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Hybrid Modes of Architectural Production in the United Arab Emirates

Abstract

This paper presents a recent design exercise in which architecture students from the American University of Sharjah were asked to design a sustainable scientific research facility with associated housing in the desert oasis city of Al Ain in the United Arab Emirates.

The studio investigated vernacular habitation patterns and crafts of ancient desert dwellers in order to develop techniques for inhabiting this harsh environment. The vernacular techniques examined have allowed people to exist in the region for tens of thousands of years and include courtyard house typologies, 'arish (palm-leaf) construction, nomadic Bedouin weaving, mashrabiya (latticework) screens, dhow boat-making, sand baffles, sewn lateen (triangular) sails, wind towers and qanat (irrigation) channels, to name a few. The students examined and reinterpreted these techniques to align them with modern construction requirements and contemporary ways of living.

Using 'hybrid' models, the students made small-scale fabrications partly determined by the site, and in so doing created proposals that were extremely site-specific and therefore inherently sustainable. In contrast to the highly incongruous development patterns of such contemporary urban environments as Dubai and Abu Dhabi, the architectural approach that emerged from this exercise aspires to be environmentally sensitive while maintaining cultural authenticity.

Keywords

Gulf architecture, sustainability, vernacular craft, habitation patterns, authenticity



Figure 1: Burj Khalifa, photo by Jason Ward

Introduction

This paper presents a recent architectural design studio experience at the American University of Sharjah (AUS) in the United Arab Emirates. A diverse group of architecture students from throughout the Middle East were asked to design a scientific research facility with associated housing in the desert oasis city of Al Ain in the United Arab Emirates.

In conjunction with an architectural seminar entitled Environmental Energies and Building Form, the studio investigated vernacular habitation patterns and crafts of ancient desert dwellers in order to develop techniques for inhabiting this harsh environment. Responding to the extremely incongruous development patterns of contemporary Emirati urban environments such as Dubai and Abu Dhabi, the students recognized that many local building strategies and cultural traditions had been lost due to a shift from maritime industries to oil production and tourism. They examined and reinterpreted these techniques and traditions in light of modern construction practices and contemporary ways of living.



Figure 2: Masdar City wind tunnel, photo by Jason Ward

Home to the Burj Khalifa [Figure 1], Ski Dubai and The Palm development, the wealthy Emirates have proven to be fertile ground for an architecture of excess. The recently announced 1.7 million-square-metre Mall of the World boasts a ‘temperature-controlled covered retail street network spreading over 7 km.’¹ Even the carbon-neutral Masdar City [Figure 2], located outside Abu Dhabi and designed by Foster and Partners, seems more theme park than a viable model of sustainable urban design.

The indigenous design strategies for surviving in the region’s brutal heat are rarely employed today. Rather, active systems pump conditioned air into the buildings while more and more of the historical and culturally significant built environment is lost.

The exercise presented here proposes a hybrid mode of architectural production, one that looks to the past as well as the future in creating an architecture that aspires to be environmentally sensitive while remaining culturally authentic.

Methodology

It is important to place this exploration within the context of architectural education in the Middle East. Unlike those in the West, most buildings in the Middle East are designed by engineers. Architects are often a part of design teams within engineering firms or even contracting companies that execute buildings through design-build processes. Large established Western firms staffed primarily by expatriates dominate the scene. Predictably, the built environment takes on a Western flavour that is disconnected from its

place and climate. Architects delineate caricature rather than character, and spectacle dominates the built environment. In recent years, a new generation of architects is being educated in the region and seeking modes of architectural production rooted in local practices of creating shelter. Rich and nuanced, these practices reflect climatic conditions as well as vernacular craft traditions.

