System Simulation Is Supposed To Be Profitable, RIGHT?

Consider these 10 points when evaluating your system simulation needs and tools.

1. Physics or Equation level modeling

For equation level tools, the users must develop their own modeling equations, program these equations (either by hard coding, or constructing block diagrams), debug them and can only then begin system analysis. Changes to the model often require major re-coding of the model.

Physics level (physics based) tools contain predefined models of engineering elements (ex. a mass or hydraulic orifice). The user combines these elements like building blocks to approximate the real system. *Expanding or changing the simulation model is usually GUI driven and quite simple.*

It is important to carefully evaluate your simulation project and determine which approach is more suitable. Keep in mind that some physics based tools also provide methods to incorporate equation-based techniques, should the need arise.

2. Solver capability

It is of no use to create a detailed set of system equations, and then not have the numerical method available to solve them efficiently. Most simulation tools provide several types of numerical methods (Runge-Kutta, Gear's method, etc) to solve the set of equations. These methods are optimized for a particular type of equation, or sometimes made very general but only efficient for some classes of numerical problems. How will the engineer determine which numerical method is best suited for his simulation, or will he be forced to use trail and error to find a suitable solver method?

Make sure your simulation tool is not attempting to solve a dynamic problem with a quasi-static method. Discontinuities can be considered as a "solver killer" and are often ignored or require manual intervention from the user. *Determine how much mathematical knowledge is required from the engineering user to obtain a good solution*.

3. Technical support

Choosing the right simulation tool is only one element in establishing efficient system simulation at your company. *In order to maximize your investment, a close working relationship with the simulation provider is essential.* When your engineers face an engineering question, will they talk to software developers or engineers working on real life consulting projects? How long will your engineers be out of action while waiting for support?

4. Learning curve

How much time must your engineers invest to learn a new tool? How quickly will an engineer be able to reuse the tool after a period of inactivity? How easily can a new engineer on the team understand existing models? These factors are often overlooked when calculating the cost of a tool.

5. Productivity

How easy is it to build a model? How much manual programming or parameter settings must the engineer make to build a model? How flexible are the predefined modeling elements? *Having the right mix of components and processing tools in a simulation environment can allow users to greatly expand their modeling capability, while increasing modeling speed.*

6. Multi domain

Any system simulation inherently contains physics from multiple domains. Does the simulation tool allow users to make erroneous connections between components and / or does it require manual intervention to find suitable connections between components?

7. Company history

Will the product exist in 10 years from now and deliver a long-term return on your investment? How well is the product documented and supported globally? Several simulation tools are developed by 1-man companies or university research centers. Although the university products are usually technologically highly advanced in specific domains, technical support and industrial survivability has to be considered. *Commercial simulation companies are profit driven, and sustained profitability only comes from sustained customer satisfaction.*

8. Hardware compatibility and Licensing

Will you be limited to a specific computer configuration or operating system? Will you be able to seamlessly transport models from one computer platform to another? What are your licensing requirements? Will you use the tool globally, company wide, on one station, or infrequently? Are there different and flexible payment schemes available?

9. Dedicated development

What if you have a special or new application that is not covered by existing physical models? Does the simulation company offer tools and / or services to develop the right tools for your needs?

10. Price

The initial cost of software (and maintenance fees) constitutes only a portion of the total cost of ownership of a software tool. The users' salary and the time required to build, debug, run, document and re-use models must be taken into account carefully. The effectiveness and level of technical support offered by the software supplier is a key factor in the successfulness of your simulation projects.

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