

## **MOVING CAE FROM PERSPIRATION TO INSPIRATION**

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### **KEYWORDS**

CAE, SIMULATION DRIVEN DESIGN, CAE MODELING, TECHNOLOGY S CURVE, FIRST TIME RIGHT, DEMOCRATIZING CAE, DEMOCRATIZING SIMULATION

### **ABSTRACT**

It's time to for CAE to leap into the 21<sup>st</sup> century. Virtually all of the main simulations codes used by industry today were created 30 and 40 years ago in the 20<sup>th</sup> century in the days of card decks, tape drives and input mechanism that were shockingly primitive. These were tools invented by and for experts. For too long, analysts have had to struggle with engineering methods created for the architectures of the past. Companies have built large engineering infrastructures around automating the creation of basic models, and yet getting even the "first answer" is a time consuming process that requires expert users. Using simulation to lead analysts to the optimum answer is just never accomplished. There have been many attempts to put simulation in the CAD authoring tools but the inherent lack of robustness of current tools in the face of modeling complexity and lack of experience in interpreting the results has caused this workflow to have only limited success.

Although "Simulation Driven Design" has been a catch phrase for many companies, simulation is still used primarily as a validation tool by dedicated analysts. These analysts build a behavioural model using a bunch of low level representations (like metric finite elements) which have never been abstracted to a higher engineering level. The carefully constructed modeling practices codify the relationship between the low level simulation tool and the engineering metrics of interest to the analyst/industry/application. Simulation can then rarely keep up with the myriad of design changes because there is only a loose correlation between the simulation model and the physical system being studied. Simulation models get created in many parts of an organization, often

for the same assemblies. When design changes occur, there is no time to update all of these representations of the same concept. Moving data from one model to another is simply a pain. Finally, moving reliable behavioural models smoothly through the supply chain has been virtually impossible

In his book, Innovator's Dilemma, Clayton Christian introduces the concept of technology "S" curves that start slow but then accelerate rapidly displacing what has come before it. In order to do this, architectural change is required. How the components of a technology process relate to each other have to be re-arranged. S curves in other industries happen every 10 years or so. But for CAE, we are still basically on the original S curve.

Dominic Gallelo will review how CAE systems have heretofore been constructed and the impact on the design process. He will then look at simulation going forward and how new architectures will dramatically impact the usability, timelessness of results and the expansion of deployment of simulation upstream and downstream in the design process.