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CASE STUDY

FROM DATA TO DECISIONS: THE HIDDEN PRESSURE POINT IN AUTOMOTIVE CAE AND HOW TO FIX IT

A Case Study on Advanced Diagnostic Solutions for Crash Analysis, Root Cause Identification and Safety Validation

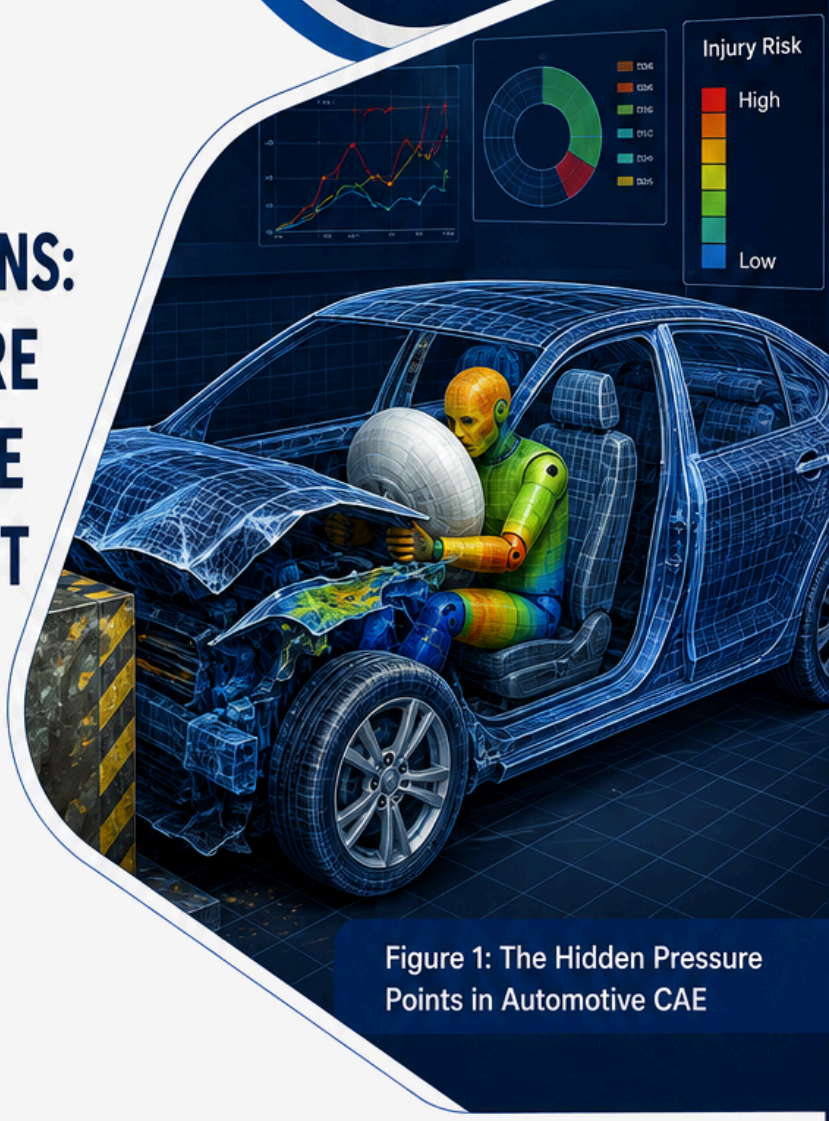

Figure 1: The Hidden Pressure Points in Automotive CAE

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ROOT CAUSE VISIBILITY | FASTER ANALYSIS | IMPROVED ACCURACY | BETTER TEAM COLLABORATION | SAFETY & NCAP COMPLIANCE

