



intrinSIM

The Changing Role of Simulation

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The Changing Role of Simulation

- The use of Simulation has seen continual double digit % growth annually for about 30 years until 2008
- This cumulative growth now means that Simulation is a significant portion of the Engineering Software Market and a driver for future growth
- This has resulted in increased focus and investment in simulation by major PLM software vendors

The Changing Role of Simulation

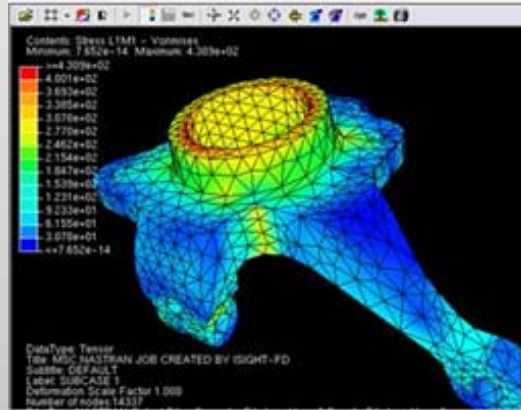
- This growth is coupled with increasing awareness of business benefits
 - Innovation is a major key to Competitiveness
 - Simulation is a key to innovation
 - Risk management is a major key to Competitiveness
 - Simulation is a key to understanding and managing risk
 - Reducing cost is a major key to Competitiveness
 - Simulation is a key to reducing material & prototyping cost
- **Simulation is the key enabler to Increased Competitiveness**

The Changing Role of Simulation

- The changing role of simulation is more about its role in business than the changes in technology
 - Changes in technology enable and are necessary to support the business related changes
- Let's explore the Simulation as it relates to perceived Business Value and breadth of applicability

Failure Analysis

Business Value

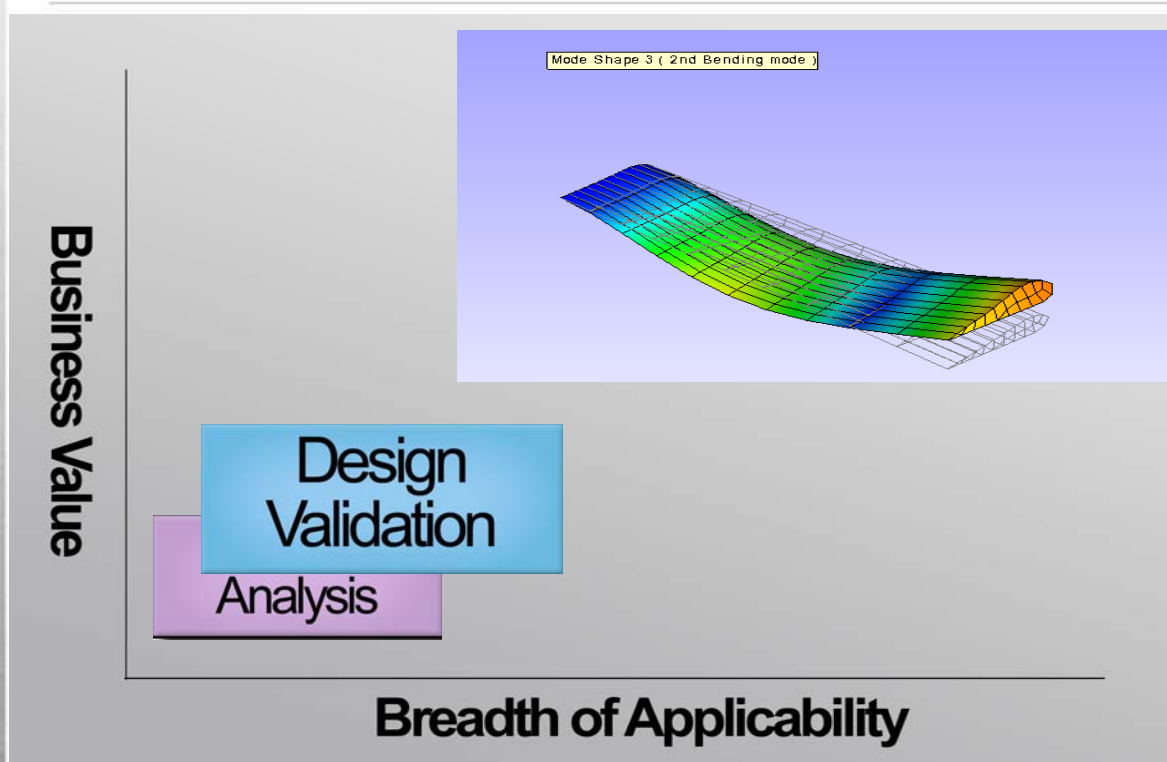


Failure Analysis

Breadth of Applicability

- This is where it begins
 - Understanding “why it failed”
- Run by a few “experts”
- Dominated by test vs analysis comparisons

