CIMdata

pSeven Enterprise Unleashes the Full Potential of Simulation for System Design Optimization

Applying Product Knowledge Faster

Sponsored by pSeven SAS

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Key Takeaways

Takeaway #1
Optimization occurs when design choices can be evaluated based on reliable simulations, even when they involve complicated methods with multiple process steps.

Takeaway #2
Realizing a digital prototype lifecycle enables multi-disciplines collaborating at scale, speeding design and validation progress.

Takeaway #3
Web applications that encapsulate multi-discipline simulations with data processing provide empowering decision aids to many engineers who would otherwise need to negotiate for time from crucial simulation experts.

Takeaway #4
pSeven Enterprise is leading this next frontier of democratizing engineering simulations. With applications tailored for decision makers, simulation solutions are usable by all members of the engineering team, regardless of location.

pSeven Enterprise

cloud-native low-code platform

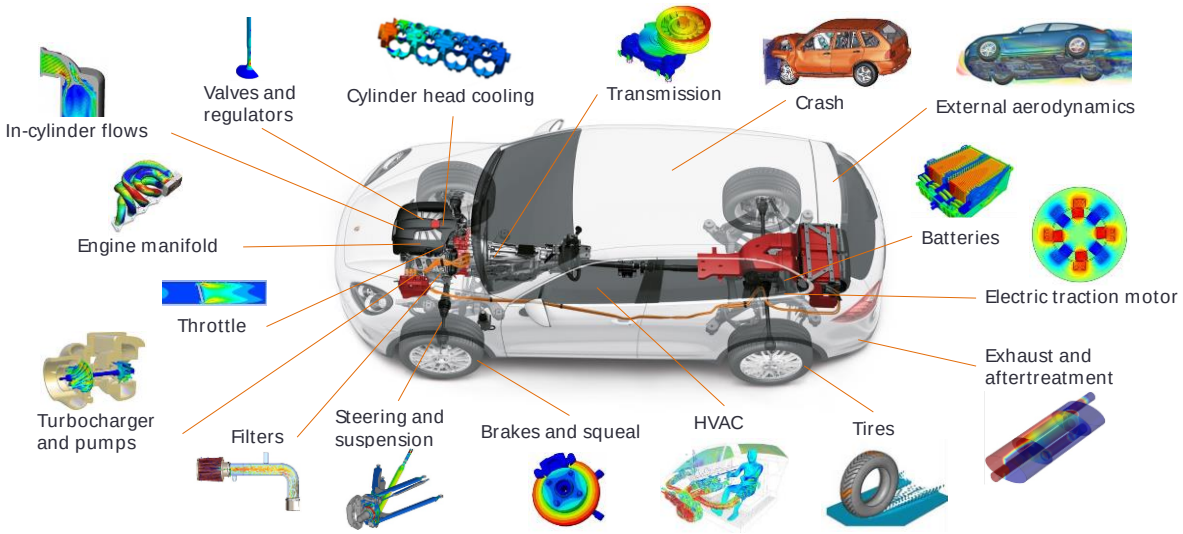
Multi-Discipline Simulation Spans Physical Phenomena and Product Domains

Virtual Engineering Accelerates Product Development

Standardizing simulations enables repetitive learning cycles in which simulation is done often as the design is refined. Automating these simulation methods accelerates the learning cycle, leading to better products, often sooner to market.

Simulations must be shared via collaboration platforms allowing engineers from different disciplines and domains to interact while considering the dynamic performance of the product being developed. Large enterprises also have engineers dispersed across the world, some in offices and some remote. Cloud technology allows physically separated engineers to work collaboratively.

As with any automotive engineering challenge, performing virtual mockups and simulations helps speed development of new vehicle variants. Assembling complex multi-disciplinary analysis and optimization workflows collaboratively delivers better products. These simulation solution sets must span physics phenomena at least including acoustics, thermal dynamics, performance, and durability.