While they have not always been able to keep pace with the region's rapid development, several excellent institutions exist in the Middle East for educating design professionals.² The American University of Sharjah (AUS) was established in 1997 as a coeducational institution based on American models but grounded in the history and culture of the Gulf region. Its architecture programme is accredited by the body that regulates American schools of architecture,³ the National Architectural Accrediting Board (NAAB), and was the first programme accredited outside North America. Architectural students at AUS, and in the region generally, are educated through the typical Western model of studio-based curriculum. These professional schools prepare students to work in Western-style firms typically located in cities that have experienced a dramatic boom in growth, though there is growing resistance to the sense of placelessness found in such contexts.

While the students studying at AUS are extremely diverse, most have grown up in the UAE as foreign nationals.⁴ Countries represented in the architecture programme alone include Afghanistan, Iraq, Iran, Syria, Lebanon, India, Sudan, Pakistan, Egypt, Palestine, Jordan and the UAE itself. Many students' families have been displaced from their home countries due to political instability or the promise of economic growth in the UAE. This displacement to the newly developed cities of the Emirates has given them little exposure to the rich vernacular traditions of either the Gulf region or the Middle East more generally.

A prerequisite seminar on environmental energies and building form afforded the students an opportunity to investigate vernacular strategies from the Gulf region. The regional building forms and construction techniques studied have been developed over thousands of years and in relative isolation from Western influence. While few exemplary examples of climatically sensitive vernacular architecture remain in the UAE today, the broader region is rich with such structures, affording the students important regional precedents from which to learn. Starting with simple sketch diagrams [Figure 3], they moved to increasingly sophisticated means of analysis. This included constructing building components through computer modeling in order to analyse and evaluate their usefulness. Utilizing various kinds of software, the students were thus able to establish the baseline effectiveness of various screening strategies and other constructional techniques. These regional models were also contrasted with environmental solutions from the Western world.⁵



Figure 3: Precedent Sketch Studies, E. Radmehr

Drawing on this somewhat abandoned body of regional knowledge, the students engaged in a process of making, with their own hands, small-scale fabrications that could achieve material and spatial relationships consistent with local historical precedents while fulfilling the requirements of a modern architectural programme. These material fabrications provided a way to explore three-dimensionally the many complex demands of an architecture that, even if employing contemporary materials and constructions techniques, remains rooted in place and authentic in both its means and its methods. The exercise in this case would have no practical outcome, but such fabrications have the potential to be translated into full building proposals or built environments. For the purposes of this exercise, the students were asked to create fabrications for the design of a scientific research facility with associated housing.

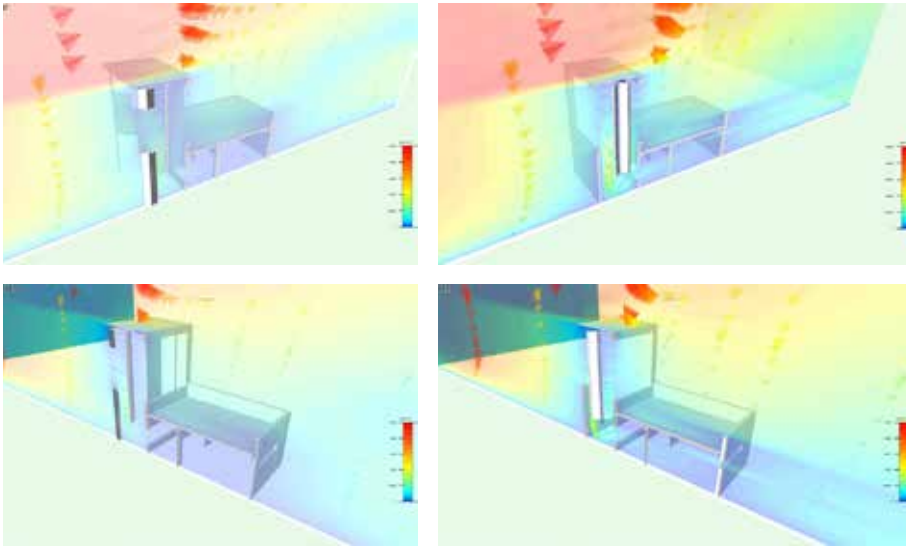


Figure 4: Wind Tower air flow analysis, A. Forney and N. Stinebrook

Vernacular Investigations and Analysis

The vernacular techniques that the students examined have allowed people to exist in the region for tens of thousands of years and include courtyard house typologies, 'arish (palm-leaf) construction, nomadic Bedouin weaving, mashrabiya (latticework) screens, dhow boat-making, sand baffles, sewn lateen (triangular) sails, wind towers, qanat (irrigation) channels and falaj (groundwater irrigation) channels, to name only some.