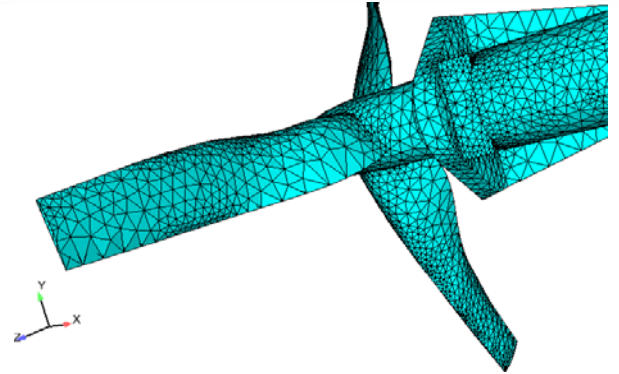
Design Validation



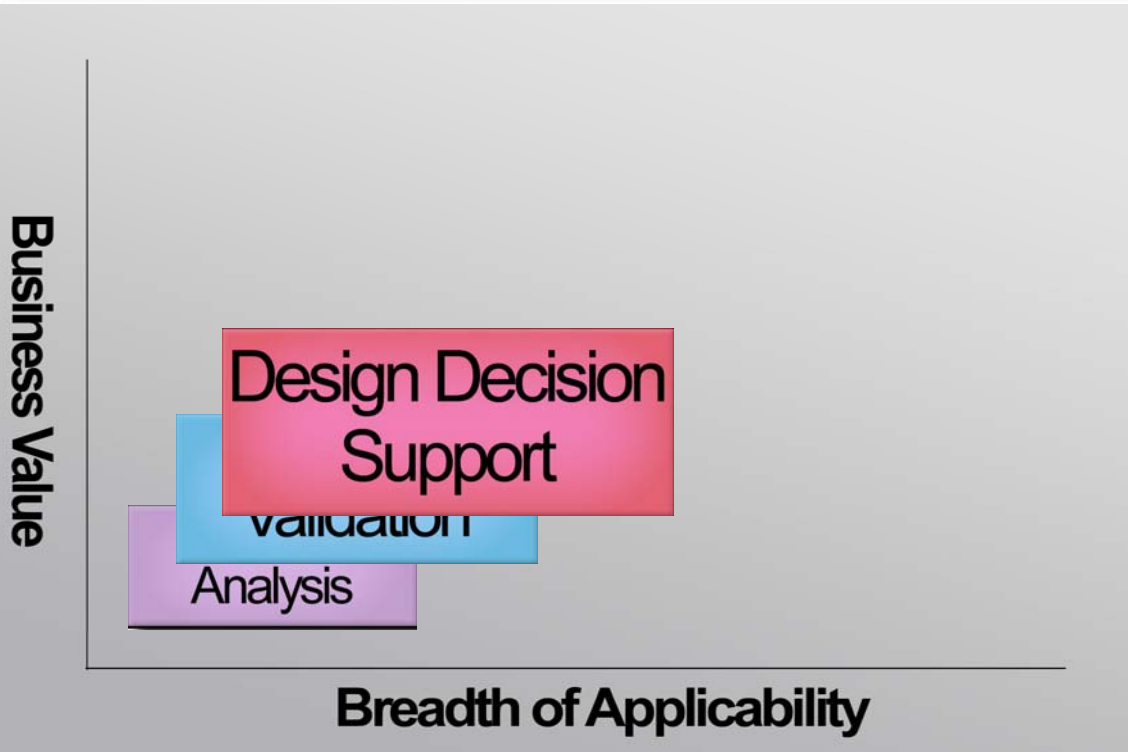
- Checking before it fails
- The dawn of Virtual Prototyping
- Broader use of simulation

Design Validation

- Drove significant improvements in automation/integration and expanded analysis capabilities
- Simulations became interesting to design
 - but still run by analysts
- Exposed the CAD/CAE interoperability dilemma



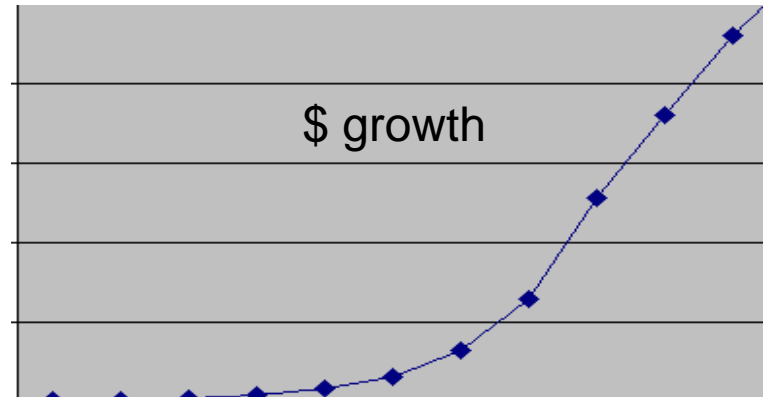
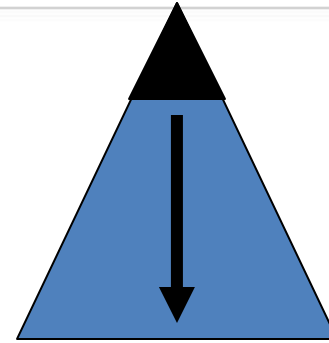
Design Decision Support



- Why not use simulation to make better design decisions
- Why not ask designers to run simulations