Automotive Simulation Addresses all Components During Development

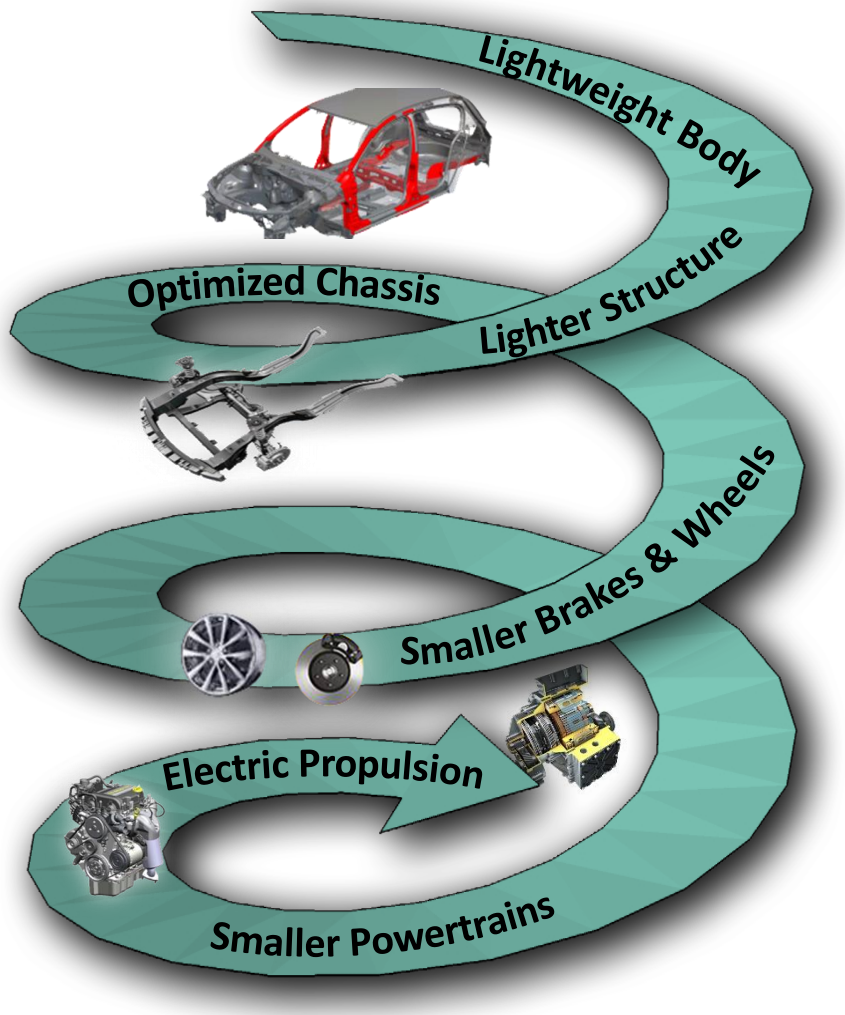
Discipline-specific simulation applications come from many solution providers, as depicted in the figure. This references solutions from GT-Suite, Modelon, Beta CAE, FEV, AVL Simulation, and many others. Establishing and reusing a sequence when performing these different simulations needs a workflow manager independent of individual applications that can invoke the applications and apply the boundary conditions for the specific simulation in the best competitive practice. Automating these workflows makes simulation results available to a broader engineering and management community.

Automotive Optimization Needs Broader Simulation

Virtual Engineering Enhances Cross-Domain Collaboration

As automotive component designs evolve, often to streamline mass production to gain scales of efficiency, fast and consistent evaluations done virtually is essential. Maintaining automotive performance while proceeding through the design spiral (note the order of design evolution in the spiral figure) encourages cross domain optimization. Multi-discipline simulations work together to assess optimal, robust final product designs. The automakers ongoing competitive pressures require a simulation ecosystem that is simultaneously available to geographically dispersed development teams.

Brand new vehicle platforms are coming to market from both new automakers, with perhaps one electric vehicle platform in their portfolio, as well as existing automakers using their mass production skills applied to a new, optimized electric vehicle product platform. Flexibility in the sizing and placement of the drive units (ICEs and electric motors) as well as the electrical harnesses and controls will be product discriminators. Systems optimization through shared simulation applications provides powerful capabilities to stay competitive. Providing knowledge exploration applications, built on trusted simulations, into the hands of non-simulation experts is key to further improve product engineering efficiency and time to market realities.

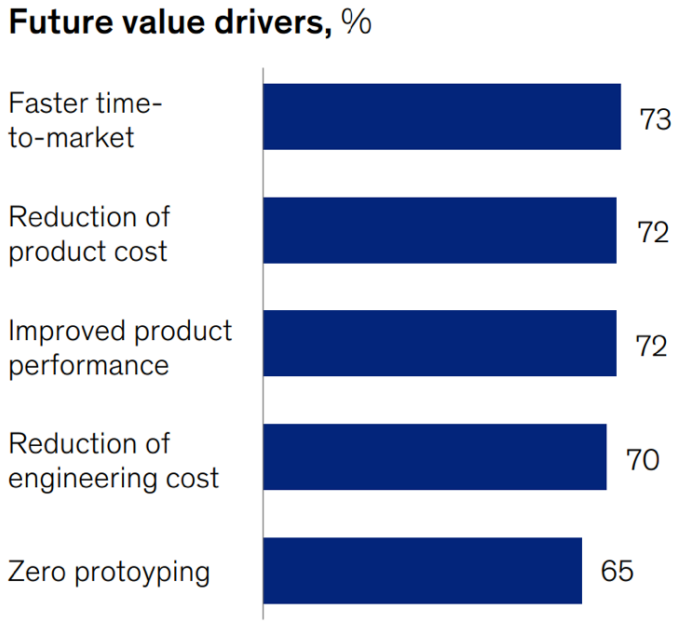


Maintaining Automotive Performance
(Original concept from GM SAE Presentation circa 2012, refined by CIMdata)

