



# THE REALIZATION GROUP

The Realization Group uses ZPrinter®310 Plus to quickly and affordably realize clients' architectural visions

- **The Realization Group** – A multi-dimensional visualization firm in Miami, Fla.
- **Challenge** – Reducing the time and expense of physical architectural models for clients facing hard deadlines
- **Solution** - Using the ZPrinter 310 Plus to produce architectural models on demand
- **Results**
  - Models delivered to customers four times more quickly than laser-cutting
  - Models cost as little as one-sixth that of stereolithography
  - Word of mouth spreading quickly throughout Miami architectural community
  - Additional customers can now afford physical architectural models
  - The Realization Group can provide two or three models for previous price of one

“Speed is the key. I can take an order for a model today and drop it off with the customer tomorrow. Cost is another key ... I can make that model for one-fourth the cost of stereolithography or laser-cutting.”

– RAFAEL TAPANES  
OWNER  
THE REALIZATION GROUP



The Realization Group used the ZPrinter 310 Plus to create this 28-inch-high model of “The Met” in Miami, in one-fourth of the time and cost of traditional architectural modeling methods.

Architectural models breathe life into abstract concepts, but they have traditionally taken so long to create that clients wonder if they're waiting for an actual building to go up.

This pain is troublesome for architectural firms facing important deadlines like client presentations or public hearings. It has created a tremendous business opportunity, however, for The Realization Group, a multidimensional visualization firm in Miami, Fla. The firm is now using in-house 3D printing to create dazzling, finely detailed architectural models in a fraction of the time it takes to hand-craft those models or to delegate the work to a subcontractor.

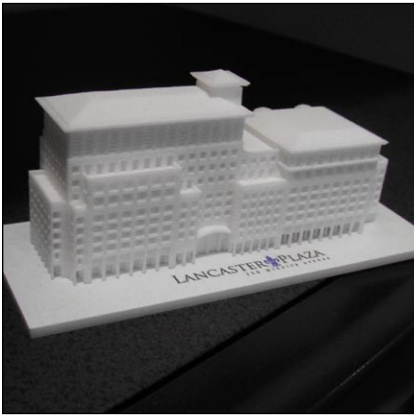
## Challenge

### Time and Expense of Traditional 3D Model Creation

The Realization Group has been a service bureau for architects, engineers

and builders since 1997, when it began creating computer simulation models and animations for professionals who needed a way to bring their building concepts to life. Over the next few years, the company naturally branched out to physical massing models. It has recently been producing these models by laser-cutting plastic or sending design files to an outside vendor who creates physical models via expensive stereolithography. Both are time-consuming and expensive options.

Through 2005, The Realization Group offered physical models primarily as a goodwill service to satisfy customer needs and secure business. Realization Group owner Rafael Tapanes, however, spent that same year investigating ways to make the physical modeling business more cost-effective for both his company and his clients. He'd been following the development of a new breed of fast and affordable 3D printers, and he investigated the pros and cons of various 3D printer offerings.



The Realization Group printed 100 of these models in an astonishing two days

“Clients love the models. The turnaround is fabulous, the price is great, and the detail is all they need. My clients are demanding, but they’re delighted with this new service.”

– RAFAEL TAPANES  
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## Solution

### Invest in ZPrinter 310 Plus

Tapanes considered speed, printing quality and price to determine value. After a year of evaluation, he decided The Realization Group should invest in the ZPrinter 310 Plus from Z Corp. of Burlington, Mass. The machine was five times faster than any other system and one-sixth of the price of the runner-up in his evaluation.

“Speed is the key,” Tapanes says. “I can take an order for a model today and drop it off with the customer tomorrow. News of our new capability is spreading quickly by word of mouth. Cost is another key. In addition to the low machine price, I can make that model for one-fourth the cost of stereolithography or laser-cutting.”

## Results

### Speed, Affordability, Profit and Client Satisfaction

The benefits of speed and affordability revealed themselves from the start. In early 2006, a real estate developer was forced to make significant revisions to a downtown city block known as the Metropolitan Miami (“The Met”) project, a mix of condos, stores and entertainment venues in the heart of downtown. The developer needed entirely new physical models within two weeks for an important meeting with city officials. He thought he was out of luck until he heard about The Realization Group’s new, ultra-fast architectural model turnaround. Tapanes produced the model of the complex, including two towers that stand more than two feet tall each, well within the deadline. The same work would have cost four to six times as much to produce by stereolithography due to the premium for rush jobs. It would have taken four times as long with traditional laser-cutting methods.