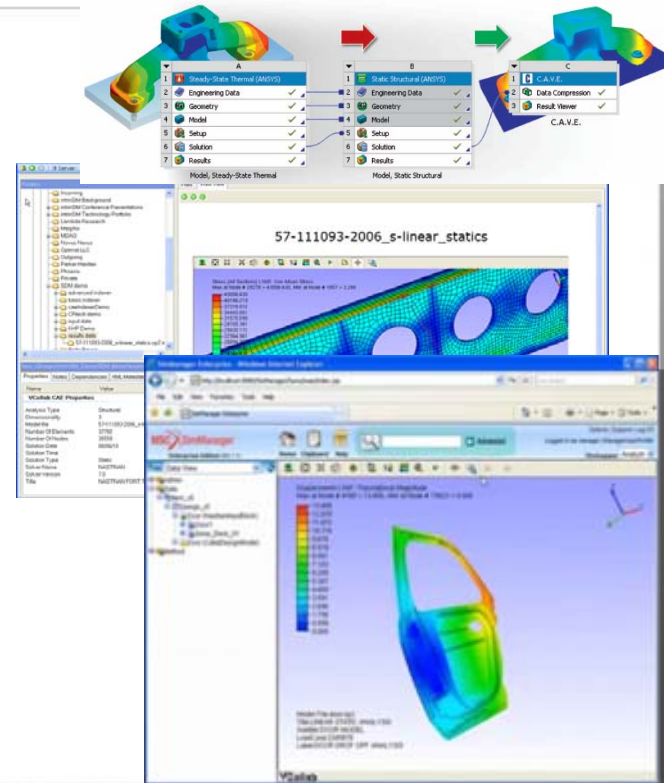
Design Decision Support

- Simulation Software vendors saw visions of “the promised land” for broader distribution to the bottom of the pyramid
 - However, multiple attempts at trying to spread simulation to simulation non-experts consistently failed

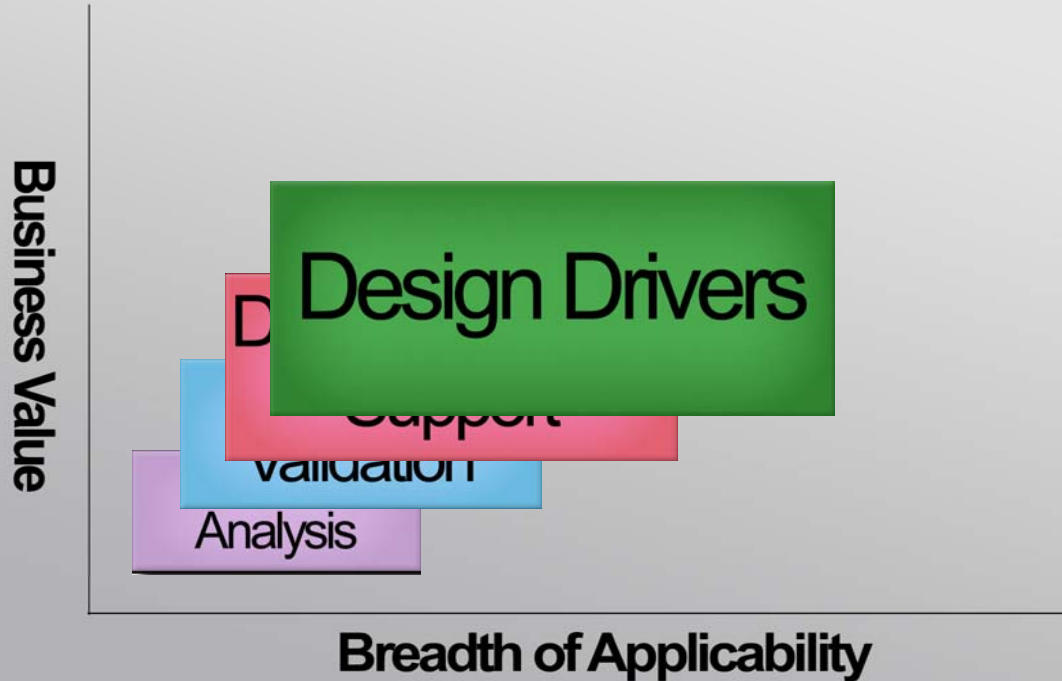


Design Decision Support

- Emergence of design related tools for Analysts
 - CAD integrated analysis
 - Design Space Exploration
 - Workflow approaches with multi-physics
 - Stochastics
 - Robust Engineering
- More analysts running more simulations on more designs more often
- Much more data → Simulation Data Management to track data and basis of design decisions
 - SDM is considered “interesting but not compelling” by most



