

Achieving World-Class Dynamics Performance and Cutting Down Development Time and Cost Using a Driving Simulator



Challenge

Building and improving the performances of a mass-market flagship vehicle while lowering the costs related to physical ride tuning, all within a restricted time frame.

Solution

Involving driving simulation at every step of the vehicle development. From target setting down to vehicle tuning, relying on driving simulation to support efficient decision-making and quick turnaround while being able to test a wide variety of setups.

Results

- Significant time savings on using simulators to test configurations
- Cost savings due to the non-need of producing prototype parts
- Re-investment of saved time into prototype and vehicle tuning
- Critically acclaimed performance results for the production vehicle

Background

Mahindra is one of the largest vehicle manufacturers in India, having technical centers and production sites presence in over 50 different countries, selling over 350 thousand vehicles per year.

In late 2018, they initiated the development of a new production vehicle partnering with IDIADA, an engineering partner in the automotive industry, specializing in providing complete solutions for development projects worldwide.

Their work aimed at developing their new flagship SUV vehicle for the mass market, the XUV700, the successor of the XUV500.

Their objective was to improve the performance of the said vehicle in a short timeframe. It was the first complete development program in which IDIADA was overseeing the chassis and vehicle dynamics performance improvements, from concept to production.

Challenge

Ride and Handling Performance

The predecessor vehicle, XUV500, was not recognized as a leader in riding and dynamics performances.

The main objective for the new development was to have the XUV700's dynamics performances radically improved.

This meant going over all parts of the chassis individually and reworking its design to produce the best ride quality possible.

Time Constraints

Mahindra set rigorous constraints to the vehicle development timeline. They wanted the teams to streamline the overall process down to 30 months, from kick-off to start of production.

Given how much performance improvement the team was aiming for, and accounting for disruptive events at the time, this was, looking back, a short period to meet such delivery.

Cost Reductions

At the time, Mahindra spent a significant amount of time on chassis tuning, producing many prototype parts during their development process, and incurring significant production costs.

The teams at IDIADA were tasked with reducing by 25% the costs related to physical ride and handling tuning.



“The Driving Simulators were a key component of the success of the XUV700”

Guido Tosolin
Senior Manager Chassis Development - Applus+ IDIADA

Solution

Driving Simulation **First**

IDIADA's teams main focus was to put Driving Simulation at the center of the development process.

Every chassis component from conception to design was initially tested on simulators, relying on VI-grade's DiM250 and VI-CarRealTime models.

Driving simulators were involved as early as possible in the development stages, starting with target setting. The team's vision for how the car was supposed to feel and handle was backed by driving simulators from day one.

Strong collaboration between **design** and **simulation**

The teams at IDIADA made emphasis on having a strong feedback loop between the designing teams and the driving simulation engineering teams, simulation testing would generate results and conclusions that could then be used as inputs for design teams to develop and refine chassis parts.

The driving simulation teams generated VI-CarRealTime models for the candidates they had to choose from, allowing them to make realistic decisions within the simulator, aiding the design directions, and furthering the maturity of each tested part.

Notably, expert drivers would be relied on for decisions within the driving simulator. Later down the line, the same experts would be able to reassess their original decisions made on driving simulators during physical prototype tuning, confirming the accuracy of the models used earlier in the timeline.

Value

Cost and Time **Savings**

During IDIADA's involvement in the development of the riding and dynamics of the XUV700, they only required 22 days of VI-grade's DiM250 across the 30 months of development. This equates to less than 3% of the total development time.

During those 22 days, they were able to test and review more than 450 different setups, a number only reachable through simulation, helping them make quick and advised decisions on design choices.

Their heavy reliance on simulation drastically reduced the need for building prototype parts for testing, further increasing the time and cost savings of the whole development.



22

Simulation days

450+

Setups tested

25%

Better Design Maturity
compared to off-line CAE only

Furthermore, the time saved during early simulation and decision-making was then re-invested into prototype and vehicle tuning, achieving better performance results for the production vehicle.

IDIADA and Mahindra estimated that Driving Simulators helped better the maturity level of their design. They considered that their design was on average 25% closer to the final result compared to off-line Computer Aided Engineering only.

Successful Market Reception

The production of the XUV700 and its market reception was deemed a success for both companies. Mahindra achieved the time, cost, and performance improvements they were aiming for during the development process.

Their new vehicle was critically acclaimed by the market. Enthusiastic press, experts, and customer feedback confirmed that its dynamics were greatly improved, further confirming the success of their strategy of using driving simulators early during vehicle development.

Conclusion

Developing and improving a new road vehicle is a challenging effort for any automotive company. By choosing to involve driving simulations early and continuously in the development process of their new vehicle, Mahindra and IDIADA were able to achieve substantial results.

Using a limited amount of simulator time, they were able to streamline the development process for many of the parts the XUV700 benefited from. Their decision-making was more accurate early on, producing a compounding effect on the finalization of the vehicle, including the tuning needed to reach production.

The time saved by being able to test a wide variety of setups, coupled with the obsolete need for many prototype parts to be built during development, drove the teams to success, both in terms of budget control as well in performance goals reached for the production vehicle.



Pictures courtesy of Applus IDIADA and Mahindra