instance, we were heavily involved in helping to bring about Project Portal — the fleet of heavy-duty commercial trucks powered by Toyota's hydrogen fuel cell powertrain. We have also worked with the Toyota Research Institute to help them retrofit existing vehicles with autonomous driving technology, all while helping to bring the e-Palette concept to life.