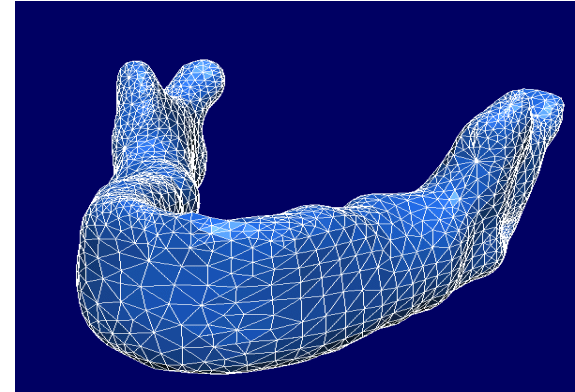
Design Drivers



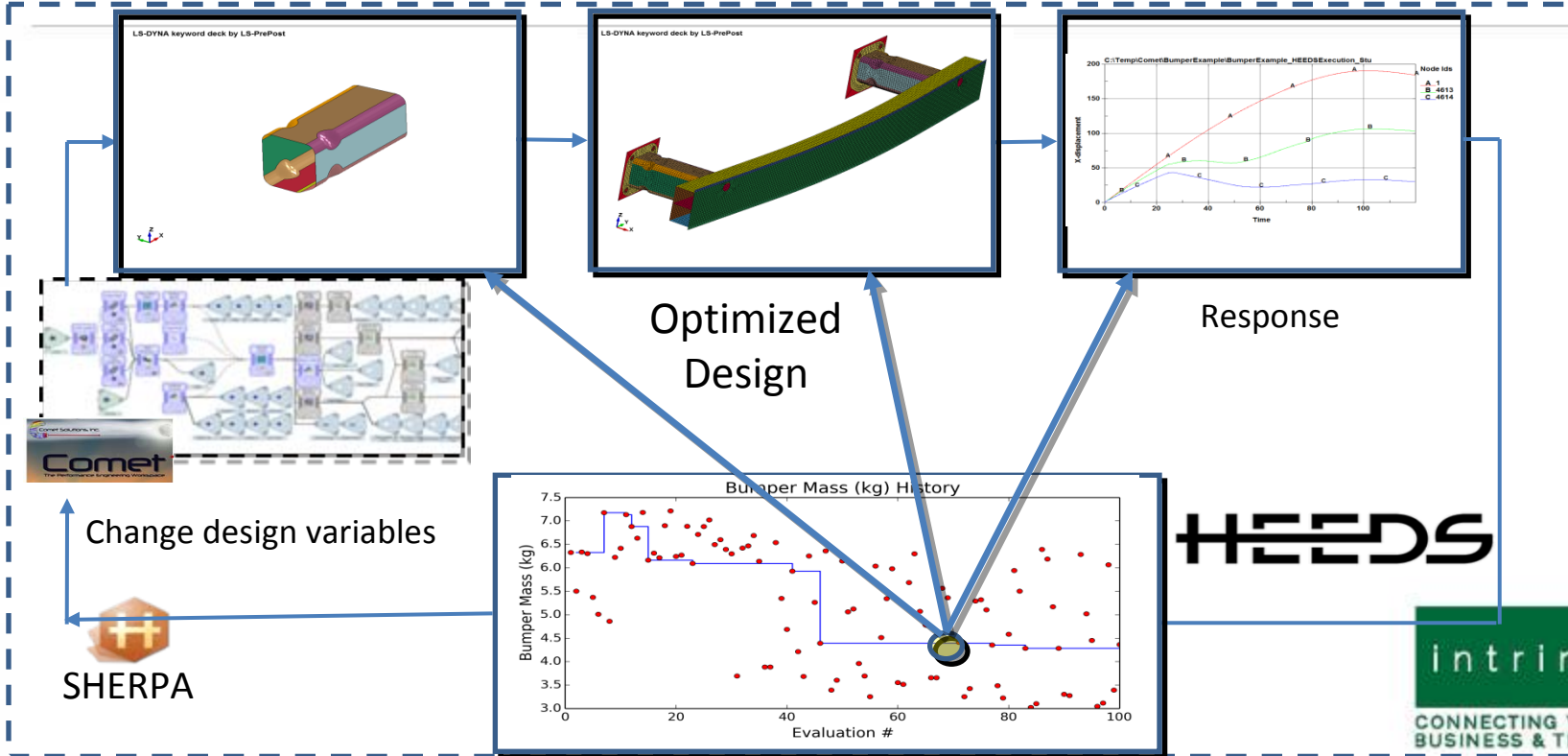
- Simulation Driven Design
- Simulation making design decisions

Design Drivers

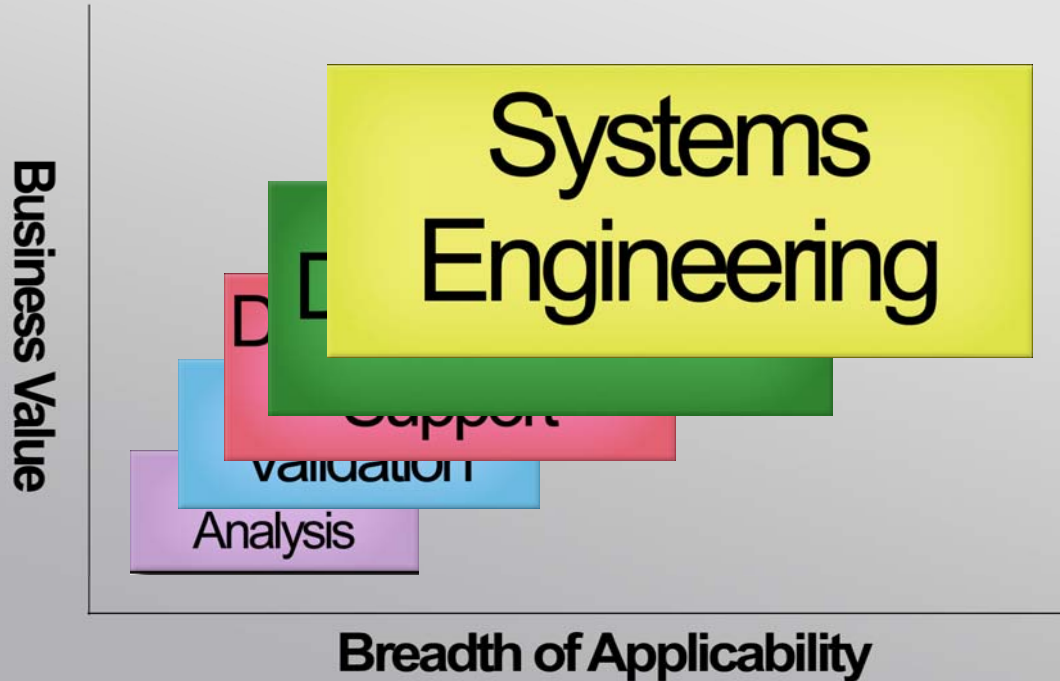
- "We are only at the verge of the era where simulation generates, rather than evaluates, geometry."
 - Keith Meintjes, CIMdata
- Emergence of design drivers for Analysts
 - Expanded use of Design Space Exploration
 - Topology Based Shape optimization
 - Analysis at concept stage
- Simulation Data Management becomes much more interesting