In another example, a retail office and residential complex in nearby Coral Gables called Lancaster Plaza ordered a model of its premises for marketing purposes. Impressed by the speed, quality and the price of the work, the company the next day ordered 100 models – one for every new tenant. The Realization Group turned around the order in an astonishing two days.

“Architects cherish tradition and are appropriately skeptical about new technology,” says Tapanes. “We’re earning their approval of 3D printing, however, by producing affordable high-quality models in record time. Clients who were dubious at first are now saying, ‘You did this? That big? That fast? For how much? Oh, wow, the detail looks good!’ ”

The lower costs of creating models with the ZPrinter 310 Plus are letting The Realization Group offer customers two or three 3D printed models for what used to be the price of one. In-house 3D printing is also fueling new sales. “I just feel more comfortable now when a customer or prospect starts inquiring about physical modeling. For the first time, I can guarantee affordability, I can guarantee the work will be done on time, and I can guarantee there won’t be any complications because we’re doing all the work ourselves in house,” says Tapanes. More customers can now take advantage of modeling services because The Realization Group has found a way to make it more affordable. “We can now offer clients a wide range of models at various price points and lead times, including the fastest turnaround in the greater Miami region,” Tapanes says.

The result of the new speed and affordability of in-house 3D printing is that The Realization Group and its clients are sharing in the cost savings and positive impact of the new service. Demand for the service is escalating rapidly as architects and their clients witness the speed and affordability of the models they can obtain.

“Clients love the models. The turnaround is fabulous, the price is great, and the detail is all they need,” says Tapanes. “My clients are demanding, but they’re delighted with this new service.”

*The Realization Group’s dealer for Z Corporation products is Quantum Leap Associates of Palm Beach Gardens, Fla.*



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# STELLENBOSCH UNIVERSITY

## Department of Industrial Engineering proves the value of 3D printing in manufacturing, architecture, and education

- **The University of Stellenbosch** – A 25,000-student institution committed to excellence in scholarship and scientific practice
- **Challenge** – Discovering the potential of 3D printing in manufacturing, architecture and medicine; and using industry partnerships and high technology to improve education
- **Solution** – Carrying out more than 800 3D printing projects to date in manufacturing, architecture modeling and medicine
- **Documented Findings** –
  - 3D printing’s value extends far beyond concept modeling
  - 3D printing is useful for rapid prototyping and small manufacturing runs
  - 3D printing can reduce production time for short runs of metal components by up to 80 percent
  - Combined with investment casting, 3D printing can quickly produce functional, complex parts
  - 3D printing helps medical students better visualize organs, tumors, defects and more
  - 3D printing can produce dramatic architectural models
  - Use of 3D printing across disciplines and in real-world business applications provides unprecedented educational opportunities

“Z Corp. has advanced 3D printing to the point where it can cost-effectively provide vital strategic benefits to organizations. These benefits are seen not only in concept modeling but in the production of tooling for prototypes that organizations can use in design validation, functional testing, proof of concept trials, and pre-production design checks.”

– PROFESSOR DIMITRI DIMITROV  
LABORATORY FOR RAPID PRODUCT DEV.  
STELLENBOSCH UNIVERSITY



Durban Millennium Tower (Photo Courtesy of F.A.D. Publishers) and ZPrinter® 310 model

Z Corporation’s unique 3D printing technology came straight out of the Massachusetts Institute of Technology (MIT), but some of the most compelling best practices for 3D printing are coming from the other side of the world, specifically the University of Stellenbosch in South Africa.

The 25,000-student institution is an established research leader, with two of South Africa’s six Department of Science and Technology Centres of Excellence on campus. More than 200 staff members are National Research Foundation-rated researchers, the second highest number in the country. Major projects are under way in biotech, solar power, polymers, agriculture, medicine and satellites to name a few.

