Carlos L. Marcos *Editor*

Graphic Imprints

The Influence of Representation and Ideation Tools in Architecture

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Little Big Models. The Tools of Japanese Architect Studios

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Abstract. *Description* Nowadays we are seeing the fall of drawing as architecture´s main tool. Drawing, which is so necessary and important in our profession as architects since the origins of architecture, is disappearing with the advance of technology. *Focus* The new ways of working in all architect studios with the advance of computer software, are leaving drawing out. Programming courses and computer drawing are more important in architectural teaching than drawing subjects. The old drawing instruments like rotring and the compass are now kept in glass windows by collectors. Models are the only tools that have remained with architects since the beginning of their profession. Models were used to convince the principal party and to explain the project to costumers that didn´t understand layout drawings and perspectives. Nowadays, architects present their studios showing rooms full of manual models. *Objectives* The main objective of this communication is to show that three-dimensional representation through physical models has been and still is, the most important tool in Architecture. Models are the link between old and modern architecture. That is why we are going to study the way they work in Japanese studios of architecture, where physical models are their main system of working from the initial stages of the project.

Keywords: Models · Manual · Japanese studios

1 The Little-Big Model

Throughout history, architects have used a broad range of tools to develop their projects, although drawing has been the main and fundamental transmitter of architecture. In this new digital era, we are seeing the decline of hand drawing, which is taking a back seat to the breakthrough of the digital drawing and its great advances and development.

Those great perspectives, sections, elevations and colorful watercolors with which big and small architects of the world portrayed their mastery have been replaced by 3D renders, digitalized computer science and virtual reality. However, as time continues to pass by, the architect still uses a tool in parallel fashion to the drawing that has always

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been present in his work. We are referring to the three-dimensional tangible models. The only thing that has changed in these models over time is the material used to build them (Úbeda 2002).

It is important to cite Vasari on the subject of the Renaissance, where he tells us how Brunelleschi carved turnips with a pocket knife to show the details to the workers of Santa María del Fiore. In those times, large turnips were sold in markets. Filippo Brunelleschi used these turnips to explain the details of the construction to the workers: "and I provided them with models of the cuts and unions of the wood, wax, or also the turnips. And in the same way, I made the tools for the work" (Vasari 1906, p. 361).

Leonardo da Vinci made edible models like the Engagements of Lodovico Sforza, a replica made of cake of the Castello Sforza. It was seventy meters long with reinforcements made of nuts and raisins, covered with multicolored marzipan. The castle made of cake could be toured from the inside because there were doors, stools and tables made of puffed pastry (Da Vinci 1987, pp. 18 and 45)

Before Miguel Ángel Buonarotti drew a single picture, he made a clay model for the Basilica of San Pedro in Rome (Úbeda 2002). We cannot forget majestic Renaissance models like Antonio da Sangallo´s. It took him seven years just in the construction of the model itself (Forni 1982).

Beyond the impressive models for presentations that yet today are still being made to participate in architecture contests, we want to make a referral in this paper to mayfly models so small that sometimes they fit in the palm of your hand. They are small in size, but they contain the essence of the architectural project. Those little-big working models are the generators of architecture.

Let us focus on current Japanese architecture studios. It is really surprising how they present their working space. They work in large rooms with a lot of people working on models and surrounded by piles of models stacked on top of each other. According to Mark Wigley when he talks about the SANAA studio, he says they are "a sea of white models" (2015) (Fig. 1). In this system of work, the model is the main theme, and architects like Kazuyo Sejima, Ryue Nishizawa, Junya Ishigami, Sou Fujimoto, Toyo Ito or Shigeru Ban among others, use this system to express their ideas and generate their personal architecture. The architects work around the same idea of eliminating the barriers between indoors and outdoors. The idea is to transgress those limits in architecture and merge it with the natural surroundings, letting nature enter inside the architecture and making the architecture belong to the environment, or even converting it into nature itself.

2 Toyto Ito

This mutual integration process appears in all of Toyo Ito´s work, whose considerations look for: "a wind-like architecture, shapeless, light, that floats in the air. A space generated like liquid, soft and flexible. A thin layered architecture, as that of a wrapping that filters the phenomenon and works as a generator of vortexes or swirls in the natural currents of, air, wind, light and sound. An architecture that produces a landscape like a garden plowed by those flows. An open architecture with oscillating and meandering limits. The limit acting as a membrane; an osmotic film that does not

Fig. 1. "Sea of white models". SANAA. Taken from El Croquis, no. 179–180

separate the interior from the exterior, but on the contrary, permits the passing through" (Cortés 2005, p. 16).

