Branko Kolarevic, ed.

Architecture in the Digital Age: Design and Manufacturing

Spon Press – Taylor & Francis Group, 2003

Reviewed by Carol Hermann

This beautifully produced and illustrated book is an excellent reference and a unique snapshot of the state of digital technologies in architecture today. It is the result of an international symposium which took place at the University of Pennsylvania in March 2002 entitled “Designing and manufacturing architecture in the digital age.” Each participant has written a chapter, with the package tied together by a philosophy clearly articulated by editor Branko Kolarevic.

Kolarevic makes the case that architects should become “Information Master Builders.” He cites William Mitchell, the MIT digital guru in describing the architect’s relationship to his tools: “Architects drew what they could build and built what they could draw.” In critiquing architecture’s past, Kolarevic suggests that there is a direct relationship between the tools we used (T-square, compass, and pencil) and the rectilinear buildings we built. He also posits that the ubiquity of “blob” forms in today’s manufactured products (razors, cars, Macs) and critical architecture practice is a product of the kinds of software available and the way we use it.

As digital tools have become increasingly more robust, architects have struggled to find a way to incorporate this increased representational ability into the work. While the computer has greatly increased the designer’s ability to produce traditional construction documents, Kolarevic questions the need for those traditional (two-dimensional, paper) drawings in today’s digital environment. Just as leading firms like Gehry & Partners have looked outside the architecture industry to find modeling tools (CATIA was developed for the French aerospace industry), this book presents the thesis that we should also be looking to the manufacturing tools of the aeronautics and shipbuilding industries. The computer-aided manufacturing (CAM) capabilities of those industries allow the designers to build a single digital model and convey the information to the CAM tools which will then produce the parts directly from the 3D model. Buildings can be manufactured robotically, just like ships.

Currently, the United States building construction industry, each faction mired in the fear of the threat of litigation from the other, has no way to bypass any of the legal responsibilities traditionally contractually laid out between the architect, owner, and contractor (and sub-contractors). Only a few daring firms are willing to take on the potential financial liability to experiment with new production technologies. While other industries have become increasingly more efficient in the last twenty years, the building construction industry has become less so. By taking control of the design and production process, by becoming “Information Master Builders,” emerging architects can become simultaneously more adventurous and creative and more productive and profitable.

The chapters of this book are loosely arranged into four groups:

1. In making his case for the “Information Master Builder,” Branko Kolarevic gives a clear, concise history of the relationship between representational drawing and the builder, brief definitions of the buzzwords of today’s digital topologies (parametrics, associative geometries, NURBS, isomorphic polysurfaces, datascapes, generative and performative architecture), a snapshot of the relationship of the architectural construction industry to the tools of shipbuilding and aeronautics, clear illustrations of the many ways architects are using Computer Aided Manufacturing, and a very lucid explanation of the contractual relationship of architect/owner/contractor, and its impediments to digital manufacturing of architecture.
2. Next is series of chapters by architects using digital design and manufacturing to actually make buildings. Though the architects writing here don’t tell you how to use the software, they are very clear in a step-by-step illustrative way of the process they go through to design and construct cutting edge architecture. These chapters express the philosophy of the “Information Master Builder” without being too heavily theoretical in their presentation.

Hugh Whitehead gives a clear description of Design Rationalization—the ability to harness the computational power to make the designs of Foster and Partners energy efficient, code compliant, and economical, while maintaining their cutting edge aesthetics.

Jim Glymp gives a highly detailed explanation of the learning curve Frank Gehry’s office went through during the time between winning the competition for the Walt Disney Concert Hall in 1988 and its eventual construction in 2003. This makes clear the complexity of the step-by-step rethinking of the design and construction process required to digitally create curvaceous buildings out of adventurous materials without traditional construction drawings.

Bernhard Franken first explains his use of animation software to generate digital master geometries for his projects for BMW marketing Pavilions, then describes the information exchange process his firm has contractors able to use computer numerically controlled (CNC) fabrication technologies to produce their doubly curved surfaces.

Trained in many diverse disciplines, Bernard Cache elegantly describes his self-imposed challenge to generate a software (Objectile) which can describe a fully associative geometry, one in which the repercussions of any design change can be automatically recalculated for an entire project.