Since 3D printing’s full potential is yet to be grasped, the university is developing an exhaustively documented “capability profile” of the technology. Industrial Engineering Professor Dimitri Dimitrov, head of the university’s Laboratory for Rapid Product Development (LRPD), is leading the university’s effort to explore 3D printing’s value in manufacturing, prototyping, architecture and medicine.

The research will provide South African industry with objective data on which to base manufacturing decisions. Simultaneously, the work is exposing students across multiple disciplines, not just engineering, to advanced technologies.

“Companies that want to integrate 3D printing into their product development, prototyping and manufacturing processes still lack reliable information regarding its potential,” Dimitrov says. “Our goal is to answer questions so

that users can better control their processes and results. We want users, including our students, to know exactly what to expect when they use a 3D printer.”

### More than 800 projects, documented results

To execute the research, the university’s Department of Industrial Engineering standardized on Z Corp. and its cost-effective, patented inkjet-based technology because of its dramatic affordability advantage. The department opted for this technology over expensive approaches to modeling, casting and rapid prototyping, including stereolithography, fused deposition modeling and selective laser sintering. The university purchased its first Z Corp. 3D printer in 2000, upgraded to the ZPrinter® 310 in 2004, and has completed more than 800 separate 3D printing projects across departments and disciplines. The research is revealing exciting new applications for 3D printing, including the creation of molds and patterns for casting and for the rapid manufacturing of fully functional prototypes.

“Some companies resist rapid prototyping



ZPrinter® 310 Rapid Tool (left) and Prototype Casting (right)

“Given its accuracy, strength, surface finish, build speed and cost, we calculate a very good price/performance ratio for the Z Corp. ZPrinter 310. It is paying off handsomely in teaching, learning and business”

– PROFESSOR DIMITRI DIMITROV  
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STELLENBOSCH UNIVERSITY

adoption because they perceive the technology as too ‘fancy’ or the materials as lacking this or that quality,” says Dimitrov. “Z Corp., however, has advanced 3D printing to the point where it can cost-effectively provide vital strategic benefits to organizations. These benefits are seen not only in concept modeling but in the production of tooling for prototypes that organizations can use in design validation, functional testing, proof of concept trials, and pre-production design checks.”

Dimitrov and his colleagues have scientifically documented this capability and the value of 3D printing with the ZPrinter 310 in investment, sand and vacuum casting. For example, designers can build a mold for direct metal pour straight from a cad file, or fabricate molds, cores, cavities, and patterns in a range of materials.

One of the most important things the University of Stellenbosch is accomplishing with 3D printing is the most subtle. Dimitrov and fellow researcher Neal de Beer have published a detailed matrix of different material combinations and their effects on accuracy, surface roughness, build volume location and time for each combination. Industry can use these findings to improve manufacturing processes.

### Combining students, industry and high tech

Students are getting involved in the private sector as well. Especially when university/industry partnerships involve high technology, they provide unprecedented education potential.

As part of this mission, Stellenbosch has performed 3D printing work for a nearby architectural firm. Students have created a physical model of the Durban Millennium Tower, a monument that identifies the port city of Durban, South Africa, in the same way that the Eiffel Tower signifies Paris.

Seventy-five meters high, the one-of-a-kind edifice is “a barometer for the city,” communicating fluctuations of sun, wind and tide. The cowl revolves so that its curved front faces the wind. The central spire moves up and down to indicate the tide. A computer-driven sunscreen tracks the movement of the sun, shielding port operations workers from glare. At night, lighting colors within the cowl change according to a random algorithm driven by tide, wind direction and humidity.

The architect, soundspace design of Cape Town, requested a model of the tower for customer presentations and other marketing purposes. Such a model is a tall order for a 3D printer, since its final height exceeds the printer’s build area. Also, parts must be strong and tolerances tight to enable seamless assembly of printed segments. The ZPrinter 310 produced a striking result that has prompted other firms to request architectural models for the concept and design phases.

Meanwhile, the university’s medical school is also using 3D printing. It is converting CT and MRI scans data into 3D models for academic and clinical purposes, enabling students to examine anatomy without surgery or dissection. It enables them to practice and plan skill-intensive procedures and treatments and is especially helpful for visualizing abnormalities such as tumors and birth defects. Students are working closely with a craniofacial specialist to create models of head and facial structures.