Among all of Toyo Ito´s models, the ones that draw our attention are in the performance and structural studio of the Bruges Pavilion (Belgium 2002). We are talking about small models that he uses to prove that the placement of the oval metallic overlays located on the honeycomb structure are not done at random. Empirical tests have been conducted on work models to find the best location for them (Fig. 2).

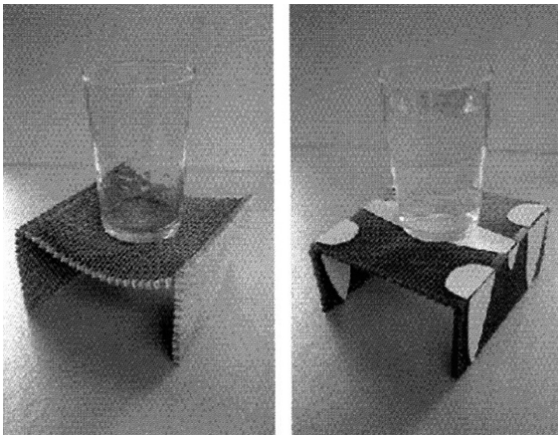

Fig. 2. Toyo Ito, Models from the structural studio at the Pavilion of Bruges, Belgium. 2002. Taken from El Croquis, no. 123

Without a doubt, the most light models are the ones that express the concept of the project the best. This is the case, when we talk about the small folding paper models. They are sufficient to design and represent the concept of architectural space of a country house made of Aluminum (Gifu 2004).

Inside these conceptual models, the working ones stand out. They are used to study different solutions for facades of the TOD´S building (Tokyo 2004). Finally, the re-creation of a forest of elm trees was opted for in the constant attempt to bring a

tree-like reference to the city. Below, trunks and thick branches become more numerous and thinner as we move up the building, allowing more light to penetrate in the same fashion as occurs in our forests (Fig. 3).

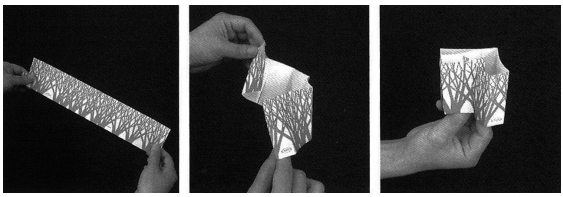

Fig. 3. Toyo Ito, Folded paper models for the study of the facade of TOD´S building, Tokyo, 2004. Taken from El Croquis, no. 123

For the S Project (Scotland 2004) two-dimensional surfaces were used as cellular units that generate the relief of the surface through its creases. The merge of those surfaces create the re-covering of the building: a high multi-shaped wall that looks like a cliff, similar to the image that nature offers us of the Scottish cliffs.

The project for the Music Forum, visual dance and culture, (Ghent 2004) pretends to be an urban landscape such as the outdoor music bandstands of the parks. That is why it recreates by means of small manual models a system of geometrical creation that illustrates the idea of labyrinthine curves allowing sound to exit in all directions. These models give you the spatial sensation of being inside a wind instrument (Fig. 4).

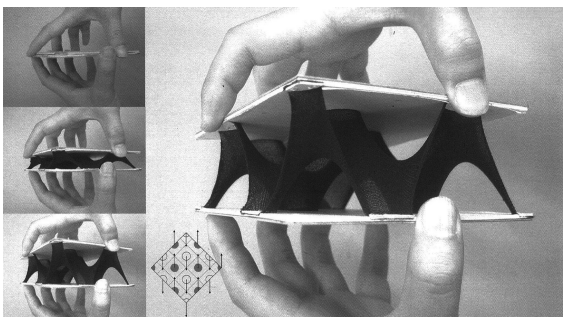

Fig. 4. Toyo Ito, Model of spatial creation for the Music Forum, visual dance and culture. Ghent, 2004. Taken from El Croquis, no. 123. Taken from El Croquis, no. 179–180

In the construction of the Media Center (Sendai 2000), a cultural complex that portrays the image of an area for a new era, Toyo Ito designed a structured space with tubes and platforms. The structure is composed of posts and beams similar to the ones of Mies Van der Rohe and Le Corbusier. The glass and steel is from Mies and the concrete from Le Corbusier. The same "Domino" system for the Media Center, consists

of the use of its three elements: plates for the plants, tubes for the columns and glass for the skin or facade.