These investigations provided not only a technical background for building structures that resist the harsh environment, but also strategies for tying the architecture to the region's culture. The courtyard house is a particularly interesting example to consider. Despite the obvious advantages of having a semi-private enclosed space that remains open to the sky, it is rarely used today in the UAE, where the prevailing typology is now the villa within a walled garden.⁶ Wind towers are another component that has fallen out of practical use. Their effectiveness has long been observed and studied; even before simulation software, tests allowed us to understand their physics and their appropriate configurations.⁷ In one analysis exercise, the students used computers to construct three-dimensional models of wind towers and conduct performance simulations to evaluate the effectiveness of various configurations. [Figure 4]

Subtle variations in configuration and orientation had a significant impact on the towers' ability to facilitate air movement and ventilation. Such experiments, though certainly not conducted for the first time, allowed the students to gain a personal understanding of this traditional method of channeling airflow.

As mentioned earlier, many of these vernacular strategies have long since been abandoned for more active cooling systems reliant on fossil fuels. Another example is the underground qanat, a water channel whose evaporative cooling can be brought up through the building [Figure 5]. If reintroduced, such strategies are meant not necessarily to replace active systems, but rather to be used in combination with them in order to maximize performance.

More than this, traditional techniques might also be conceptually reinterpreted to provide new ways of inhabiting the landscape. Consider, for example, shading devices such as mashrabiya [Figure 6], which rely on an intricate weaving of geometry just as Bedouin tents rely on an intricate weaving of threads [Figure 7].

Superficially, one may limit these notions of weaving to a surface treatment. Conceptual exploration, however, can lead to explorations of how spatial relationships between architecture and landscape might be understood as the woven warp and weft. Perhaps more potent is the idea that various uses or programmatic spaces housed within the building could be woven. Spatial hierarchies that allow varying uses to bleed into one another can create a richness one often associates with Modernism. Such reconceptualization of traditional crafts works across scales and assemblies: indeed, the metaphor of landscape or courtyard being woven into the experience of a house is tied to the actual process of forcing two disparate objects to become intertwined.

Exploration of Craft

The mode of production presented here challenges students to investigate building design through conceptual 'hybrid' models. They are hybrid in nature because while they are, on one hand, miniature architectural models constructed to be roughly the same size and scale of the assigned building programme as it relates to a scale model of the site, they are not meant to represent larger architectonic assemblies in all their particulars. That is, they are supposed to be read as autonomous 1:1 constructions that are conceptual rather than literal in nature. The fabrications thus work both as preparatory sketches and as crafted art pieces in their own right.

These fabrications reveal the physical ordering system of the site while allowing programmatic hierarchies to emerge that can inform the development of a building design. For example, programmatic spaces that may require heightened security or limited natural light may be represented by solid concrete. Programmatic spaces meant to welcome the public or be open and inviting may be constructed out of glass or cast resin. Differentiations in programme may be more nuanced, such as the relationship in a laboratory building between the storage areas and support space for the staff. These two spaces might be differentiated in a very subtle way, for example by using pine and oak, two different kinds of wood. Further differentiation of programmatic requirements, such as cold lab storage and warm lab storage, may be distinguished by leaving the wood rough or sanding it. Rather than approaching the creation of architecture as a linear process, the simultaneous development of conceptual ideas and model architectural assemblies forces

