

Simulation and models definition

- Simulation is the imitation of the operation of a real-world process or system over time in a controlled environment for the modification or adjusting of the variables as needed.
- basically, it's a model that mimics the operation of an existing or proposed system at different scenarios or process changes.
- **Don't have to spend time (or money) building and testing multiple prototypes. You can settle on a design that satisfies the requirements in simulation before building an actual prototype**

A general-purpose simulation package can be used for any application, but might have special features for certain ones (like manufacturing, communications, or business process reengineering).

Arena

- Arena is a [discrete event simulation](#) and [automation](#) software developed by Systems Modeling and acquired by [Rockwell Automation](#) in 2000.
- **Arena is a simulation software product that provides an integrated framework for building simulation models in a wide variety of applications.**
- Based on discrete event modelling, Arena models are developed using a well-defined flowchart-based modelling methodology with an extensive library of standard modules.

An application-oriented simulation package is designed to be used for a certain class of application (like manufacturing, health care, or call centers). Manufacturing Automod (banks and brooks) , medmodel (healthcare)

Medmodel

- **a powerful Windows-based simulation tool for simulating and analyzing health care systems of all types and sizes.**
- MedModel focuses on issues such as resource utilization, system capacity, and capability. By modeling the important elements of a health care system, you can experiment with different operating strategies and designs to achieve the best results.
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- **provides the perfect combination of ease-of-use and complete flexibility and power for modeling nearly any situation, and its realistic animation capabilities makes simulation come to life.**

Typical applications for using MedModel include:

- Facility planning
- Health care policy formulation
- Staffing & equipment requirements planning
- Disaster planning
- Managed care analysis
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Features:

The important features to consider when selecting simulation software are:

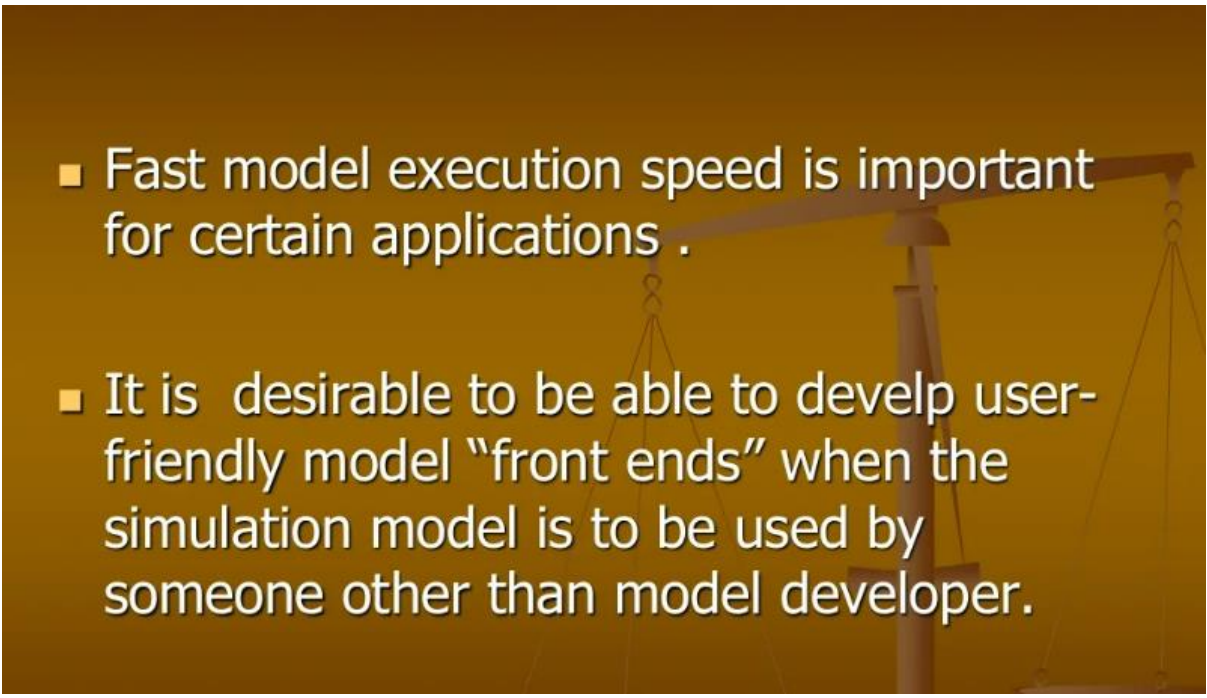
- General capabilities
- Hardware and software considerations
- Animation
- Statistical features
- Customer support and documentation
- Output reports and plots