Design Drivers – Optimization (minimize mass)



Systems Engineering

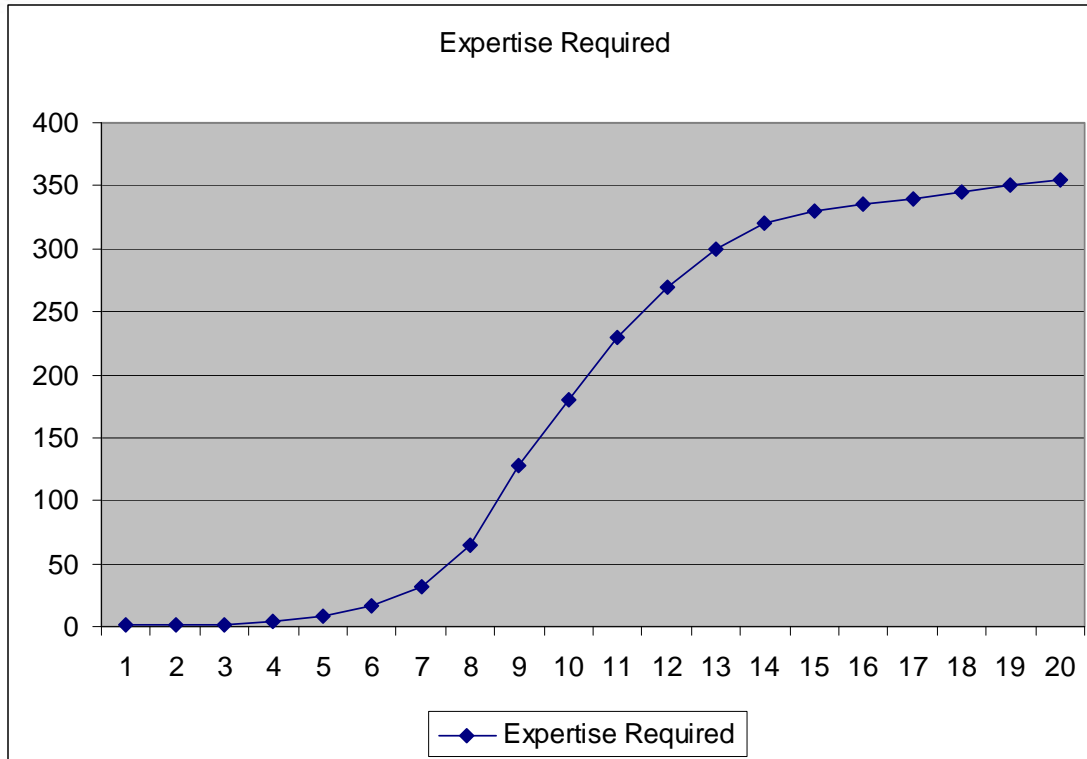


- Driven by growth of embedded software
- Heavily used in EDA world
- Design drivers extended to systems

Systems Engineering

- Exciting and promising – but path forward is unclear
 - 1D simulations are effective
 - How do we incorporate high fidelity 3D models
 - Response surfaces
 - Abstract modeling for analysis
 - Very active area of investigation
- Limited to a small number of “thought leaders” who can apply this to current simulation practices and experience
- Simulation Data management becomes necessary