Students have also used the 3D printer to make models of products like cell phones, remote controls, underwater cameras, corkscrews, elaborate perfume models, innovative electrical plugs – and the Eiffel Tower.

The scope of possible uses for 3D printing across the university is only broadening as additional educational opportunities are uncovered, according to Dimitrov. “We are very happy with our strategic decision to adopt this technology. We find it cost-effective, versatile, fast and easy to operate. Given its accuracy, strength, surface finish, build speed and cost, we calculate a very good price/performance ratio for the Z Corp. ZPrinter 310. It is paying off handsomely in teaching, learning and business.”



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# iKix

## Architectural Modeler in India Introduces 3D Printing as Project Management Tool

- **iKix** – An architectural modeling service based in India and serving the world
- **Challenge** – Helping architects, builders and their teams save time, labor and materials by reducing errors
- **Solution** – Using 3D printing as a project management tool
- **Results** –
  - Architects, their contractors, their clients and their permitting agencies can view projects in three dimensions from the earliest stages for deeper understanding.
  - Improved communication shaves 3 percent to 8 percent off construction budgets because of savings in time labor and materials.
  - Errors, oversights and poor decisions are captured prior to the onset of construction.
  - 3D printing provides models in six to 10 days versus a month, which is the typical turnaround time for a handcrafted model.
  - Since iKix architectural models are modular, architects and their clients can move pieces at will to reconfigure designs.
  - 3D printed models can easily be dismantled, packed, moved and reassembled.
  - 3D printed models emerge directly from 3D design data for a level of accuracy far superior to handcrafted models.

“...we can print a model of a community of 1,000 acres – including homes, schools, churches, temples, golf courses and more – in six weeks versus five months for handcrafting the model”

– R. “PARTHA” PARTHASARATHY  
iKix

Rosedale by ETA Star,  
Chennai India



In his two decades in the computer-aided design industry, R. “Partha” Parthasarathy’s first question to clients has always been, “What problems can we solve for you?”

“Getting our projects to market more quickly,” was the inevitable answer.

In the AEC world, Partha has discovered that projects are often delayed due to two main reasons – inappropriate communication and lack of scientific project management.

### Discovering 3D printing

Just two years ago, however, Partha discovered a technology that offered an entirely fresh way to compress time to market for architects and everyone involved in building projects: 3D printing.

With 3D printing, one could provide on-demand identical sets of three-dimensional physical models of buildings and communities at every stage of a project to every stakeholder. He instantly realized that this would dramatically improve communication, increase efficiency and eliminate costly errors. Thus was born iKix, India’s first service bureau chain for architectural 3D printing.

Based in Chennai, capital of the state of Tamil Nadu, iKix serves top Indian architects and construction companies like Hiranandani, ETA Star and L & T South City. Though based in India, iKix is a global company. It accepts orders online and delivers models in the United States through its partner IDEAL Scanners & Systems, Inc., USA. iKix has created about 200 architectural models for U.S. customers alone.

### Challenge

#### Inefficiency of handcrafted models

The traditional method for creating an architectural model is handcrafting in cardboard or Styrofoam.

Because of the long lead time and expense required to produce such a creation, architects usually commission these models only when it’s time to reveal final plans to the public.

iKix, however, can “3D print” a typical project in six to 10 days, far less than the month that handcrafting a model requires, according to Partha. “In fact, we can print a model of a community of 1,000 acres – including homes, schools, churches, temples, golf courses and more – in six weeks versus five months for handcrafting the model,” he says. “The time and cost advantage is even more pronounced when plans change and models need to be modified on the fly.”

3D printing’s value stems from its breakthrough ability to print three-dimensional physical objects from 3D data. It operates in much the same way as a traditional office printer produces documents from word-processing data. iKix uses the Spectrum Z™ 510 full-color 3D printing system from Z Corporation of Burlington, Mass., USA, maker of the world’s fastest 3D printers and the only ones capable of printing in multiple colors.

The Z510’s agility enables architects and project managers to quickly obtain multiple physical models of a project – one for the architect, the client, the general contractor, the subcontractors and the civil authorities. “A 3D printer is more than a prototyper,” says Partha. “It has become a project management tool.”