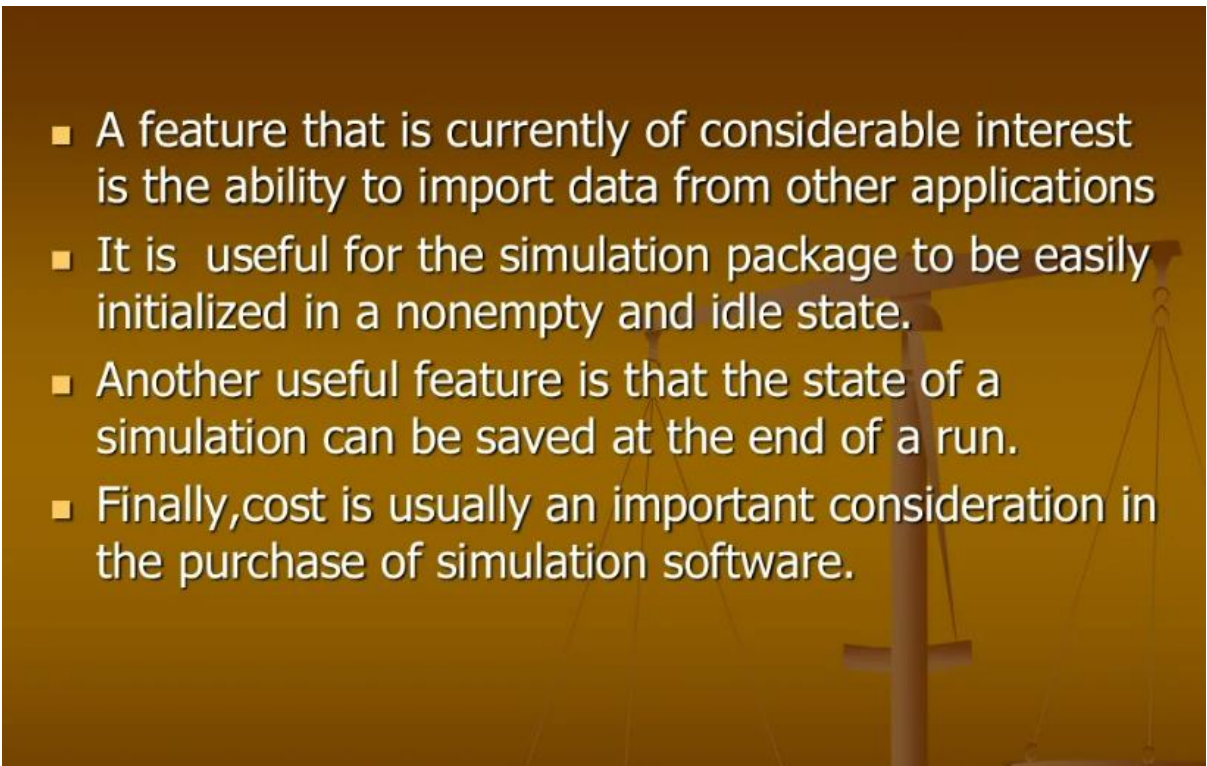
General Capabilities

The most important feature for a simulation software product to have is modeling flexibility. The following are some specific capabilities that make a simulation software flexible:

- Ability to define and change attributes for entities and also global variables and to use both in decision logic
- Ability to use mathematical expressions and mathematical functions
- Ability to create new modeling construct and to modify existing ones.

- Follow a single entity through the model to see if it is processed correctly
- See the state of the model every time a particular event occurs.(e.g. machine breakdown).
- Set the value of certain attributes or variables to “force” an entity down a logical path that occurs with small probability.