For this contest, Toyo Ito made a lot of models. The first one was presented in the contest and it only shows the structural elements. The building suggested in this model was a forest of columns, therefore, it was a highly abstract object.

After winning the competition, the construction lasted more than five years, during which a series of studio models were made using different materials such as: styrofoam, nets, wire, plastic tubes, and mesh netting. This made the building less abstract. Like Toyo Ito says: "Certainly the building-in-the-making is not as abstract as the competition model. Nonetheless, over the last five years our team has tirelessly continued to do studies imaged upon strictly abstract tube-and-plate models. These studies have, in other words, been an exercise in how to maintain the prototype image even while adding on elements (exterior walls to separate inside from out, partition walls, doors, elevators, stairways, …)" (Ito 2013, p. 11).

This is an image that expresses the movement of reeds and seaweed moved by the waves and sub-aquatic trees that smoothly sway about. Like Sou Fujimoto expresses, "Toyo Ito´s Media Center represents wavy spaces that generate circular bundles of tubes. A new place for people. A plant with bubbles floating in a square" (Fujimoto 2011c).

3 Shigeru Ban

Shigeru Ban is known as "the architect of paper" due to the fact that he uses paper to build. A material 100% recyclable which contributes to conserve our environment.

With his tubular paper structures, he illustrates from stores, the sheltering of the world´s refugees, by means of churches, large works and even his own house. Likewise, he builds these buildings in the same way as he does the models previous to his projects. He uses paper, but increasing it up to scale. In Frei Otto´s idea, Shigeru Ban enlarges the models until converting them into buildings (Fig. 5).

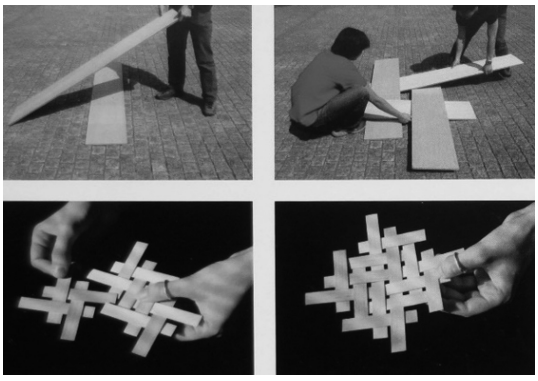

Fig. 5. Shigeru Ban, wickerwork house 2. Taken from: Matilda McQuaid. *Shigeru Ban*, NY, 2003

In this way, the construction of S. Ban are experiments set to the scale of 1:1, in other words, models of real scale with those he experimented with in "Universal floor", which is nothing else but the foundation of Japanese Architecture. They are floating spaces fit to live in, whose physical edges and layers that separate the interior from the exterior of the house are ever changing and so light that they seem nonexistent. This idea of the wall-less-house is recurring in Japanese architects. The concept is to perpetuate the exterior inside the house and the interior of the house outdoors, in a constant continuity and interchange.

Shigeru Ban´s work method is clearly explained in the construction of Japan´s Pavilion for Expo 2000 (Hannover 2000). As he himself says, he asked Frei Otto, who he admires for his magnificent structures, to collaborate with him in the construction of this pavilion. The entire team met monthly starting in August 1997 and a huge model was built for each meeting that illustrated all the aspects that would be discussed in the meeting. In fact, Frei Otto´s daughter, who was working as an assistant in the studio, made the models (Fig. 6).

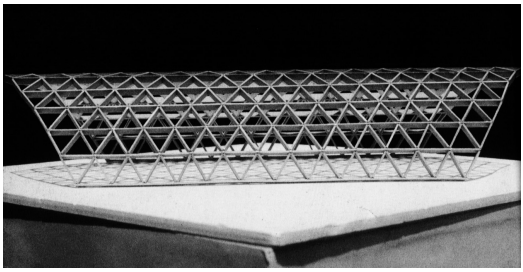

Fig. 6. Shigeru Ban, Model for Japan´s Pavilion in Expo 2000. Hannover, 2000. Taken from: Matilda McQuaid. *Shigeru Ban*, NY, 2003

To define the final shape of the structure, dependent on the method of construction and the way to elevate it from below, they built a model on a scale of 1:15. Thus, they were able to test and find the best way to elevate it and measure and design the intersections made of paper tubes (McQuaid 2003, p. 9).

4 Sou Fujimoto

Sou Fujimoto´s Vitruvian-like idea states that "the nest and the cave are the original shapes of architecture", and both are found in nature. The nest represents artificial things and tectonics, where shapes adapt themselves to the inhabitants. Meanwhile, the cave represents natural things and the recreation from 2D to 3D images, and it is the inhabitants who adapt to the shapes (Fujimoto 2011b, p. 198).

