Tectonics, Economics and the Reconfiguration of Practice: The Case for Process Change by Digital Means

The current programming culture in architecture could all too easily be written off as a youthful, glib obsession with the algorithmic and the parametric among nascent practitioners, who have had little if any opportunity to build. The activities of Gehry Technologies run counter to this stereotype. Building on 15 years of experience at Gehry and Partners, Gehry Technologies was founded in 2002 as an independent organisation dedicated to the business of technological innovation and the development of architectural software tools. Dennis R. Schemper, chief technology officer, discusses the wider implications of a concentrated focus on technological tools and organisational processes for designers and the business of building.

Gehry Technologies is a relatively new organisation, representing a new organisational model in the spectrum of building practice. The organisation pursues an inquiry into the processes of building and the emerging practices and roles suggested by technological advances. The impact of this focus on the process translates into architectural form through the tectonic aspects of design, and a view of building from the process of making back towards architectural design, rather than the prevailing view of making as design's outcome. There are several reasons for this focus on tectonics and process, not the least of which is that consideration of these aspects has been downplayed in the development of tools and methods in favor of the more obvious architectural drivers of schematic and planning-level thinking about building. At Gehry Technologies we perceive there to be a gap in the available tools and methodologies for those engaged in design and the potential for the profession as it moves into these areas of interest.

The opportunities and potential value of reviving contemporary building practice are well documented, as are the potential pitfalls. There is great potential for design in expanding the set of tools available to architects, along with a corresponding sense that the rules of engagement have to be different to realise this potential.

Capabilities for the geometric expression of form — enabled by advances in digital media — have moved beyond the capacities of conventional project descriptions to effectively capture, process, and present intentions into building. Meanwhile, the traditionally structured conventions of project teams, organisation and roles have inherent, deliberate limitations on communication, whose reliability and utility have now been exceeded.

Reconfigurations of Practice

Building has a history of a hierarchically structured organisational model and supply chains that stem from the "limited bandwidth", or limited capabilities for the transmission and processing of information of the postdigital age, and suggests a preference for "command and control" over collaboration.

Other businesses have advanced their organisations in light of recent technology. While the design and manufacturing industries have adopted and optimised around hierarchical command-and-control structures, others have developed more de-centralised, networked business organisations, including learning and retail and the entertainment industry.

The business of building has yet to do either. It has been used that building teams are constructed as networked organisations, but are contractually restricted from functioning in this manner. The process of building has remained — officially — hierarchically structured in control.
The third dimension has so far been the locus of this new communication. One of the drivers of information integration is the understanding that miscoordination occurs at connections and interfaces, precisely where the inherent gaps of contemporary processes are defined.

One of the hallmarks of emerging design tools is the ability to expose cost-benefit analysis as an aspect of iterative design. This requires exposing information developed late in the game and hidden internally in specific delivery roles, upstream, and into the mix of high-level project decision-making.

The 'single-building model' has been an attempt to coordinate project knowledge around a framework for the integration of spatial occupancy. This view of the net result of specification as geometric location is an obvious one, and substantial efficiencies are being realised by digitally simulating the spatial configuration of building elements prior to construction.

Yet, even as this view of the spatially integrated building model begins to take hold in practice, there is the sense that technology and opportunity have already moved beyond. The reason is simple: much more is known internally about the nature of products that can be exposed to the process, simply as occupancy of space. The notion is that design and engineering intent generates occupancy of space in a given building configuration, and that this intent can be coordinated in a much more direct manner. Parametric modelling is the technological basis for this expression of intent. The opportunity of parametric modelling is that we can express design, engineering, and fabrication intentions independent of geometry, so that these intentions persist over geometric variation. It is this capability that allows the conventional notions of the linearity of process to be reversed, that late-stage decision can be potentially back-propagated upstream into design iteration without the inherent cost of the conventional generate-test-discount model.

Digital Tectonics

One net effect of algorithmic design on practice has been a new emphasis on tectonics as a key driver of architectural expression. The trajectory of tectonic intentions towards a central role in design has occurred independently of digital processes, but expansions of formal possibility through digital media have necessitated increased attention to these practical aspects of building.

There was a sense in 20th-century practice that what was critical was to get the more 'architectural' aspects right – aesthetic intentions and the relationship between form and programme – and that these intentions could be abstracted from project execution. Modernist forms allowed for the abstraction of form from materials, and for a primacy of geometry over materials. Tectonic specifications were at best secondary drivers of form, and were 'hot swappable'; one material could be substituted for another late in the process as part of 'value engineering' without requiring substantial reorientation of higher-level project intentions. The move away from tectonics and process is expressed in the contractual distinction between the roles of architects and builders, and corresponding distinctions between specification and execution.

Of all the unanticipated trends that the digital has produced, none is more surprising than its role in the re-emergence of craft and increased intentions towards materiality as important design themes. We might question whether these arose as first-order drivers in themselves, or emerged as necessary topics with design's move beyond the forms of Kodakian geometry, a development in which digital media certainly have played a profound role.

The expanded potential of architectural forms has revolutionised a consideration of material and tectonics as first-order drivers, key enablers or constraints that impact the potential realisation of form as building. The limits of our
The forces of technology and economics have, as yet, no means been universally favourable to architecture as a profession, nor necessarily to builders, owners or consumers of design. Yet there is a resurgence of interest in design as an economic differentiator, which has unfolded parallel to the evolution of design technologies, that appears as a counterforce to the ongoing commoditisation of both tools and practice. The extent that this phenomenon is of concern to design, it is to expand the opportunities of buildable form, to extend the reach of design into deeper into the building delivery process and bring economies of making within the set of formal trade-offs available within the scope of parameters available for design synthesis.

Predicting and Building the Future

generative algorithms used to develop panel-based strategies, based on rules provided by the fabricator, used on a project for the Faber Group, Oxford, 2006.

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