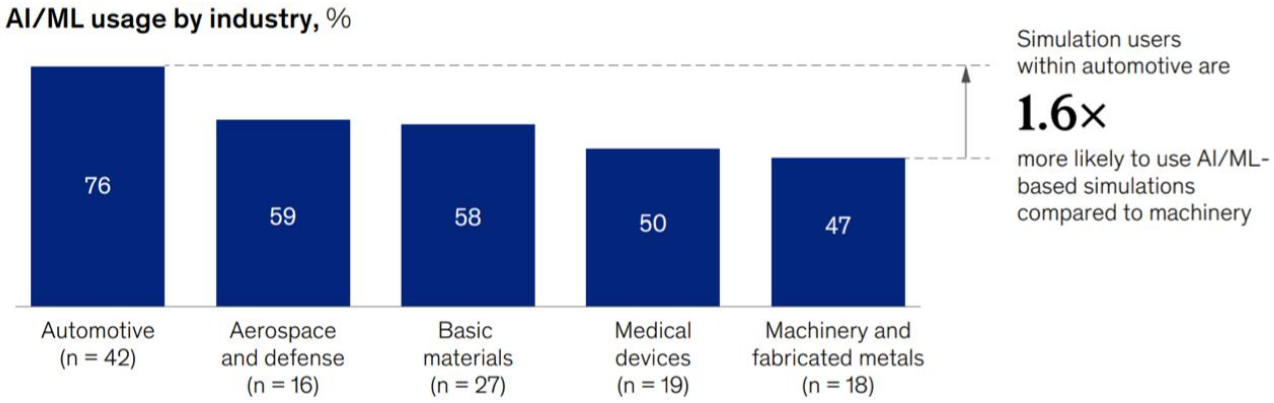
Advancing Simulation Industry Needs

NAFEMS Sponsored McKinsey Study

Unveiling the next frontier of engineering simulation was the result of a collaborative effort by McKinsey & Company and NAFEMS. They conducted a survey asking simulation experts what they saw emerging in the world of simulation over the next few years. Inexpensive computing, cloud technology, and broader democratization were identified as trends. Multi-physics simulation will expand and most engineers in the future will perform at least components simulations driven by standard procedures. The market leaders will use simulation to drive designs, rather than just as an efficiency alternative to physical prototype testing. This shortens time to market while delivering reduced product costs without jeopardizing product performance. When it came to questions about using artificial intelligence and machine learning, the automotive companies have jumped into the lead.



pSeven SAS is responding to the challenges identified in this recent study by developing a cloud-native low-code pSeven Enterprise platform which accelerates simulation democratization across enterprises. Insights about industry AI/ML adoption clarifies the market demands focused on interests of automotive companies.



(Courtesy of NAFEMS & McKinsey)

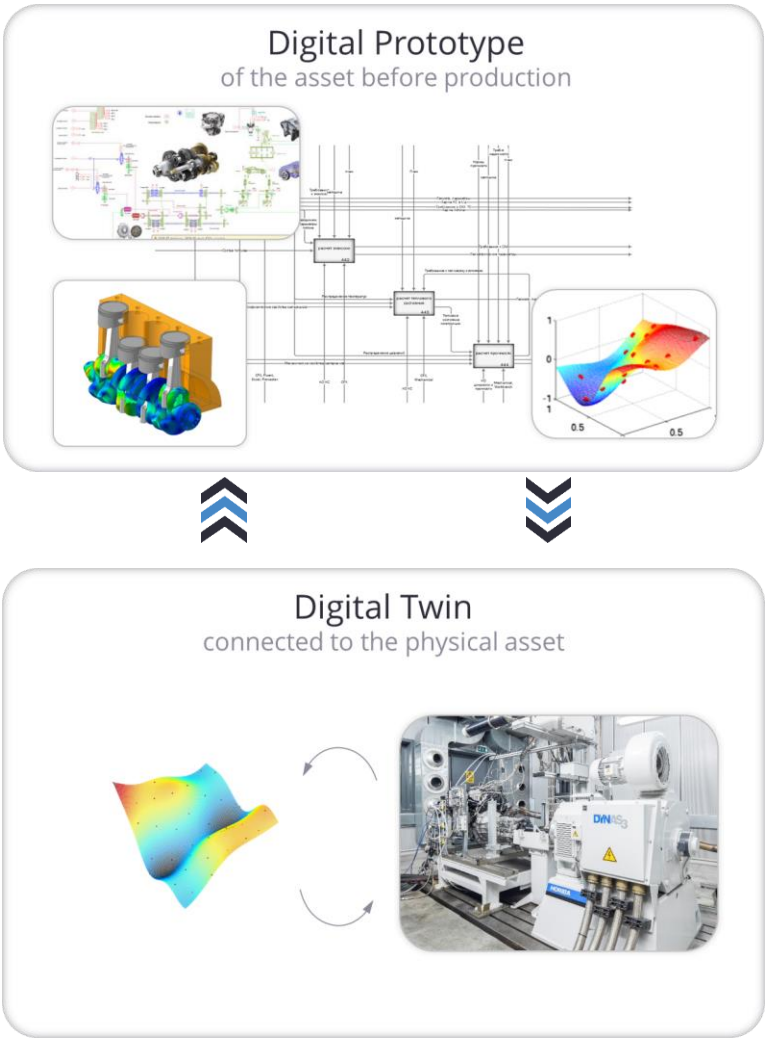
Product Knowledge Improves with Proven Simulations