This idea is perfectly captured in his project for the house of the primitive future (2001), where the idea of the cave appears in the shape of sliding slabs that embrace human activity. And as Fujimoto himself says, "it is about a place to live, a primitive place like a cloud, a nest or a cave" (Fujimoto 2011c, p. 22).

Sou resorts to this same idea in his project of the workshop house in Hokkaido (Japan 2007), where he expresses the idea of the cave with different topographic levels to unite in his architecture artificial presence with nature. It is clearly visible in his work model that the cave does not need to look like one to be a cave. In this case we are dealing with a "transparent cave". In his houses N (Otia 2008) and H (Tokyo 2009), the idea to transgress the limit between the interior and the exterior in architecture is reflected once again. In these models, he experiments with the box using huge pierced gaps, joining them three-dimensionally to see and feel the exterior from inside: "empty spaces linked together that generate reciprocal relationships". Fujimoto calls it "telescopic nesting". He also turns to the idea of a house extended like a tree, where you can enjoy the experience of living as if you were outdoors: "A place where transparency and opacity blend together with an enveloping exterior and at the same time lacks it all together". Understanding "architecture as a forest" (Fujimoto 2011a, p. 152) (Fig. 7).

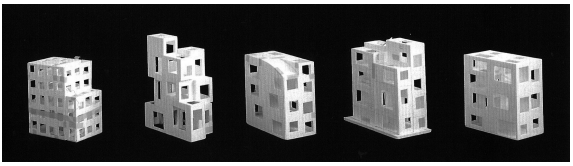

Fig. 7. Sou Fujimoto, work models for the H house, Tokyo, 2009. Taken from El Croquis, no. 151

In these small models, Sou Fujimoto experiments with "a unique area" that goes from inside to outside and from outside to inside due to the fact that "the interior and exterior are eternal matters of architecture. Sometimes, the interior and exterior invert or converge themselves to enhance architecture with other possibilities" (Fujimoto 2011d, p. 152).

5 Junya Ishigami

Freeing architecture from its artificial hindrance is what Junya Ishigami is looking for. He tries to relate the world and architecture in a different way than established by the laws of physics. In his projects he experiments with scale, the environment and gravity, surpassing all known physical limits. He does so rehearsing with models (Ishigami 2015). Small samples of studio paper models are the ones that provide him with the solution to the balance and bending problem that appears when it comes to building his project Table (Tokyo 2005, Osaka 2005, Basle 2008, Jerusalem 2010), a table of 9.5 m in length with only 2.6 mm of thickness (Fig. 8).

We find a similar problem as far as gravitational liberty is concerned, in his project for the Multi-use Square at the Technological Institute (Kanagawa 2008). Here he investigates with thin paper overlay, the covering of an open area of 100 m by 60 m without a single column. The covering is supported by the outlined walls. In his house of peace (Copenhagen 2015), he takes the integration of architecture with nature to the

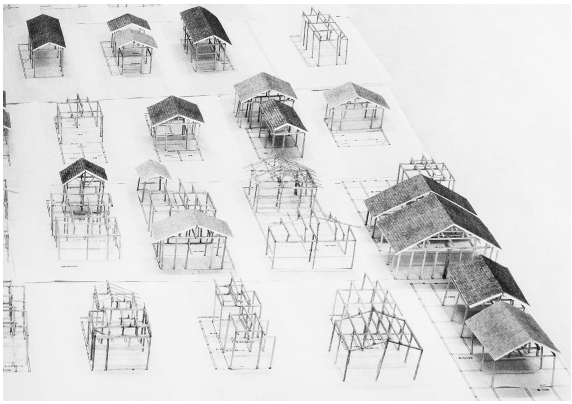

Fig. 8. Junya Ishigami, Models for Akita Residence, Tokyo, 2005. Taken from El Croquis no 182

limit, by converting the sea into the floor of a cloud building that fluctuates above the water. This produces a changing interior with the movement of the tides, wind and light which modify the water surface and shape the spaces.

In the studio models for the Maritime Terminal of Kinmen (Taiwan 2014), the decks recreate a mountainous landscape interior summits and curves where: "rocky tops, grass areas, water courses, windy areas, protected areas, shadows, sunny areas, and wild bird reserves", appear. Various sets that emerge from the shapes of the decks designed with the natural sensibility of the mountain itself" (Ishigami 2015, p. 285).