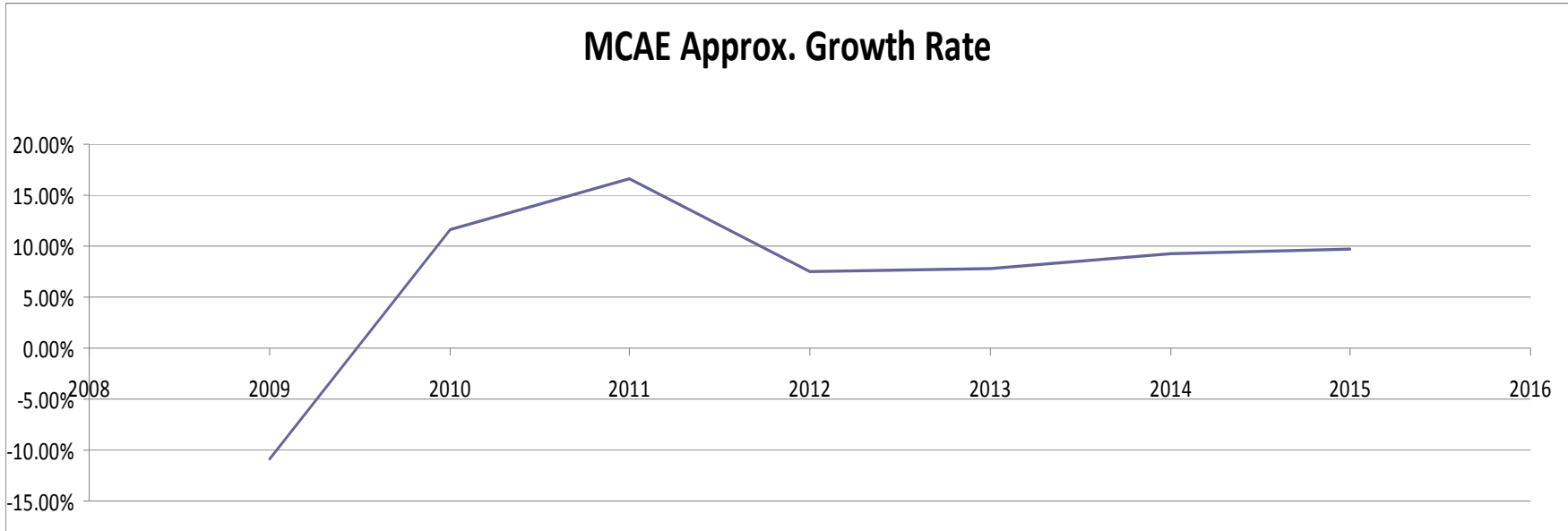
Business value drives broader demand



- Demand could be increasing on a classic S curve
- Is simulation at an inflection point to break through ?

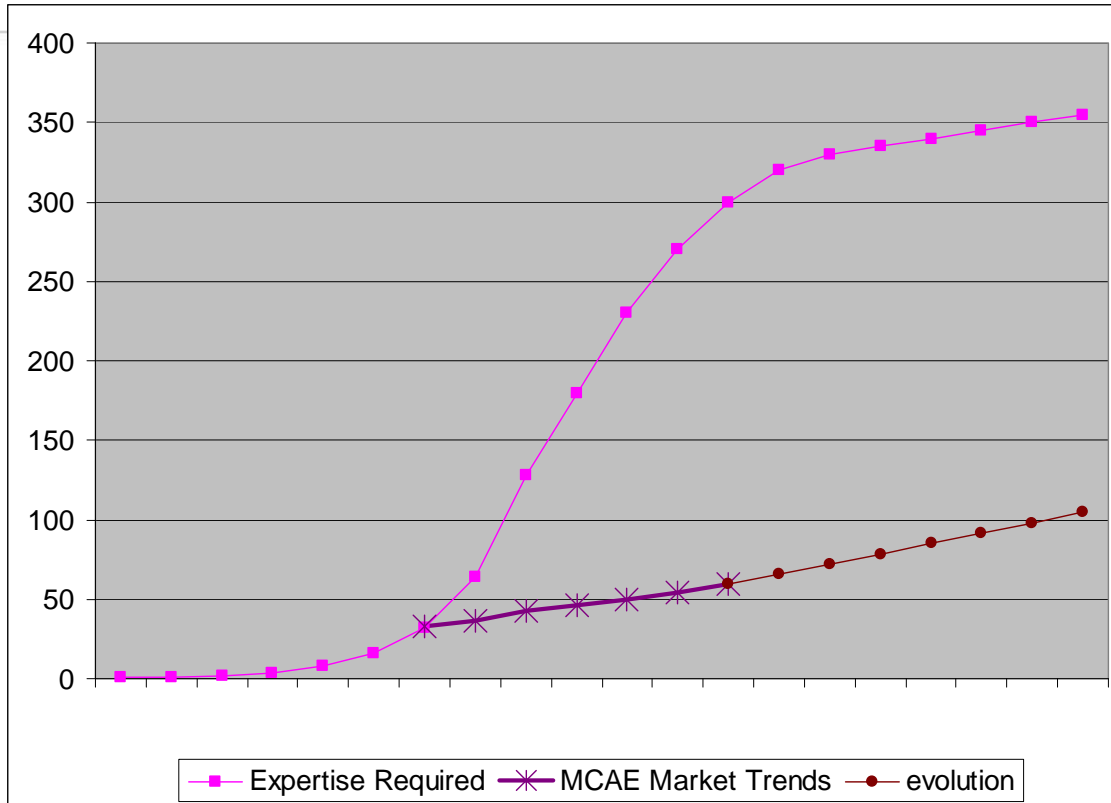
Business value drives broader demand

MCAE Approx. Growth Rate



- intrinSIM looked at actual & projected MCAE Market growth since 2009 (Courtesy of Cambashi data observatories)

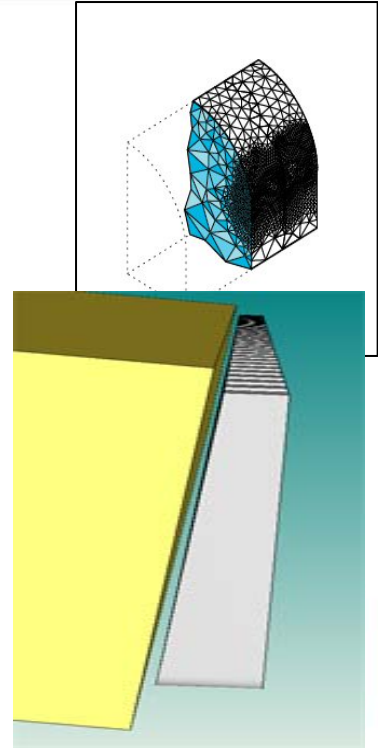
Business value drives broader demand?



