

# State of the art

**Andy Richardson** shares some key findings on the state of engineering simulation from a cross industry survey

The acceleration in the introduction of new technologies, and continuing increase in product complexity, coupled with reduced product development cycle times and costs, all contribute to the ever increasing challenge for engineers developing today's products.

Engineering modelling and simulation is today a critical tool in the engineer's toolkit, helping achieve their goals. Indeed, it is making a massive contribution, being used successfully to develop concepts, refine designs, optimise performance, assess sensitivity, ensure quality, and sign off design and production requirements. Simulation is enabling organisations to do this faster, more efficiently, at reduced cost, and at higher quality than ever before.

Indeed, many of today's products simply could not be delivered without engineering simulation.

## Feedback from industry on the status of engineering simulation today?

NAFEMS offer a training course on the subject; *"How to Build and Implement an Engineering Simulation Strategy"* ([www.nafems.org/strategy](http://www.nafems.org/strategy)). The course covers all of the elements essential to build and operate an effective and efficient simulation capability. So far, over 150 people have attended the course, ranging from; engineering and simulation leaders, through to simulation specialists. Participants attending the course take part in an interactive survey to provide insights on the key topics from experience of the situation in their own organisations.

## What does the survey tell us that organisations want from their engineering simulation?

The first step for any organisation building a capability in engineering simulation is to understand their goals. Depending on their current status, organisations will identify priorities and set specific objectives for the engineering simulation teams to meet. Hence, delegates on the strategy course are first asked to identify their Product Goals, i.e. what are they using simulation for? Unsurprisingly, the top answer (77%) was, to engineer the product to meet targets. Next, to optimise product performance (69%), and to verify the product meets requirements (68%). Interestingly, only 27% of delegates selected 'Certify the final design', perhaps suggesting a continued requirement for witnessed certification tests or maybe due to a lack of confidence in simulation results.

Delegates were next asked to identify their organisations Business Goals for M&S. Improving speed to market was the top answer (72%), then improving efficiency (70%), with reducing prototypes and testing a

close 3rd (68%). Surprisingly, 'deliver more product', was only selected by 2% of respondents.

## The essential elements of an engineering simulation capability

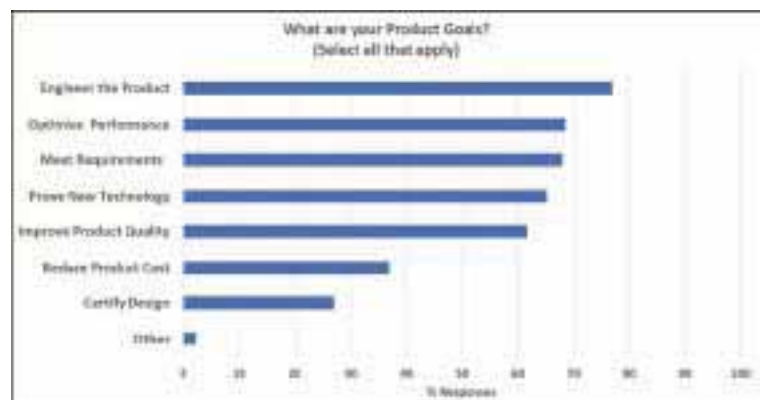
Seven elements can be regarded as essential to build and operate an effective and efficient engineering simulation capability. These can be summarised as:

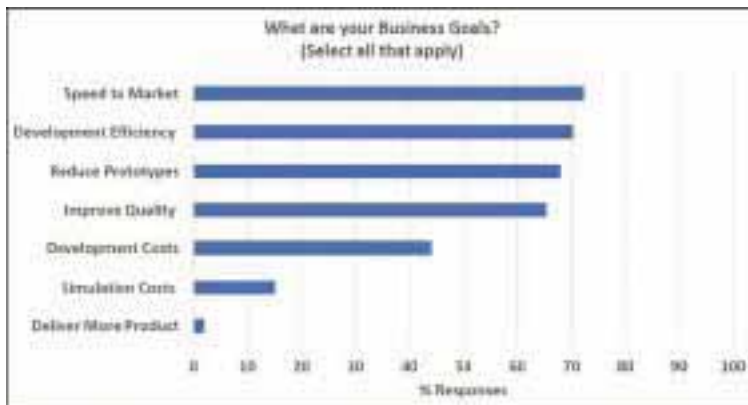
- Efficient processes
- Capable methods
- Appropriate tools
- Representative models
- Reliable data
- Skilled people
- Sufficient computing infrastructure

Each of these topics are covered in detail in the course, giving delegates the chance to consider each in the context of their own organisations.

## Challenges industry faces in delivering engineering simulation

Participants are asked to identify the top 3 challenges their organisations face in delivering their Engineering Simulation. 60% identified processes as their greatest challenge, followed by people and organisation (59%), then methods (46%) and data (39%).





For each element delegates are encouraged to consider the status in their own organisation, and hence what could be done to improve this.

### Survey findings on the challenges and opportunities across the essential elements

**Processes:** 60% of participants responded that their simulation processes take too long. 55% that processes are too complex, and 41% that they are un-documented. Indeed, over half of respondents reported that their organisations are spending ¼ to ½ their time on non-value-add tasks. Clearly, this suggests there is a significant opportunity for organisations to improve speed, efficiency and reduce costs.

**Methods:** 77% responded that methods are mostly developed on the job (experience based but undocumented). Half of organisations only use an informal process to verify confidence in methods, whilst 31% only sometimes use a confidence

metric. Representing a significant opportunity to improve simulation confidence and product quality.

**Tools:** The most common issue identified with tools is the cost @62%. 48% responded that they have too many tools, and 40% that they suffer poor tool to tool connectivity. Representing an opportunity for cost and efficiency.

**People and Organisation:** Simulation teams are organised very differently across businesses and shortage of skills remains a significant issue. Organisations need to invest in skills and ensure they are organised effectively to maximise collaboration and sharing.

**Models:** 69% of participants report that their model build activity is mostly manual. Suggesting opportunities to improve automation.

**Data:** 81% responded that they use structured file systems to manage their data, whilst 57% also use email to transfer data for simulation between team members.



This confirms the importance of organisations focussing on data management to improve data quality and process efficiency.

**Compute Infrastructure:** Computing is still dominated by inhouse solutions, with 57% using individual PCs for simulation and 43% also using Inhouse HPC. Use of the cloud still limited.

### Significant opportunities exist for improvement by focusing on the fundamentals

Organisations need to focus on the fundamentals, to make sure they have a solid foundation to build on and can use the following approach to build a strategy:

- Get leadership support and confirm the organisations goals
- Identify and build a collaborative stakeholder team
- Identify needs, requirements, and targets
- Assess the current state across the essential elements
- Identify gaps and improvement opportunities
- Identify priorities and build a roadmap
- Build a business case and allocate budget
- Detail planning, resourcing, project implementation
- Establish governance

### Key lessons

Engineering Simulation is a critical engineering tool, and yet in many cases there may be significant opportunities to improve the effectiveness and efficiency of this capability. Its critical for organisations to review their goals, conduct a maturity assessment, and build a simulation strategy to implement improvement.

More details on the topic will be shared at the NAFEMS UK Regional Conference.

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