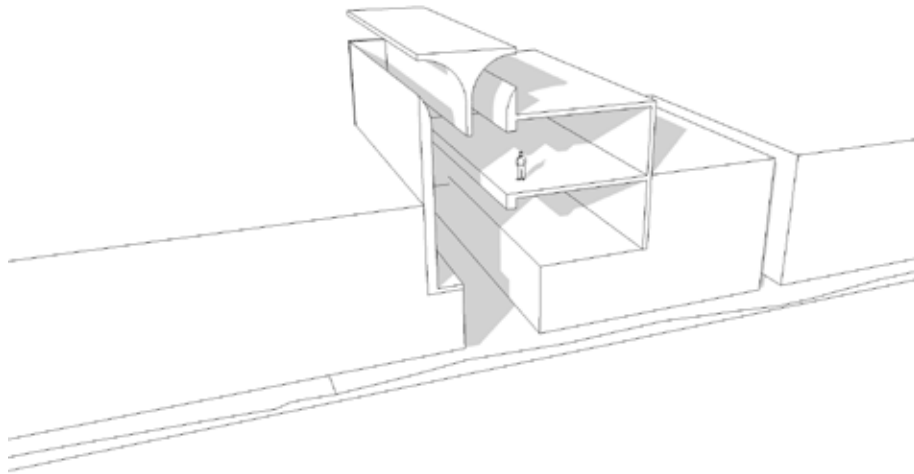


Figure 5: *Qanat Diagram*, A. Forney and N. Stinebrook

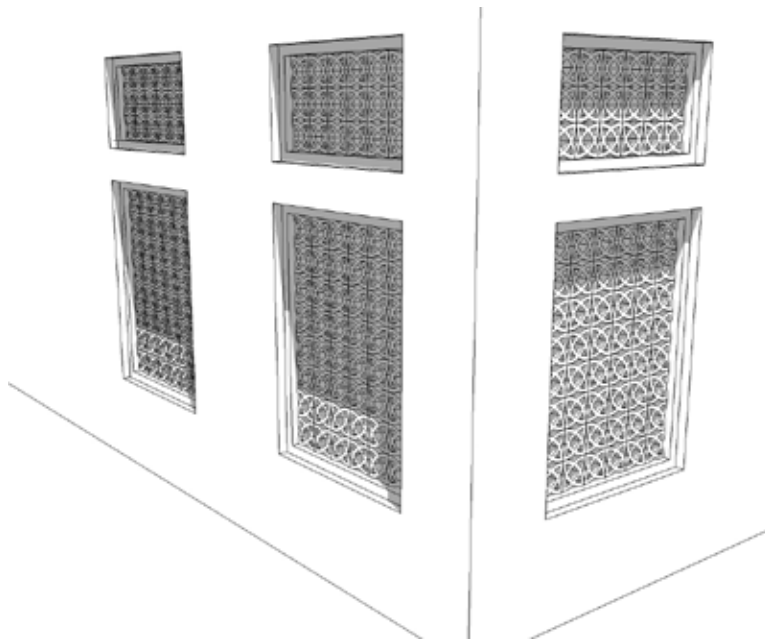


Figure 6: *Mashrabiya Screen*, A. Forney and N. Stinebrook

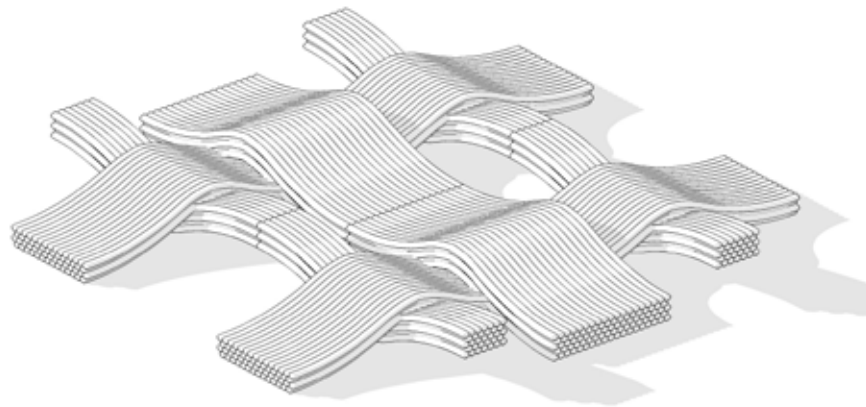


Figure 7: *Weaving Diagram*, A. Forney and N. Stinebrook



Figure 8: *Hybrid Conceptual Model, K. El Jack*

a cyclical design approach in which environmental energies, physical site forces, vernacular craft and traditional habitation patterns are concurrently reconciled. [Figure 8]

Hybrid models as a genre are based loosely on the Light-Space Modulator studies of Laszlo Maholy-Nagy at the Bauhaus (1922–1930). They reimagine Maholy-Nagy’s quintessentially Western process in response to climatic and site constraints. Unlike the Maholy-Nagy studies, which are void of programme and site context, a hybrid model blurs the relationship between buildings and their landscapes. The designer reveals a construction informed by the ordering systems of the site and the environmental forces acting upon it by making such systems visible in the configuration and selection of materials used in the model. With this approach, the overlay of ordering systems—such as environmental energies, the graining of the landscape or the fabric of an urban context—is reflected in a model void of the expectation that it perform as a building. This level of abstraction supports a more intuitive approach to sustainability. Unconstrained by the requirements of a real building, the designer need not, for example, follow standard window sizes and manufacturers’ specifications, but can indicate openings that are as site-specific as possible. The forces of the site itself thus determine the ways in which the designer connects the fabrication to its physical, cultural and temporal context.

The hybrid process also forces designers to create with their hands and bodies. Unlike an architectural model in which foam core and chipboard are called upon to represent building materials and glue is an acceptable means of connection, the hybrid model assumes no representational abstraction. Connections are understood and evaluated as the physical joining of two disparate items. The metal washer that comes into contact with steel is chosen for different reasons than the cushioned rubber gasket used to connect acrylic or glass. These selections are made with great consideration. Craft is explored on larger scale than allowed by typical architectural models. This allows for a muscular memory of making that moves beyond an intellectual exercise alone. [Figure 9]