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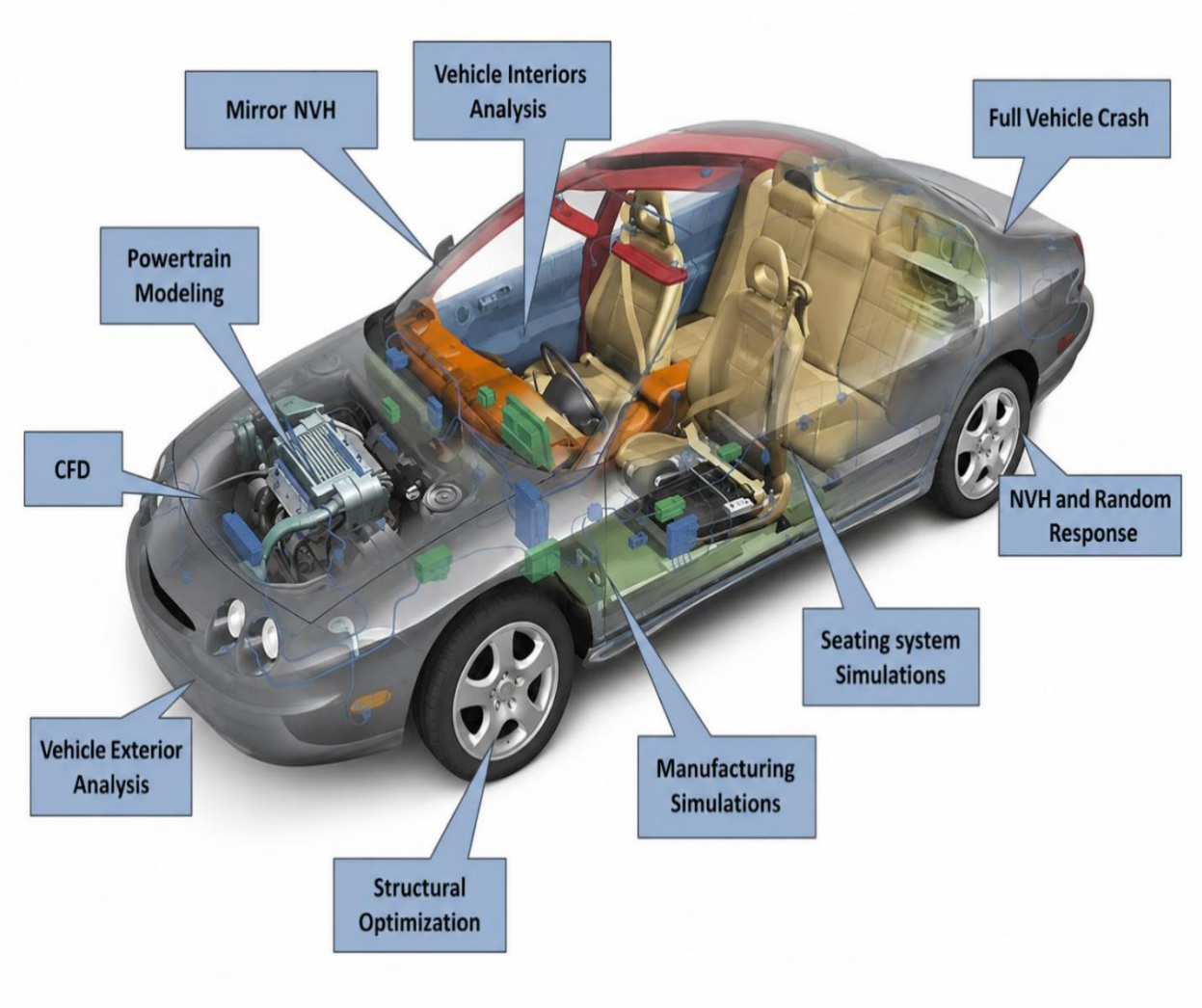

Figure 1: The Hidden Pressure Points in Automotive CAE

1. Overview

The automotive manufacturers are under pressure as they have to improvise their vehicle safety while minimizing the development time as well as the engineering cost. Safety teams also require managing more complex crash simulations, NCAP-based testing requirements, and occupant protection systems.

The major challenge was that the traditional crash analysis methods showed the injury results without properly explaining why these injuries occurred. As a result, delays occurred, repeated testing was necessary, and safety was compromised.

This case study addresses these issues by utilizing an advanced automated diagnostic platform to improve the identification of root causes in crash analysis and enhance system validation.

2. Problem

The major automotive safety engineers found that the traditional CAE tools were able to identify the crash results but could not provide a clear explanation about the nature of the injury results, which created major difficulties at the time of the vehicle development program.

The common issues that arose during the development program include:

- Slow crash analysis occurs when values exceed the NCAP limits.
- Repeated modifications in the design
- The engineering workload increases.
- Vehicle program delays
- Testing cost increase

The company also struggled to manage the safety performance of occupants across different passenger categories, including the elderly, children, women, and larger individuals.

3. Challenges

The automatic team struggled to identify the various technical and operational challenges that occur under crash conditions. This created difficulties for the engineers in identifying the reasons for the injury exceedances.

The main challenges incorporated are

- Injury route causes
- Large stimulation data volume management
- Analysis time reduction
- Meeting the safety targets of the NCAP
- Dependence on the senior engineering team.