Knowledge improves as product experiences are comprehended and shared. Advances in simulation to allow multi-disciplines and domains collaboration improves system understanding that applies knowledge. When data from many experiences are considered, usage patterns emerge, which helps understanding product strengths, performance behavior, and sensitivities. This makes robust products possible.

Virtual models, the digital prototypes of real-world systems, are streamlining product development in place of most physical mockups and prototypes. Only a few physical assets are needed to confirm that simulations are trustworthy (note the data exchanges between Digital Twin and Digital Prototype).

Interactive simulations are an engaging way to apply knowledge as a new product is being designed. The same simulation steps of preparation, solving, and analysis are performed hundreds of times. Automating the scripts which execute these steps repeatably enable design space exploration as a range of customer use cases are evaluated. Simulation encapsulating these "experiences" to reliably predict system performance provides useful insights for all those in product development, not just the simulation experts.

Performing these simulations across the product development cycle enhanced by engineering collaboration that is improved with best practices automation. Applying product knowledge faster than the competition is a competitive advantage to meet customer expectations.

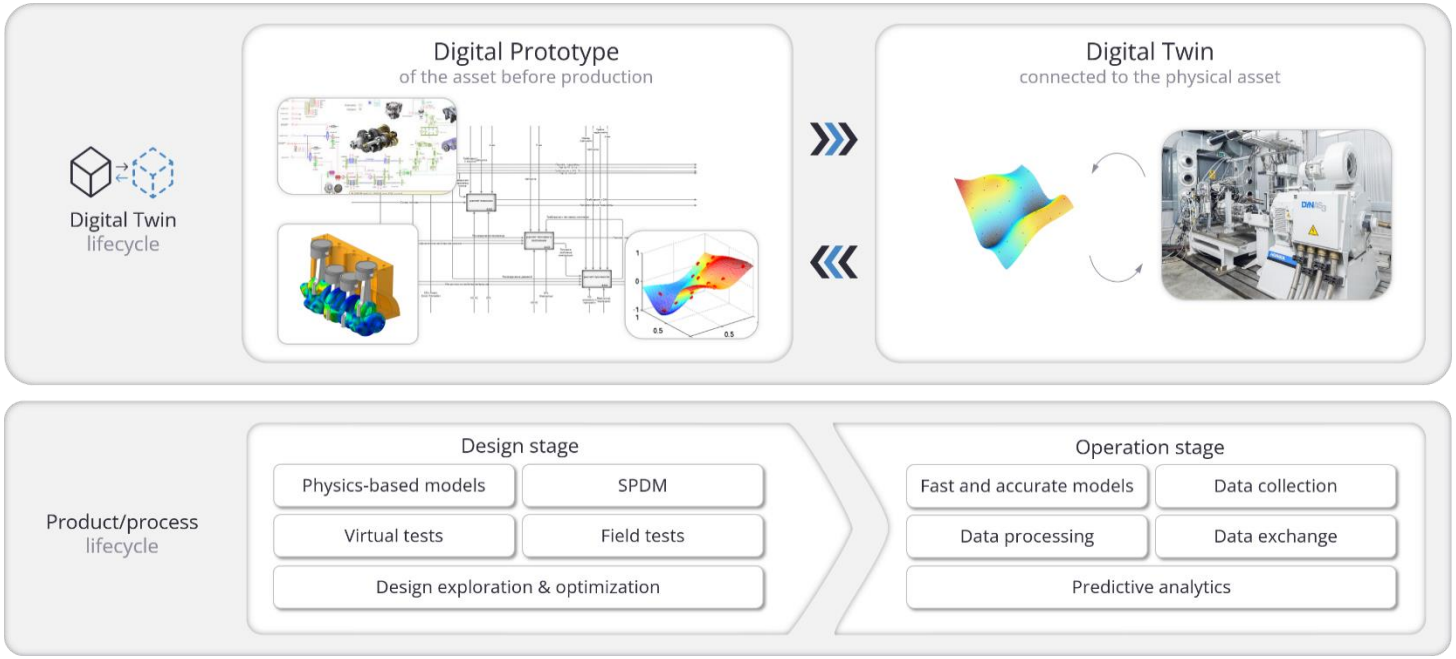


Digital Prototype and Twin Dependent Lifecycle
(Courtesy of pSeven SAS)

Measurements Qualify Digital Prototypes

Digital Prototypes are only part of the virtual engineering story. Simulation models must also stay aware, even adapt to, operational measurements. As they adapt, they become more useful digital prototypes—surrogates for faster decision-making during product development.

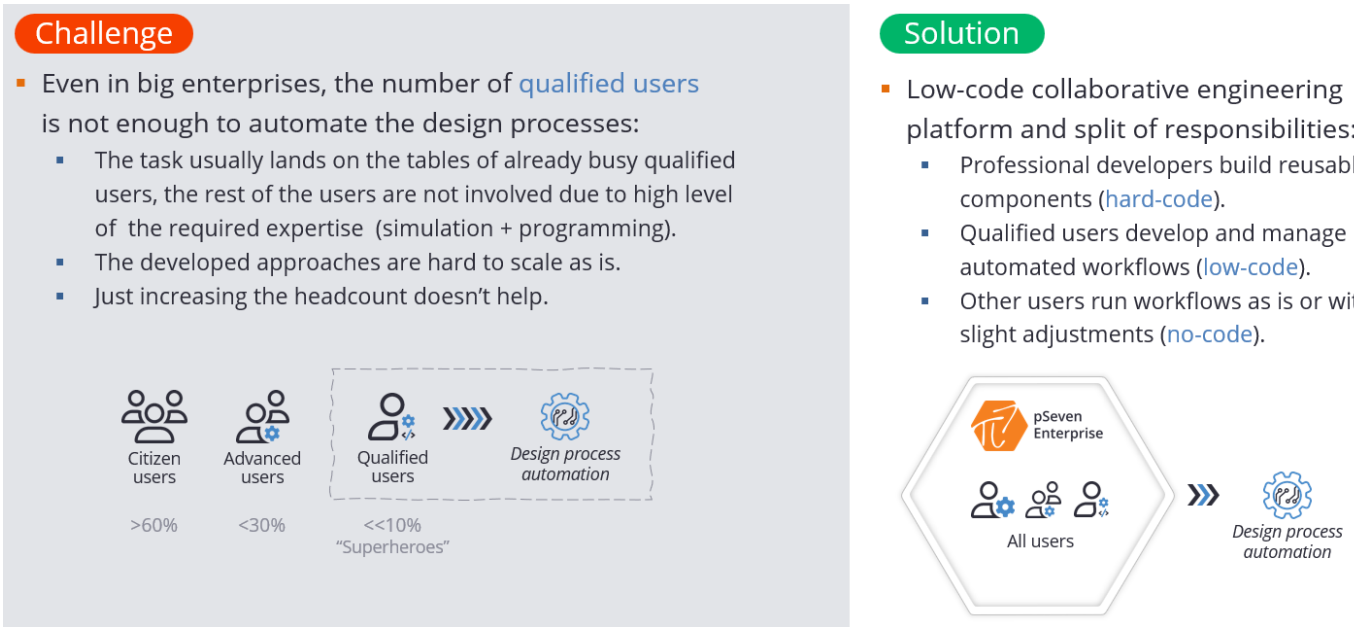
The figure shows pSeven's digital prototype lifecycle. Note the connections between physical assets using measurements shared with the mathematical performance model. All engineers can confirm their understanding based on the latest, trusted measurements of their component design under usage loads. pSeven's digital prototype framework enables broader collaboration beyond the test laboratory and the simulation experts. The models and data work together to build confidence that nurtures trust. Trust that is proven by experience fosters confidence to change product development processes. Digital prototypes are driving all phases of development to consider broader views.