### Solution

#### 3D: the way we think

Architects and contractors have traditionally worked from 2D plans. While seemingly precise, 2D plans in fact lend themselves to interpretation – and thus misinterpretation. “The human mind thinks in three dimensions, not two,” explains Partha. “The architecture community communicates



Rosedale by ETA Star  
Chennai India



Kathipara Grade Separator  
Tamil nadu Government, Chennai India

**“3D printing is a breakthrough that I believe will redefine technical communication for the next 200 years.”**

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iKix

in two dimensions only because there hasn't been a viable technology for readily communicating in three dimensions until now. 3D printing is a breakthrough that I believe will redefine technical communication for the next 200 years. Every design should be represented in 3D, and soon will be. It is my sincere desire that all architects move to 3D soon. Every customer of iKix has come back repeatedly for subsequent projects. They have found the benefits irresistible.”

Consider a typical large residential community. It takes perhaps three months to design and 15 months to build. Two months into construction, with all trades working from 2D blueprints, the architect sees something amiss due to a misinterpretation of the plans. A misplaced wall. Or a staircase headed for a support column. The choices are 1) tearing everything down after 20 percent of the project is built, incurring major loss of time, labor and material; or 2) accepting the mistake and continuing construction. Neither option works. Handcrafted models don't solve the problem. They are approximations of the plan while a 3D printed model essentially is the plan.

“What is intended in plans is often starkly different from what is executed,” observes Partha. “That's why iKix clients are commissioning 3D printed physical models from the earliest stages of the design and avoiding these catastrophes. Clients bring us in early and start making models from the concept stage, which is yielding project management savings in the 3 to 8 percent range, which is huge given the size of their construction budgets.”

“The value of the iKix models are really in the time and money saved due to cost and time overruns avoided,” says Chander Seetaraman, CEO of CS Designs, a top design firm in India and an early iKix user. “They pay for themselves right at the early stages of the project.”

Partha offers the example of a recent urban residential project with hundreds of clustered units. The client was happy with the plans, but when he saw the 3D printed model, he immediately worried the units were too crowded together. The architect moved a pool and fitness club into the center of the site to ease the congestion. This is a solution that all parties would have otherwise missed – until the buildings were halfway up.

Civil engineering projects need physical models, too, according to Partha. When officials are planning to build a highway overpass, for example, they must plan temporary traffic flows over the various phases of the job. Having 3D physical models for every stage eliminates confusion and improves construction efficiency.

## Results

### Options and changes are easy

Unlike hand modelers, iKix is able to present clients with multiple options for projects at the earliest

stages. “If you present a client with four design options,” Partha says, “a client is likely to choose a fifth by requesting elements of the first four.” Not only can Z Corporation 3D printers print that fifth option on demand, clients can move 3D printed models of buildings, pools and parking lots around at will so they can reconfigure a design on the spot. That's because iKix purposefully builds its models in a modular fashion. Handcrafted models, by contrast, are fragile and glued in place, often with an off-putting “do not touch” warning.

The modular nature of iKix models also makes them simple to pack, transport and reassemble at different venues for different audiences. A model used for obtaining building permits, for example, can be packed up and reassembled in the sales office for prospective occupants to view.

Because 3D prints emerge directly from CAD data, they are more accurate than handcrafted models, and it's easy to make multiple copies – almost unheard of in hand modeling. It's also easy to scale models up or down without losing data.

iKix chose the Spectrum Z510 because of Z Corporation printers' unique ability to print in multiple colors. This is an essential capability for non-technical audiences as well as painting contractors, decorators and exterior contractors. Color is also essential for applying labels and texture to models for maximum impact.

“Full-color, 3D printing simply offers so many advantages,” says Partha. “It communicates information directly in the way humans think so they can fully, deeply understand what the project will look like and what the project will be like. How can an architect not take advantage of 3D printing when it will save money and save time? I ask customers to just try it once. When they do, the benefits are overwhelmingly obvious, and they call us in from the beginning of the next project – not as a vendor but more as a partner. Like the architect.”

Remember, says Partha: Project efficiency decreases quite rapidly as the number of stakeholders increases. Proper communication is therefore key to managing projects well. 3D printed models are a great way to increase project execution efficiencies.



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