Using welded metal, cast concrete, carpentry tools, laser cutters and CNC routers, designers create an artwork that stands autonomously to reveal and reconcile any number of site forces: sun direction, prevailing winds, watershed, bird migration, ecological patterns and, of course, zoning and other contextual constraints. These techniques are carefully chosen. Alongside modern materials and techniques, the hybrid model incorporates regional traditions of craft, building and settlement patterns in ways that celebrate



Figure 9: Hybrid Conceptual Models, F. Hussain, R. Hanafi, M. Al Zaabi

their value in creating authentic designs. These traditions are reinterpreted in order to acknowledge local heritage while articulating a restructured sense of place that is relevant to our time.

Reinterpretation/Development

Equipped with a knowledge of local techniques, the students were, as already indicated, tasked with constructing theoretical hybrid models for the design of a scientific research centre. The specified site was located on a partial clearing near the top of Jabel Hafeet, a mountain outside Al Ain in the UAE. This flat clearing has been excavated and until recently contained five giant ionizers that reportedly propel negatively charged electrons into the sky resulting in rain clouds.⁸ Catchment and erosion were common theme as site visits revealed significant wear and instability on the site's edges.

Students began the design thinking process using these hybrid models as a way of defining the formal ordering system. The hybrid model establishes a framework for site strategy, form, programmatic configuration, building systems and materiality. The model can be sliced into orthographic views that serve as the underlay for conventional architectural modes of representation, including plans, sections and elevations. Programmatic hierarchies are further refined by the designer but already exist, having been drawn from the network of environmental and cultural form determinants.

