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### How 3-D printing is changing AEC industry

CARLTON MCFADEN

Have you ever wanted to get a small model of your house? Well, it is now possible with a technology called three-dimensional printing, or 3DP, and it is changing the way that the architecture, engineering and construction community conducts business.

3DP is a young industry, having been in existence for only about 20 years. It is also referred to as rapid prototyping or additive fabrication. 3DP is a process by which you send a 3-D CAD, a computer-aided design file, to a 3-D printer, and the printer builds a physical model of that file one cross-section at a time.

This technology has many applications but is primarily used by mechanical engineers and industrial designers for product development.

However, thanks to recent advancements, it is now in the early stages of adoption by the AEC industry. The major areas of advancement have been in user skill, CAD software compatibility with 3DP and improved 3DP technology. Today's AEC professionals can now create quality 3-D files of their designs, and a good file is crucial to getting an aesthetically pleasing and structurally sound 3-D model.

Because of this, 3DP has become a viable option for architecture, engineering and construction and AEC software providers such as Autodesk and Bentley have upgraded their programs to support 3DP file formats.

Finally, 3DP technology continues to improve with stronger materials, office-friendly equipment, simplified operation and the option of full-color models.

There are numerous competitive advantages for the AEC firm that adopts 3DP. First, 3-D-printed models are far cheaper to build, easier and faster to produce and more accurate than those created from traditional model-making methods. These benefits and cost savings allow physical modeling to become an integral part of the entire design process instead of a token that represents the completion of a milestone on a project time line.

Having physical models early in a project greatly improves communication between design team members. This enhanced communication helps the team make changes earlier in a project when revisions are cheaper and easier to implement, thus reducing a project's time and expense.

However, perhaps the greatest benefit of producing physical models earlier in a project is the increased buy-in that can be gained from the firm's clients and stakeholders. While AEC professionals are accustomed to viewing computer renderings of a building site, physical models help public officials and customers, who can be unfamiliar with viewing 3-D renderings, to better visualize how the final product will look.

This approach can be used for large site models, a single building, massing/spatial/detailed models or shadow studies.

Geographic Information System 3-D data can be printed to show actual city landscapes, and proposed buildings can be added to show the effect on a city's skyline.

When seeking approval from a customer, just remember: If a picture is worth a thousand words, a model can be worth a thousand pictures.

One way for an AEC professional to come up to speed with 3DP is the new American Institute of Architects course called "3-D Printing for Architecture/Engineering/Construction." The course is worth 1.5 hours of Continuing Education System learning credit for AIA members. It is taught by a 3DP professional from a company such as Anvil Prototype & Design in Hampton, and includes an introduction to 3DP, how it works, utilizing it in the design workflow and creating good data for printing.

Other options for learning include attending a seminar with a 3DP company or inquiring with a CAD software provider.

Once educated on 3DP, AEC professionals must decide how to utilize it. AEC firms can bring printing in-house with a capital investment in a 3-D printer, or they can outsource by sending files to a service bureau.

The obvious way to maximize the benefits of 3DP is to bring it in-house. A firm can get started for less than \$30K, which gets the company everything it needs: a printer, materials and professional training, service and support. With this investment, a firm can take full advantage of the speed and ease of model-making while avoiding the time delays and product markup that come from purchasing outsourced models.

For a small firm or individual AEC professional, outsourcing to a 3DP service bureau or to a reprographics firm that provides 3DP service may be the better option. Companies offering 3DP services can also be helpful to AEC firms that need file clean-up services due to a lack of expertise or time/manpower constraints.

3DP is still in the early stages of use with AEC, but it is becoming increasingly popular. AEC firms that embrace 3DP are among the heaviest users of the technology. This means that these early adopters have realized 3DP's competitive advantage.

Forward-thinking firms that implement this technology soon will enjoy a first-mover advantage and leap ahead of their competitors in client satisfaction, reputation and increased business.

Carlton McFaden is a managing partner at Anvil Prototype & Design in Hampton. He oversees the company's mid-Atlantic operations. He can be

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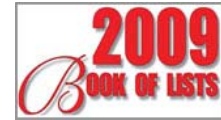
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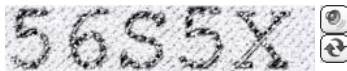
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