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- A faint, stylized image of a balance scale is visible in the background of the slide. The scale is tilted slightly to the right, with the right pan hanging lower than the left. The background is a solid dark brown color.
- Fast model execution speed is important for certain applications .
 - It is desirable to be able to develop user-friendly model “front ends” when the simulation model is to be used by someone other than model developer.

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- A feature that is currently of considerable interest is the ability to import data from other applications
 - It is useful for the simulation package to be easily initialized in a nonempty and idle state.
 - Another useful feature is that the state of a simulation can be saved at the end of a run.
 - Finally, cost is usually an important consideration in the purchase of simulation software.

Hardware and software requirements

- In selecting simulation software, one must consider what computer platforms the software is available for.
- If a software package is available for several platforms, then it should be compatible across platforms.
- The amount of RAM required to run the software should also be considered.
- One should also consider what operating systems are supported, such as Windows 98, Windows NT and UNIX.

Animation and Dynamic Graphics

- The availability of built-in animation is one of the reasons for the increased use of simulation modeling.
- In an animation, key elements of the system are represented on the screen by icons that dynamically change position, color and shape as the simulation model evolves through time.

Statistical Capabilities

If a simulation product does not have good statistical-analysis features, then it is impossible to obtain correct results from a simulation study.

- The software must have a good random-number generator. Each source of randomness in the system of interest should be represented in the simulation model by a probability distribution.
- The simulation software should allow the user to specify what performance measures to collect output data on, rather than produce reams of default output data that are of no interest to the user.

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Customer Support and Documentation

- The simulation software vendor should provide public training on the software on a regular basis, and it should also be possible to have customized training presented at the client side.
- Good technical support is extremely important for questions on how to use the software and in case a bug in the software is discovered.
- Good documentation is a crucial requirement for any software product.
- There should be detailed description of how each modeling construct works.
- Most simulation products offer a free demo disk and in some cases, a working version of the software can be downloaded from the vendor's web page

Output Reports and Graphics

- Standard reports should be provided for the estimated performance measures.
- It should also be possible to customize reports, perhaps for management presentations

The simulation product should provide a variety of graphics.

- It should be possible to make a histogram for a set of observed data.
- It is desirable if results for different simulated scenarios can be stored in a database and, if desired, plotted on a single graph.
- A correlation plot is a useful way to measure the dependence in the output data produced from one simulation run

Some popular simulation softwares

- **Matlab: matrix laboratory** developed by MathWorks., high-level programming language and interactive environment for numerical computation, visualization and programming.,
- matrix manipulations; plotting of functions and data; implement algorithms; analyze data; develop algorithms; and create models and applications.
- Signal Processing and Communications
- Image and Video Processing
- Control Systems
- Test and Measurement
- Computational Finance
- Computational Biology

Fusion 360:

- by Autodesk
- is a cloud-based 3D modeling, CAD, CAM, CAE, and PCB software platform for professional product design and manufacturing.

Simscale:

- CAE software ,
- The platform is cloud-based and provides instant access to computational fluid dynamics (CFD)
- The SimScale platform provides capabilities for solid mechanics, fluid dynamics and thermal analysis.

Blender

Simpy:

- a Python library that enables users to simulate real-life events.
- SimPy is a process-based discrete-event simulation framework based on standard Python.
- `pip install simpy`

Solidworks:

- SOLIDWORKS is used to develop mechatronics systems from beginning to end. Mechatronics, the combination of robotics, electronics, computer, and control systems,

Anylogic:

- multimethod [simulation](#) modeling tool developed by The AnyLogic Company .
- It supports [agent-based](#), [discrete event](#), and [system dynamics](#) simulation methodologies

Sanskar Phet

Sandesh Blender:

- Blender is a free and open-source 3D creation suite that supports pretty much every aspect of 3D development.modeling, rigging, animation, simulation, rendering, compositing and motion tracking, even video editing and game creation.
- Blender is cross-platform and runs equally well on Linux, Windows, and Macintosh computers. Blender software is free and downloadable from its [official website](#).
- Blender software was developed out of the Blender Foundation, a nonprofit organization formed in 2002.
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