Mark Burry describes his twenty year undertaking to interpret the brilliant dribbles left behind when Antonio Gaudi died, such that the work at Sagrada Família can continue as the master intended. His use of parametric design and associative geometry has enabled those working on the church in Barcelona to describe ruled-surfaces which meet the design intent of Gaudi and can be described for construction by today’s masons.

Mark Goulthorpe is more theoretical in his presentation, “endeavor[ing] to draw out the principles, or points, of the new digital territory we are traversing, emphasizing the cognitive shifts that such a transition entails (the creative deformation)” as his firm, dECOi Architects, quests for “non-standard geometric form, the object [that] seems to have anticipated an emergent tendency.” (167)

3. Next is a series of chapters which give theoretical grounding to the move towards forms only possible in the digital realm.

Ali Rahim's uses animation software to create his time-based, process-driven work. In giving substance to the process of parametric and animation based design, Rahim references French philosophers Henri Bergson and Gilles Deleuze:

Contemporary animation techniques are destabilized by temporally-located potentials that make possible the development of new organizations. These processes amplify the difference between the possible and the real, and contain a set of possibilities, which acquire physical reality as material form. The static object which produces predetermined effects defines the real, whereas actualization, on the other hand, is emergent and breaks with resemblant materiality, bringing forth a new sensibility, which ensures that the difference between the real and actual is always a creative process. This sensibility, which subverts fixed identity, is a flexible spatio-temporal organization producing performative effects. One possibility out of many is actualized and its effectiveness is measured by the capacity to produce new effects, which modify behaviors and performance (p. 207).

Because twenty-first century culture exists between disciplines, not firmly rooted in any one, Sulan Kolatan writes about the chimeral effect, and produces recombinant forms made possible by the computational power of digital technologies.

Antonio Saggio writes eloquently about interactivity: the connectivity between physical substances and between the abstract forces which traditionally influence architects. He says "interactivity may serve to focus contemporary thought on an architecture that, having overcome the objectivity of our needs, can respond to the subjectivity of our wishes." For this reviewer, this is an unblurred way to begin to describe why architects want to design parametrically, why we want to harness the computational power available today, why "blob" buildings are not just an aesthetic whim.

4. In the final series of chapters industry heavyweights speculate on the state of software—in the parlance of Chris Luebke—Now, New, and Next. These nuts and bolts chapters serve to remind architects that we are using software packages borrowed from other industries. To fully meet our needs, we must forge out on our own, and either demand software which meets our needs, or ally ourselves with programmers and write our own software.

While this book is lusciously filled with sensuous images of "blob" buildings, Branko Kolarevic is clear that "it is not about 'blobs'. ... The challenge for the profession is to understand the appearance of the digitally-driven generative design and production technologies in a more fundamental way than just as tools for producing 'blobby' forms" (p. 27) The careful explanations of design rationales put forth in this book make a strong case for the many varied approaches to using digital technologies in the design and manufacture of buildings today.

Contributors:

Branko Kolarevic – University of Pennsylvania
William J. Mitchell – Dean, SAP, MIT
Hugh Whitehead – Foster and Partners
Jim Glymph – Gehry Partners
Bernhard Franken – franken architekten
Bernard Cache – Objectile
Mark Burry – RMIT University
Mark Goulthorpe – dECOi Architects
Brendan MacFarlane – Jakob + MacFarlane
Ali Rahim – University of Pennsylvania

Sulan Kolatan – Kolatan/Mac Donald Studio
Antonio Saggio – University La Sapienza
Robert Aish – Bentley Systems
Jon H. Pittman – Autodesk, Inc.
Chris Yessios – autodesk, Inc
Norbert Young – McGraw-Hill
Chris Luebke – Arup Research + Development
Also included are transcripts of the symposium opening and closing panel discussions.

About the Reviewer

Carol Hermann is a registered architect and an Assistant Professor of Architecture at Philadelphia University. She studied architecture in Massachusetts at the Harvard Graduate School of Design, where she graduated with a Master of Architecture in 1986. She has been teaching Architecture to undergraduates at Philadelphia University since 1996. Previously, she spent eight years in the practice of architecture at Ewing Cole Cherry Brott in Philadelphia, Pennsylvania, where she learned the ins and outs of AutoCad while working on large corporate projects. She presented “Architecture and Programming: Generative Design” at the Nexus 2004 conference in Mexico City.