Digital Prototype Learns from Physical Evaluations
(Courtesy of pSeven SAS)

Broadest Adoption of Digital Prototypes Needs Low-Code

Packaging simulation and data analysis scripts into applications that any engineer or manager can use broadens their adoption. Managed load cases encapsulated in a specific application for the next evaluation decision, e.g., thermodynamic robustness, allows each engineer to use simulation during design or whenever a component changes. pSeven Enterprise enables applications construction in a ***low-code environment*** that permits the busy simulation expert to craft new applications when needed. Training the citizen engineers and managers on the use of the specific decision applications is more intuitive as the tedious steps needed for simulation execution with appropriate boundary conditions are encapsulated within the application. The citizen engineer reaps simulation insights quickly using the digital prototype on demand determining if the design change is adequate. By Using qualified, best practices apps automate the application of boundary conditions and solve lots of formulas and then automatically present the results in a visual way to show design strengths and weaknesses.



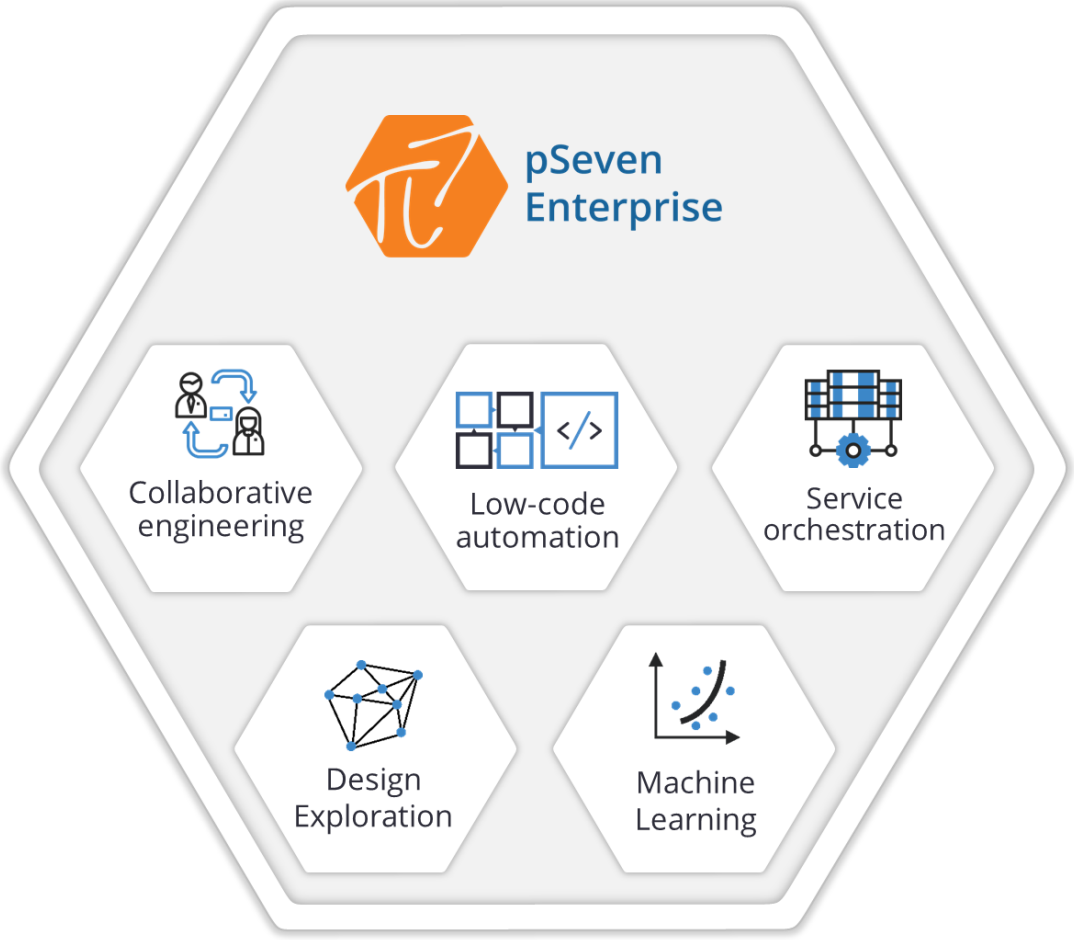
All Engineers and Managers Using Simulation Improves Earlier Understandings
(Courtesy of pSeven SAS)

Introducing pSeven Enterprise

Robust designs happen when all individuals across the product engineering teams use proven, trusted multi-physics models. pSeven Enterprise provides a toolset to build web applications for the non-simulation expert to use complex simulation procedures as critical decisions are made. Product development iteration cycles decrease as each engineer and manager uses simulation throughout the product development lifecycle.

pSeven Enterprise provides capabilities for low-code automation, machine learning, and design exploration within a computing service orchestration that allows more collaborative engineering. As cloud-based computing costs continue to decrease while execution speeds increase, more and more citizen engineers are compelled to do their own simulations, without becoming simulation experts.

pSeven SAS is building pSeven Enterprise platform based on their knowledge of complex, multi-discipline simulations needed by aerospace manufacturers. They are redeploying their experience in a cloud-native computing environment while also automating simulation scripts. By encapsulating these mechanisms within decision specific applications in a low-code environment, automotive companies will get the same benefits across a much broader development community. Those concerned with utmost product secrecy can install pSeven Enterprise on-premises or in their own private cloud.