Junya Ishigami looks for a new relation between architecture and the current world, full of rapid changes. With his work models, he aims to materialize the "freedom in architecture".

6 Kazuyo Sejima and Ryue Nishizawa

But, without a doubt, it is the SANAA studio and its architects, Kazuyo Sejima and Ryue Nishizawa, who best illustrate the idea of the model as a fundamental tool in their work. For them, the models are their working process for design and presentation of their buildings. Looking at the way they present their studios with rooms full of models, where you can find situation models, work models, detail models and presentation models. Just looking at these photographs we can imagine the way they faced the architectural project.

If for Christian Kerez, the model is a tool of comprehension, for SANAA it goes beyond being a simple tool. For both of them, the model becomes their way of work. Kazuyo Sejima states that "a continuous work of abstraction by means of models in all scales, defines the creative process of Sejima and Hishizawa´s studios" (Sejima 2015, p. 6). But not only their studios, but also SANAA´s. This studio that both parties make up, uses the same working tool. For them, the architectural project is a question of models. "We make work models non-stop from the start of the project until the end.

The size of the models get bigger and bigger, but whether we go forward or move back a few steps, we are dealing with something that we repeat over and over again as we approach the actual object. At the beginning of the project we build a bunch of models, but once we get through the initial stage and we approach the execution of the project, we build a good model to the scale of 1/50 or 1/20. Instead of testing the waters through repetition as we had done up to this point, we use this model until the end, modifying it as many times as needed. At the same time, we resort to the small models used in the stage immediately before this one to compare the general design, while we build other models with specific details to a greater scale" (Sejima 2015) (Fig. 9).

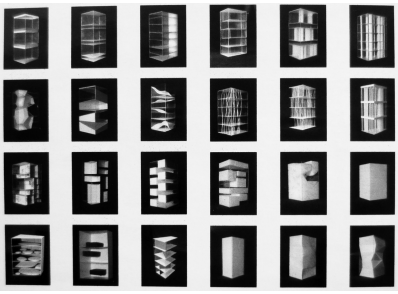

Fig. 9. SANAA, Paper working models for Christian Dior building, Omotesando, 2003. Taken from El Croquis, no. 179–180

Abstraction by means of three-dimensional models, simplifies immersion into the architectural space, allowing them to experience it directly in an almost real approach. "What really seems difficult regarding work models is how to use them to think about reality in an acceptable level of abstraction. Or on the contrary, when thinking about architecture and its construction, there must be a moment for the abstraction process to take place. I think that making models can be very useful to achieve this"(Sejima 2015) (Fig. 10).

As Mark Wigley puts it, her studios become "a sea of models", a great testing laboratory to reach the new image of her architecture (Wingley 2015, p. 22). A constant process of repetition of three-dimensional models in which barely any detail is changed. It is a system of feedback where the building is refined little by little until the ideal result is obtained. As Federico Soriano states, "…the work of these architects with the constant repetition of complete models. In each new model, the object is not more detailed, but the same. They are not models with fragmented details, but that of the complete object. Each iteration makes it more complex and polished, with the same formal presence and maintaining the graphic document identical" (Soriano 2015).

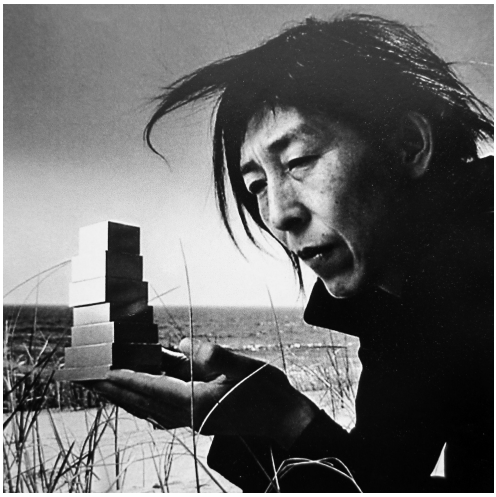

Fig. 10. Yamagata, 2013. Kazuyo Sejima with one of the models of his projects. Taken from AV Monographs 171–172 (2015)

7 Conclusions

When we contemplate a great model of a project, it brings us closer to the building. But studying those small working models reveals the process of approaching the real experience of architecture. These are the real tools that architects have used, are currently using and will use in the future. Small tangible models that are willing to be manipulated, modified and altered over and over again until becoming the foundation of architectural space. These little-big models are utensils to make us think. They are the means for projecting and the tools of the architect.

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