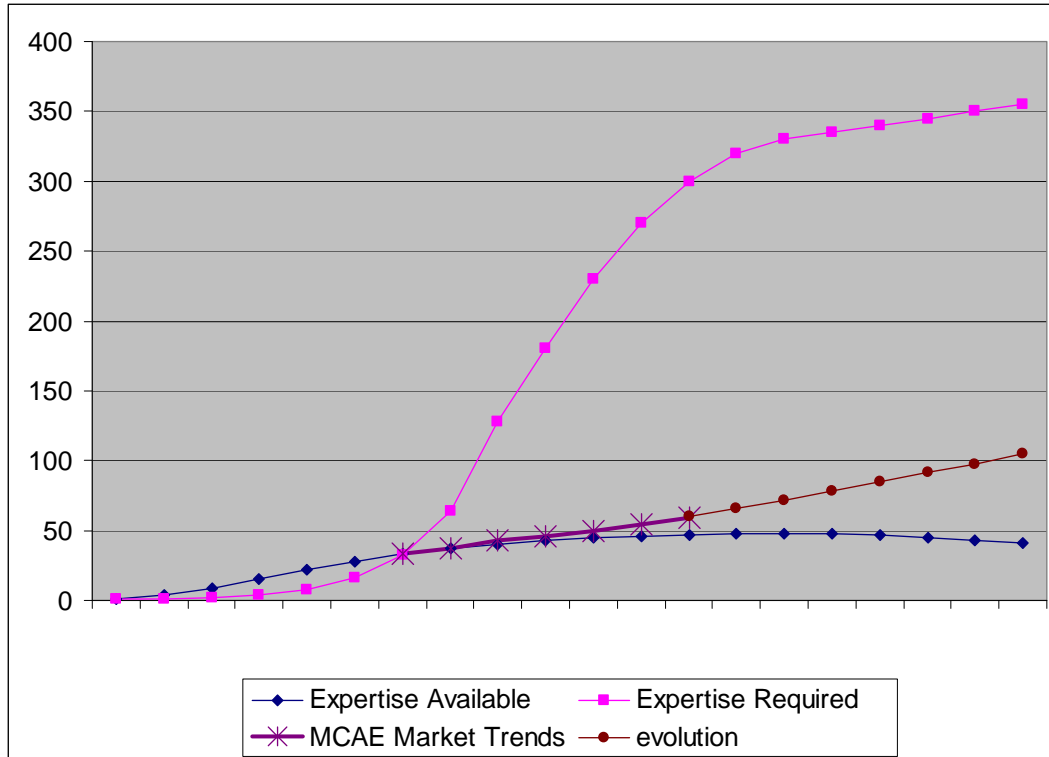
- Inserted MCAE growth and evolution based outlook
- This does not look like an inflection point
- What happened?

Enabling the evolution

- Focus on improved automation
- Focus on improved integration
- Focus on Simulation throughout the entire product lifecycle as a key performance indicator

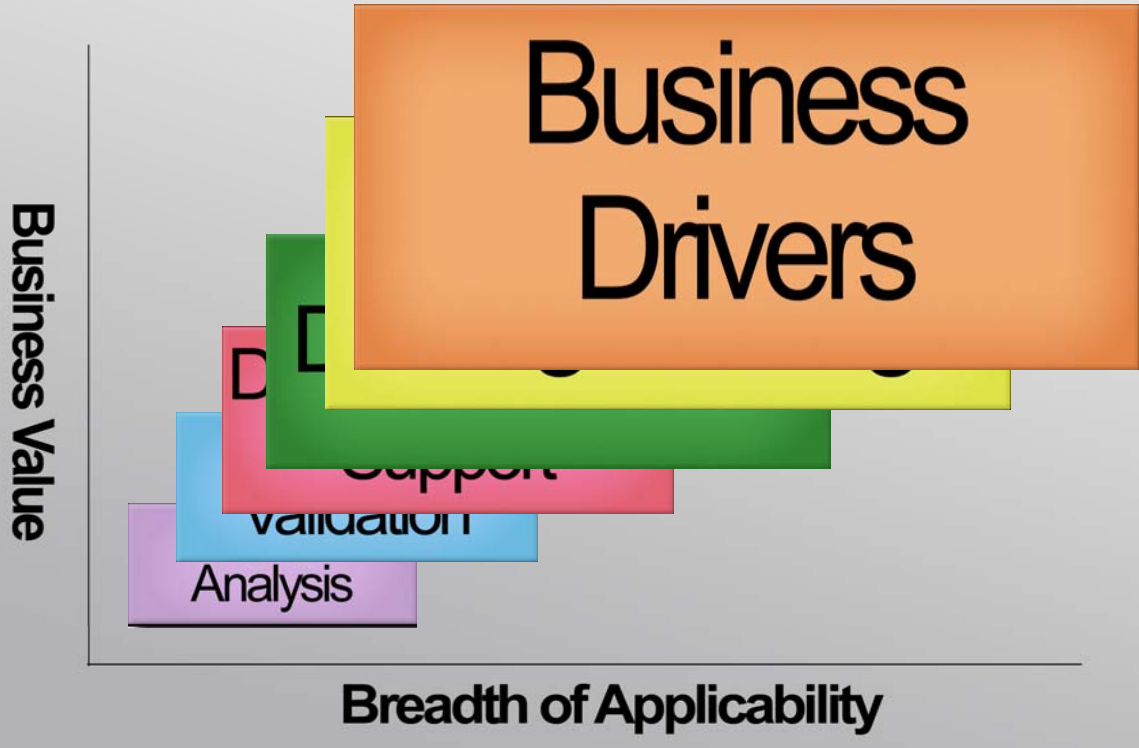


Business value drives broader demand



- Simulation is still done primarily by specialized Analysts
- Growth of MCAE market is tempered due to lack of expertise available