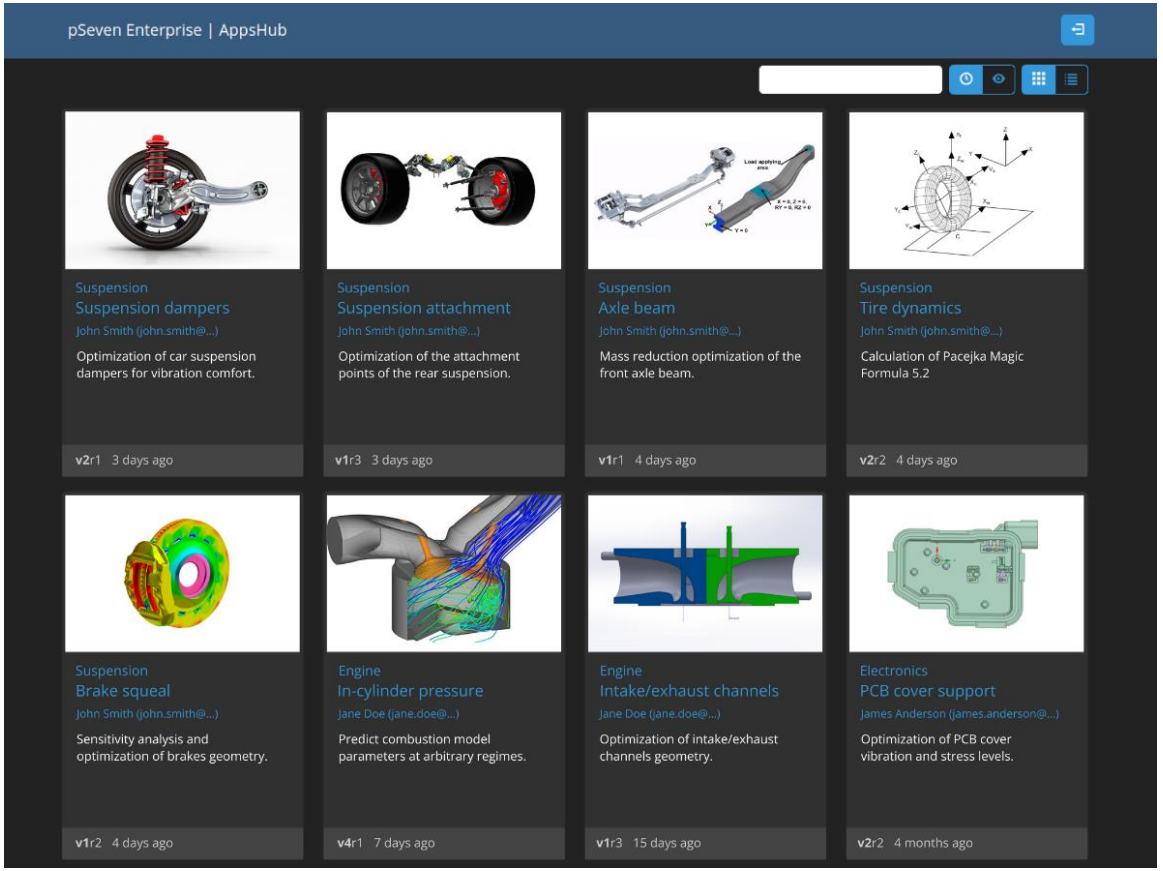
pSeven Enterprise—A Cloud-Native Analysis Platform
(Courtesy of pSeven SAS)

Simulation Web Applications for Automotive Engineering

Automakers are leveraging digital prototypes to optimize weight reductions, cabin comfort, and performance attribute balancing for efficient, reliable electric and conventional vehicles. Advances in simulation including fast-decreasing HPC costs is causing automotive OEMs to broaden the use of simulation earlier in development to facilitate systems level trade studies with many optimization explorations of the potential solutions spaces. A digital mockup, verified with actual usage measurements, forms a meaningful digital prototype. In some cases, this dynamic, digital prototype is more realistic, than a hand-built custom prototype.

Furthermore, quality managers are exploring the roots issues by exploring what-if studies to help discover real root causes faster. Failure mechanisms knowledge improves when meaningful digital prototypes provide a way to conduct design of experiments (DoE) faster.

pSeven Enterprise provides a mechanism to share, distribute, quickly construct, and democratize simulation to most of product engineering by putting their simulation expertise into modern, cloud-based technologies. They provide an AppsHub to organize and access simulation web applications.