Circulation and egress are also derived from the conceptual model in that hierarchies begin to emerge that can be interpreted as primary, secondary, and tertiary space, place space, path space, and 'servant/served space'. The structural grid, having been derived by the designer out of site forces, responds efficiently and appropriately to topography, watershed, wind, views, loads and even site access for materials delivery. The designer sizes mechanical and electrical systems efficiently and complementary to the passive strategies that the hybrid model implies, such as solar orientation, thermal mass and prevailing winds and ventilation.

One project drew on the notion of weaving to establish programmatic relationships, folding 3D-printed ribbons into the landscape of a CNC-routed wood block. The resultant complex sat within the landscape much like a Bedouin tent. [Figure 10]

Another model looked at the traditional beggar's bowl, shaped like a boat and intricately engraved with calligraphy. The curved inscriptions on the surface of the bowl were reinterpreted as bladders or water pouches within the exterior façade of the building, allowing the façade itself to catch and store water before it is shed down the hillside. [Figure 11] Others utilized concrete, steel, plaster, and various other materials to convey abstract conceptual ideas about space making.

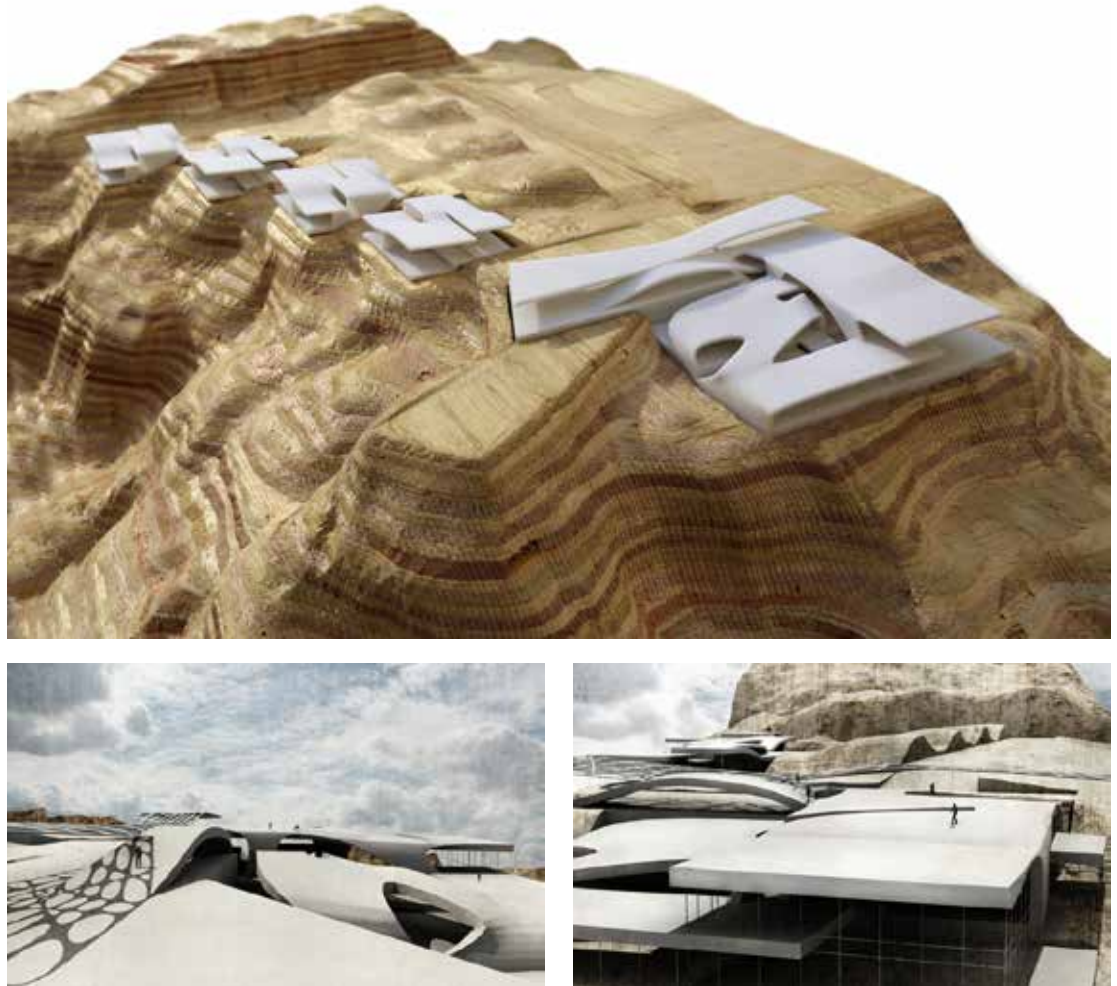


Figure 10: Architectural model and renderings, S. Al Qasimi

Conclusion

Contemporary architecture in the United Arab Emirates has evolved far beyond the indigenous sensibilities that allowed its native people to inhabit the region's brutal climates. As oil wealth has brought limitless excess to the built environment, unimaginable feats of engineering have served as an undeniable metaphor for a new kind of freedom: freedom from the environmental constraints that once regulated human habitation patterns.

It is naïve to imagine passive environmental strategies being able to accomplish the level of comfort that contemporary Middle Eastern society demands. However, the wholesale abandonment of traditional building craft and techniques has led to a placelessness that is unsettling. The common practice of hiring Western architects to design buildings that appear to be transported from various cities and climates has resulted in a lack of authenticity and a built environment of spectacle.

A new generation of architects being educated in the Middle East is acutely aware of the cultural appropriation that has occurred and is experimenting with new modes of architectural production. By studying the rich traditions of Islamic architecture and understanding the principles behind its vernacular forms and craft, one can reinvent ways of inhabiting the harshest climates of the region. The influence of environmental energies on building form provides the discipline of architecture with a fundamental rule system that allows it to create a built environment that is environmentally sensitive and culturally authentic.