4. Key Solution

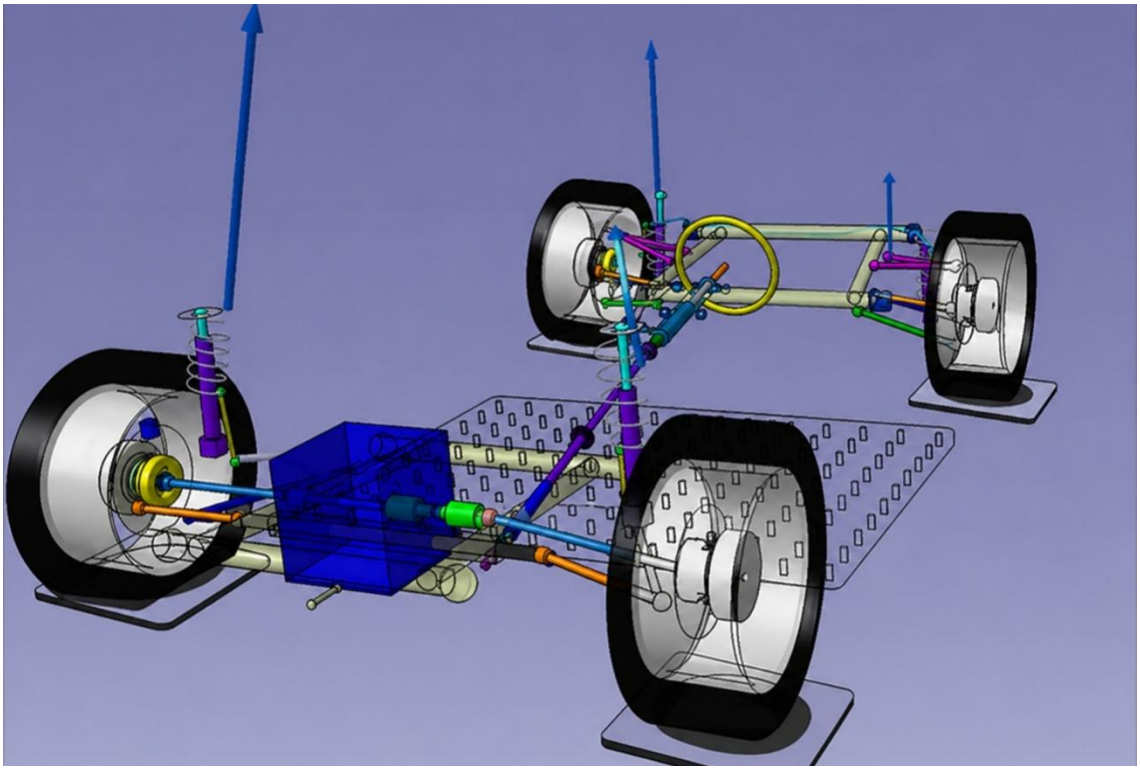

Figure 2: Automative CAE Solutions

To improve crash analysis along with safety validation, the team implemented an automated safety analysis solution that is capable of identifying data interpretation and automated processes.

4.1 Automatic root cause analysis

The new system helped engineers to quickly identify the main contributors that were behind the injury spikes at the time of the crash simulation.

The engineers quickly identify the issues related to airbag timing and occupant interaction problems in vehicles.

- Airbag timing issues
- Occupant interaction problems
- High-impact force transfer across body regions
- Seat belt load transfer
-

4.2 Advanced data visualization and diagnostics

The platform introduced the visualization tools that allowed engineers to track how the forces could move through the occupants and the system.

The improved understanding can help to achieve better results such as

- Force movement at the time of impact
- Head injury chest concentrations
- The system's interaction between the restraint and the occupants is crucial.
- Safety performance variation reasons

4.3 Better team collaboration

The updated workflow can improve the collaboration between the technical and non-technical teams in a clear format by presenting the crash analysis.

The solution supported the following aspects:

- Faster stimulation reviews
- Design rework got reduced.
- Engineering communication improves better.
- Support for future NCAP testing requirements
- Development speed work improved.

5. Outcome

After implementing the manufacturer's advanced crash analysis solutions, the organization improved its engineering efficiency and optimized its restraint system.

The organization successfully achieved the

- Safety validation cycles
- Improvised accuracy for injury analysis
- Restraint behavior got better.
- Stimulation rework was reduced.
- Engineering productivity is improved.
-

6. Key takeaways

Modern automotive safety systems have become more advanced, and engineers are looking for faster and more intelligent methods so that they can analyze the crash performance and restrain the behavior of the system.

Key takeaway 1: This case study demonstrates how modern stimulation systems and analysis tools can improve engineering productivity to a significant extent and provide strong occupant protection performance.

Key takeaway 2: By combining root cause visibility and simplifying the complex crash analysis process, automotive companies can minimize their development complexity and improve occupant protection performance while better aligning with compliance and NCAP guidelines.

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