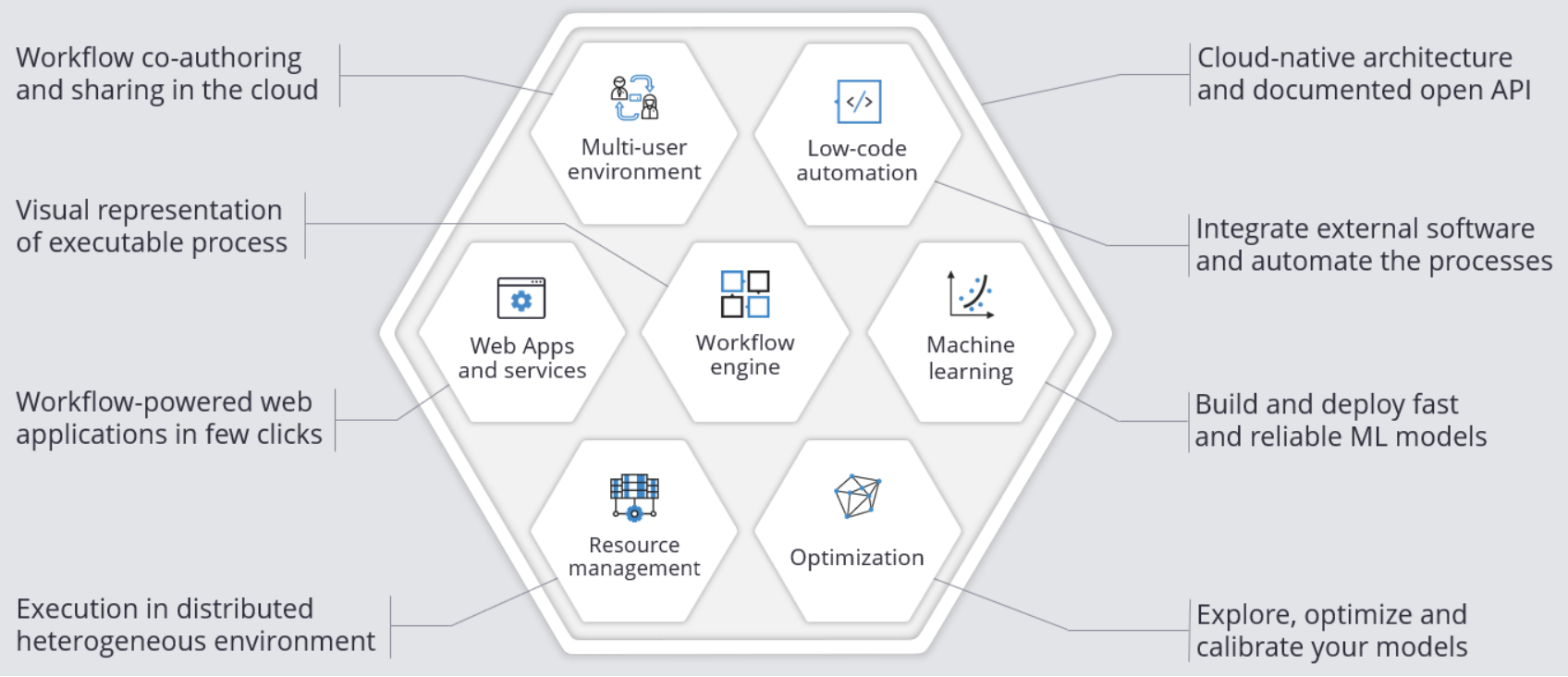


Multi-Discipline Simulations Expand Design Optimization

(Courtesy of pSeven SAS)

Applying pSeven Enterprise for Automotive Engineering

Our physical word behaves in coupled ways. Simulation and computing advances now make it possible for everyone to perform simulations on-demand. CIMdata is pleased to see pSeven SAS's commercialization of applications which comprise state of the art coupled simulations delivered in the cloud. All engineers can evaluate design choices without waiting on a laboratory, prototype, instrumentation, or a simulation expert and their HPC machinery. Instead, they invoke a cloud-hosted application for the critical decision which knows the load cases and the procedural steps to complete the appropriate simulation and then display the results in a graphic, visual image improving understanding when decisions are made. Automotive companies should benefit when using pSeven Enterprise platform, making the optimized product systems spiral cycle even faster.



pSeven Enterprise Platform Accelerates Simulation Democratization

(Courtesy of pSeven SAS)

About pSeven SAS

pSeven provides software tools for machine learning, optimization, collaborative engineering and low-code automation. Founded in 2010 as a spin-off of Airbus, pSeven has been an independent simulation solutions provider since 2015.

Automate engineering processes at scale

Ready to transform your development?

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