Business Drivers

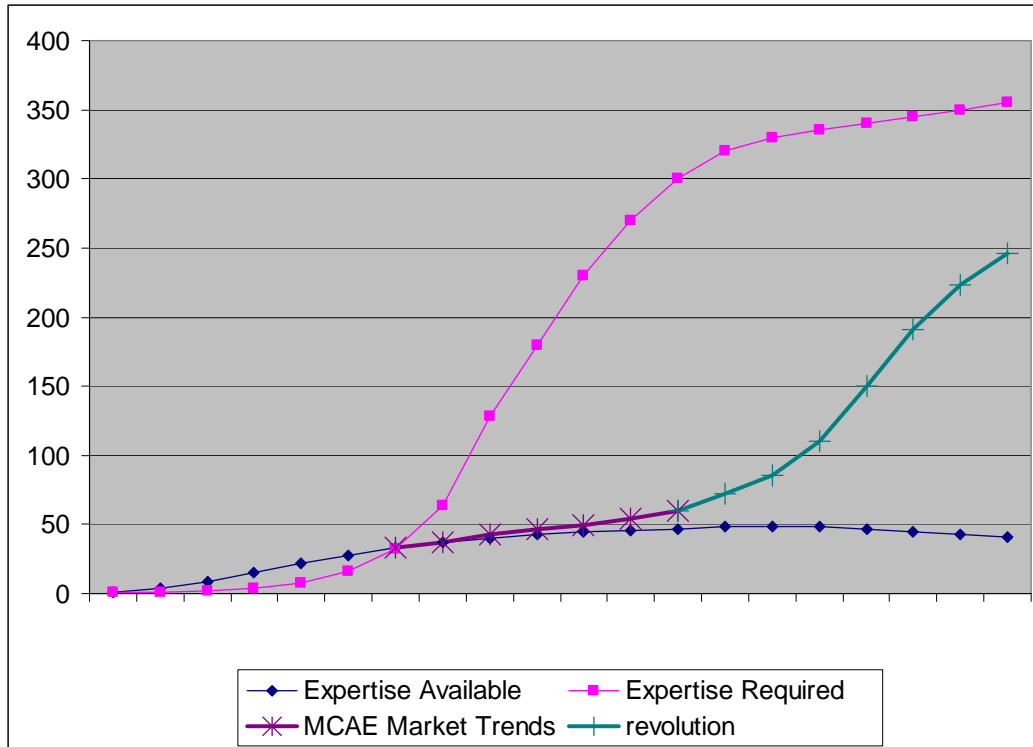


- Business Drivers are going to force a “**revolution**” to overcome the expertise based limitation
- Simulation will be forced to find a way

Business Drivers

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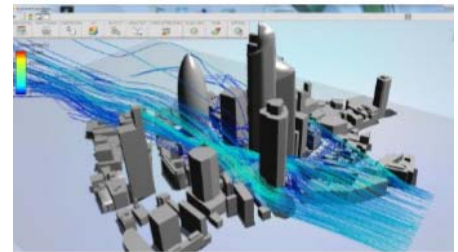
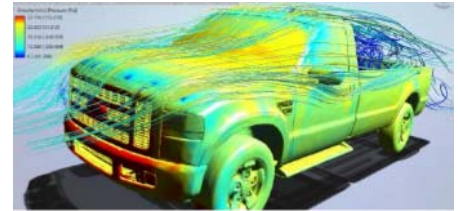
Business Drivers



- The demand is not going away
- A Simulation revolution will occur:
 - “Fit for purpose”
 - “Smart”
 - “Integrated”
 - “Transparent”

Enabling the revolution

- Increased emphasis on purpose built applications
- Increased emphasis on Systems Engineering
- Emergence of simulation knowledge capture & reuse
- Emergence of near real time / near physics approaches



Enabling the revolution

- Unlimited access for the appropriate “performance” evaluation needed
 - “Cloud” based simulation is the enabler but not the goal



The screenshot displays the SIMSCALE website interface. At the top, a dark navigation bar contains the SIMSCALE logo and links for Home, Industries, Stories, Product, Pricing, Community, and Company, along with buttons for 'Get Started', 'Sign Up', and 'Log In'. Below this is a blue banner with the text 'Engineering simulation in your browser' and 'Flexible and powerful simulation technology on-demand.' The main content area features a section titled 'SimStreamlinedForDesign:' with a navigation menu including Home, Account, Projects, Get Started, More Info, and a Logout button. The central focus is a promotional card for 'Simulation designed for designers' with the headline 'This is something we call streamlined.' and a sub-headline 'A simple straightforward process that allows designers to evaluate structural performance of design alternatives quickly and with confidence leveraging commercially proven and robust geometry import, automatic meshing, and analysis enabling a better understanding of design changes.' A 'LEARN MORE' button is present. To the right is a 3D model of a blue mechanical part with a stress analysis overlay. Below the main content are four columns: 'See for yourself' (with a description of sample models), 'Tutorials' (with a description of straightforward tutorials), 'FAQs' (with a description of frequently asked questions), and 'Your Account' (with a description of account management).



THANK YOU!

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