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# Decision Aid for Electronic Simulation in Construction

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## DECISION AID FOR ELECTRONIC SIMULATION IN CONSTRUCTION

### THE NEED

The construction industry can strongly benefit from the use of interactive three-dimensional computer models. These models provide a simulation environment that could include one or more of the following: (i) spatial visualization, (ii) virtual interactive environment, and (iii) construction process simulation of the facility under construction. Despite the benefits offered by the interactive three-dimensional computer simulation models their use in the construction industry has been limited to sophisticated process and power owners, engineers, and contractors. With the advancement in technology many simulation packages are available in the market that can be effectively used by the construction industry. These simulation programs offer various features and functions that should be carefully evaluated by the user with respect to their specific need to select the most appropriate simulation package. The lack of guidance and information regarding simulation programs available for construction application might lead the users to invest in a software package that may not address all their current and future needs.

### THE TECHNOLOGY

The Decision Aid for Electronic Simulation in Construction is an output of the research “Electronic Simulation in Construction” sponsored by CII (Construction Industry Institute). Research was conducted to find the state of art, state of practice, state of development, state of research, and the state of future of Electronic Simulation in Construction.

The Web-based Decision Aid was developed to assist a decision-maker in utilizing the results of this research. This system along with the database allows the user to (i) establish the need for electronic simulation, (ii) ascertain specific needs with respect to application domain, product features, and operating system requirements, and (iii) identify products and suppliers that support the need and requirements established in the previous steps.

The Web-based Decision Aid has two components: (i) database and (ii) a decision model with a web interface. The database is used for storing information with respect to



suppliers and products and it has an administrative interface for updating and maintaining the data. The decision model on the other hand is a Web-based model that can be accessed from the Internet and has two modules: (i) Module-1: Preliminary needs assessment (Suitability) and (ii) Module-2: Product availability to address the need (Product Selection).

The web based user interface is very easy to follow and leads the user through Module-1 and Module-2 in identifying the need and selecting the appropriate technology.

***SUITABILITY:***

Basic aim of this module is to help users identify the need for Electronic Simulation in Construction for their company with respect to the size of their company, technological advancement, flexibility to accept change, strategic plan, type of clients, type of projects, technical infrastructure in place, etc.

***PRODUCT SELECTION:***

User is able to search for available Suppliers and their Products in the field of 3D CAD, Virtual Reality and Mathematical Simulation. The Supplier products on this site are for the Construction industry and may or may not be applicable directly outside the construction industry.

For the purpose of this Model, Electronic Simulation is defined to include (i) spatial visualization (3D-Static), (ii) virtual interactive environment (3D-Dynamic), (iii) construction process simulation (mathematical models), as well as (iv) an integrated simulation environment to include 3D-Static, 3D-Dynamic, mathematical simulation models, as well as other project management software.

- Spatial Visualization (3D-Static) is defined as the use of 3D CAD systems/tools for spatial visualization and analysis in contrast to simple 2D rendition. Example: 3D-Model Review
- Virtual Interactive Environment (3D-Dynamic) is defined as the use of visualization systems/tools to present 3D objects or project plans into computer generated interactive virtual project environment for visualization, simulation, and analysis. Example: Animated 3D-Model Construction Sequence
- Construction Process Simulation (mathematical models) is defined as the use of mathematical models/tools to simulate system interactions with an objective to determine activity bottlenecks, forecast impacts, resource requirement, and productivity of the system or process. Example: Monte Carlo based models, MicroCYCLONE, Stroboscope, COOPS, etc

Through an interactive set of questions, the user is lead to a list of appropriate solutions and detailed information on each software.

**BENEFITS**

Electronic simulation environment has a strong potential to assist construction managers in issues such as preplanning for capital projects, reducing number of changes in a project, improving safety, and in providing integrated cost and schedule control procedures. The Decision Aid assists the user in defining the need and selecting the most appropriate product for their specific simulation need.



## **STATUS**

The Decision Aid for Electronic Simulation in Construction is an output of the research “Electronic Simulation in Construction” sponsored by CII (Construction Industry Institute), based in Austin, TX. Professor Makarand Hastak (Purdue University, West Lafayette, IN) developed this system as a part of that project.

## **BARRIERS**

The results of this research represent a “snapshot in time” of the state of technology. The technology is rapidly changing and developing with additional improvements made by suppliers driven by the increased demands of the marketplace for more intuitive and functional solutions and systems. This research has also developed a Supplier Criteria Review (SCR) Checklist that can be used for updating the information on the desired products identified through the decision aid.

## **POINTS OF CONTACT**

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## **REFERENCES**

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Web site at <http://rebar.ecn.purdue.edu/ciiweb/Welcome.asp>  
CII (Construction Industry Institute) research information  
<http://www.engr.utexas.edu/news/articles/200705101234/index.cfm>

## **REVIEWERS**

Peer reviewed as an emerging construction technology

## **DISCLAIMER**

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

## **PUBLISHER**

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