TECHNICAL REQUIREMENTS FOR THE DEPLOYMENT OF ENGINEERING SIMULATION APPS

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ABSTRACT

The term "simulation governance" refers to the exercise of command and control over all aspects of numerical simulation through the establishment of processes for the systematic improvement of the tools of engineering decision-making over time. This includes selection and adoption of the best available simulation technology, proper formulation of mathematical models, management of experimental data, solution and data verification procedures, and the revision of mathematical models in the light of new information collected from physical experiments and field observations. For organizations engaged in the application of established design rules only data verification and solution verification, are important. The goal is to ensure that the data are used properly and the numerical errors in the quantities of interest are reasonably small. In the interest of consistency, reliability and efficiency, expert-designed standard processes should be established wherever possible Democratization of numerical simulation through the development and dissemination of expert-designed "engineering simulation apps" is gaining momentum; however such apps must meet certain technical requirements. They must be developed by FEA analysist for users who need not have FEA expertise; possess built-in safeguards to prevent use outside of the range of parameters for which it was designed; incorporate automatic procedures for solution verification, that is provide estimates of the size of numerical error for each of the quantities of interest; provide for automatic generation of reports and must be deployed with detailed documentation with clear indication of the assumptions incorporated in the mathematical model and the scope of application.

These engineering simulation apps can be designed to fit existing engineering processes, capturing as well as accumulating institutional knowledge and best practices with increased reliability and productivity. Among the benefits are consistency and reproducibility of results, efficient utilization of the time of expert analysts and designers alike, avoidance of needless replication of analysis tasks and timely delivery of reliable information needed in engineering decision-making processes.   Examples will be presented.