

Business Case Study: Sharing a vision

Kevin Lach

Full-color 3-D printing helps Nordic civil engineering giant Ramboll communicate concepts.

Firm

[Ramboll Group](#), Copenhagen, Denmark

Objective

Convey civil engineering visions to prospective clients, established customers, and engineers throughout the 4,000-person company.

Product application

Use a full-color 3-D printer to produce 3-D physical engineering models on demand.



Landmark buildings, breathtaking bridges, efficient roadways, and reliable public utilities serve as convincing testament to the Ramboll Group's engineering vision. Communicating one's vision prior to winning a job, however, is another matter. This is one reason that Ramboll, a \$577 million Nordic engineering consultancy, has adopted advanced 3-D printing capabilities for all of its operations.

Ramboll operates an extensive international business offering full-service consultancy in infrastructure, telecommunications, building, health, industry, oil/gas, energy, environment, IT, and management. The company earned record profits in 2005 and achieved a 98 percent customer satisfaction rating.

Despite its successful track record, Ramboll faces aggressive competition for new business. From the start of a business relationship, the company must convincingly establish the advantages it can offer the client. While Ramboll has always been proud of its engineers' design concepts, it's always been a separate task entirely to make the words, blueprints, and pictures behind the designs vivid, memorable, and compelling in the minds of prospective clients.

Seeking new ways to improve its competitive capabilities, the company in late 2004 identified 3-D printing as a potential solution. From the start, Ramboll saw full color as an indispensable capability. That requirement made the evaluation process straightforward. Early in 2005, Ramboll invested in a Z Corporation Spectrum Z510 3-D printer, the only high-definition, multi-color 3-D printer on the market.

The Spectrum Z510 produces 3-D architectural and engineering models in shorter time and, in most cases, at far less cost than traditional handcrafting. The models' fine, multi-colored detail enable the company to vividly communicate its unique vision. The Spectrum Z510's ability to print image-files on surfaces gives the models a realistic and picturesque touch and is an especially important factor when presenting infrastructure projects. For example, Ramboll engineers can map textures such as brickwork onto a wall, or they can map aerial photos onto terrain models.

New business

These new capabilities are improving Ramboll's success at winning new projects. Shortly after purchasing the Spectrum Z510, Ramboll competed for a high-profile bridge project in its home country of Denmark. The company was able to depict special V-shaped abutments that consume less space and material than traditional vertical pillars. The model conveyed the concepts behind the innovation and helped Ramboll win the job.

"3-D printing gives our prospective clients a good idea of our unique capabilities," said Gita Monshizadeh, CAD

development manager for Ramboll's transport and infrastructure division. "We can create compelling presentations that give tangible substance to the superior Ramboll vision in full detail and vibrant color. The colors, the detail, and the textures—down to the seams on a model of a masonry wall—establish our credibility immediately with the client and are quite convincing."

In addition to securing new business, 3-D printing saves Ramboll money. For example, Ramboll recently needed a model of a 12-story apartment building and discovered that it requires just one-third of the expense to print the model in full color compared with commissioning a model by hand. Then there is the simplicity of 3-D printing with the Spectrum Z510. Engineers can produce the model by printing directly from a digital design file produced by applications such as Bentley Systems MicroStation or Autodesk 3ds Max software.

"It takes little or no effort to turn a design into a full-color physical model if you have a proper print scale," Monshizadeh said. "If your design is in 3-D, you have what you need to make a 3-D model. Sometimes you have to optimize the model so that the scaling factor allows printable elements, but in many instances that's not a big effort. It's quite the opposite case to fabricate a handmade model, where essential fine detail can consume great amounts of production time. In other words, 3-D printing lets us think more creatively and spatially when we work on a project. We can easily print different technical phase-models for important comparison."

On another occasion, Ramboll needed to introduce a New York architect to the landscape around the planned Orestad district of Copenhagen, for which Ramboll has a multifaceted engineering contract. Rather than fly the architect to Denmark, Ramboll printed a 3-D model of the landscape and took it to a meeting with the architect in New York. The 3-D model provided the architect with a clear and concise vision of the landscape that was almost as helpful as if he had visited the site. A site visit would have been far more time-consuming for all parties involved, and the model will be handy for the architect's reference throughout the project.

Ramboll engineering teams can now work from physical models in three dimensions instead of 2-D images on a computer screen. This difference was particularly helpful for a 12-member Ramboll team recently charged with the engineering work for a \$25 million glass-domed elephant house at the Copenhagen Zoo designed by British architect Sir Norman Foster. The third dimension in the printed physical model promoted a gut-level understanding of what the engineering work would entail.

"A full-color 3-D model helps the team keenly understand the intent of the architect with every feature in context," said Monshizadeh. "Architectural designers think in spatial terms, and a 3-D model helps bridge the gap between them and the engineers charged with bringing the design to reality. With a physical model, the engineers can see the concept in concrete terms and can easily imagine themselves in the 3-D space. By improving our engineers' understanding we are improving their accuracy, and we are avoiding the time, cost, and embarrassment of errors that are ultimately unnecessary."

"Internally and externally, there's just something about a 3-D model that stirs the passions in ways that a blueprint or computer file just can't," she said. "For this reason, 3-D printing has become a distinct competitive advantage for us, and ultimately, a tool that significantly benefits our customers."

Kevin Lach is vice president, marketing for [Z Corporation](#).

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