Figure 11: Architectural model and renderings, H. Hatem

The studio exercise described here promotes the notion that the visible context of a site provides only one ordering system upon which the designer must rely in order to reveal solutions that reconcile programme and climate while creating a sense of place that provides cultural significance. In the case of Jabel Hafeet, this exercise will have no practical impact on the site's development. The artificial plateau that has been excavated flat will remain empty and eroding. Nevertheless, the students came out of the process armed with a new analytical tool. The exercise is repeatable and adaptable to different locations and varying contexts.

Through such fabrications, an understanding of the site forces is made visible for all to see, as when an archaeologist carefully brushes away the dirt from an excavation site. These educational artifacts allow peers, faculty and outside critics to engage with the physical manifestation of conceptual ideas. The process ingrains a reflexive intelligence in reading site conditions and drawing out design considerations not readily apparent.

The theoretical project discussed here would be considered of medium scope. It contained multiple housing units and various programmatic spaces, and it lends itself to being configured as a complex of buildings. The same process would likewise prove potent in dealing with much smaller scale projects such as a single-family residences. It is also relevant to exploring larger commercial projects or high-rises more on the scale common to the developed urban areas of the UAE. Whatever the size of the project, hybrid models introduce an alternative design process, one that is cyclical and privileges neither broad conceptual ideas nor details at the scale of materiality. Rather, the fabrication provides an exercise that is read both as concept and full-scale mock-up.

This simultaneity is a necessary result of the complex network of physical, environmental, political, religious and cultural forces at work in these globalized settings. This conceptual apparatus embodies and synthesizes the framework for an architecture of environmental sensitivity and draws on the lost traditions of the vernacular crafts of the region.

Contributor Details

Joe Colistra is an Associate Professor at the University of Kansas. He has also taught architectural design and building technology at the American University of Sharjah's College of Architecture, Art and Design in the United Arab Emirates. He is a licensed architect and founding principal of his own architectural practice, in situ Design. He earned a Bachelor of Environmental Design from Miami University in Ohio and a Master of Architecture from the University of Colorado at Denver.

Endnotes

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