Hybrid Practice: Expanding the Discipline of Architecture

Emergent technologies continue to give new opportunities for design evolution. As we foster new relationships with interdisciplinary expertise, we explore new fluid forms of collaboration and dissemination. This paper reflects on the evolution of the interdisciplinary model that propagated a new hybrid instrument for local and global communication.

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INTRODUCTION

Paul Virilio, in *Lost Dimensions*, began to theorize about the emergent spaces that architects would be developing in the future. In the last decade, through technological advancements, we have seen this speculation become a reality. As new hybrid environments (physical and virtual) are emerging that embrace (HCI) human-computing interaction, immersive media and virtual reality, new spatial experiences are possible. The mixing of digital media and physical space has created new opportunities for humanistic experiences and expands on a new paradigm of creation that is going to continue to emerge in our social fabric.

Two faculty at the University of New Mexico whom each lead laboratories in fabrication and visualization were presented with the opportunity to design a "hybrid" installation at the Albuquerque International Sunport. The communication and marketing department for the University approached the faculty members about creating an immersive environment experience that would visually stimulate incoming visitors at the airport and inform them of the diverse activity happening at the university. The faculty members, bringing expertise in digital fabrication and immersive digital media, created a team that researched the possibility of designing a new dynamic interactive cinematic experience that would formulate into a new social space, unique to consumer mass communication. In this case the client, University Communication and Marketing, acted in a participatory role. This is a unique dynamic where the client was an equal member of the design team.

A new practice construct emerged from the project that was created from an interdisciplinary foundation, fostered within the confines of the university system. The ability to research and fund the project completely within the university created a design opportunity that ultimately challenged conventional practice and delivery models.

THE COLLABORATION

The marketing and communication department at the university was interested in developing a new system of information communication. The team sought to challenge traditional conventions and promote new instruments for branding the university. This collaborative

practice of building included UCAM (University Communication and Marketing, ARTS Lab (Art, Research, Technology and Science Laboratory), CRAF+T (Center for Research in Advanced Fabrication and Technology), The School of Architecture and Planning in Conjunction with the City of Albuquerque through the school's City Lab. The liberty to research and produce new options for physical and digital interactivity was inspiring to both the University of New Mexico and the City of Albuquerque. The habitation of this installation while not an environment of physical dwelling, became a habitation of time related to social interaction and visual narrative. The challenge in the design was to formally intrigue visitors with a dynamic 3-dimensional form and to trigger social media interaction at multiple scales.

The design production was based on iteration and interdisciplinary critique format that included members of each team (communication & marketing, fabrication and visualization). The dialogue in the discussions set a discourse that pushed the design boundaries, ultimately creating a new hybrid system.

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Figure 1: Knowledge Tower, Culver City

DEVELOPMENT OF THE HYBRID

One of the primary design objectives for both the fabrication and visualization teams was how the façade piece would perform in sync with the digital mapping and projection from the virtual side of the dialogue. This dialogue required the design and prototyping process to be perpetually iterative. The digital and physical constructs had to perform with one another, a constant push and pull. Performance-based architecture is defined by a complex set of systems, both technological and social, made of physical components and digital content. Ultimately, the architectural team, is responsible for coordinating this discourse; responsible from the point of conception to the delivery of a project. This research focuses on building systems combining prefabricated sets of assemblies that allow for a comprehensive consideration of that interaction. The work demonstrates methods of combining software and digital manufacturing processes to increase performance and assembly of a hands on built structure.

Through an iterative fabrication process the team constantly accepted design input and output from the entire group of participants to enhance the visual interactive narrative. This was done through a series of both scaled and full-scale prototypes. Countless iterations of digital models were explored, revised and re-examined.

The visualization team has had experience in working in distributed rendering immersive environments. The lab continues to research new surface mapping software that creates interactive visuals on a variety of surfaces and scales. The visualization laboratory recently completed a large-scale-mapping project in Culver City, California. The "Knowledge Tower" designed by Eric Owen Moss was a distributed rendering system that the director of the visualization lab collaborated with Samitaur Constructs to create a more efficient workflow to allow designers and artists the opportunity to create content on the large scale system. This expertise was essential in moving the hybrid facade installation forward.

The design team worked with the airport administration and communication team to select a site for the hybrid facade. It was essential to have a space that had limited ambient light to ensure that the projection system would allow full illumination of the physical surfaces. Due to the complexity of the participatory nature of the project the location was changed from the original contracted space to capitalize on the human participation. This space maximized interaction and visual connection which now required highly durable materials to withstand this traffic. Several preliminary sketches led to a scaled vacuum form model, created to begin the process of digitally mapping the surface. It was determined early in the process that a faceted undulating geometric surface would allow for greater image distribution and digital calibration. The idea of a faceted surface arose from the landscape of Albuquerque, representing a new digital landscape reminiscent of the Sandia mountain range and the geometry inherent in our cultural context.

As the geometry was finalized a full-scale mock up was produced that allowed the visualization team to begin to program the visual narrative. The discussions began with understanding the fluid mobility of users and how to best address visual content. It was determined that the content would have to continually be visually dynamic and yet also reveal a sophisticated storyline in a loop. The videography team was tasked with capturing content in quick snippets and was organized in topics related to the universities programs (research, athletics, campus life and community). Once this structure was determined motion graphics software was introduced to execute the visual storyline.

The marketing team then began discussions about how to effectively brand the installation and create interactive moments for visitors to engage the hybrid wall. Utilizing full-scale interactivity (with a Microsoft Kinect system), content could be created that would allow users to manipulate the surface image and promote the university brand. The interstitial spaces between the narrative storyline would be the moments where pedestrian traffic could stop and engage the installation.

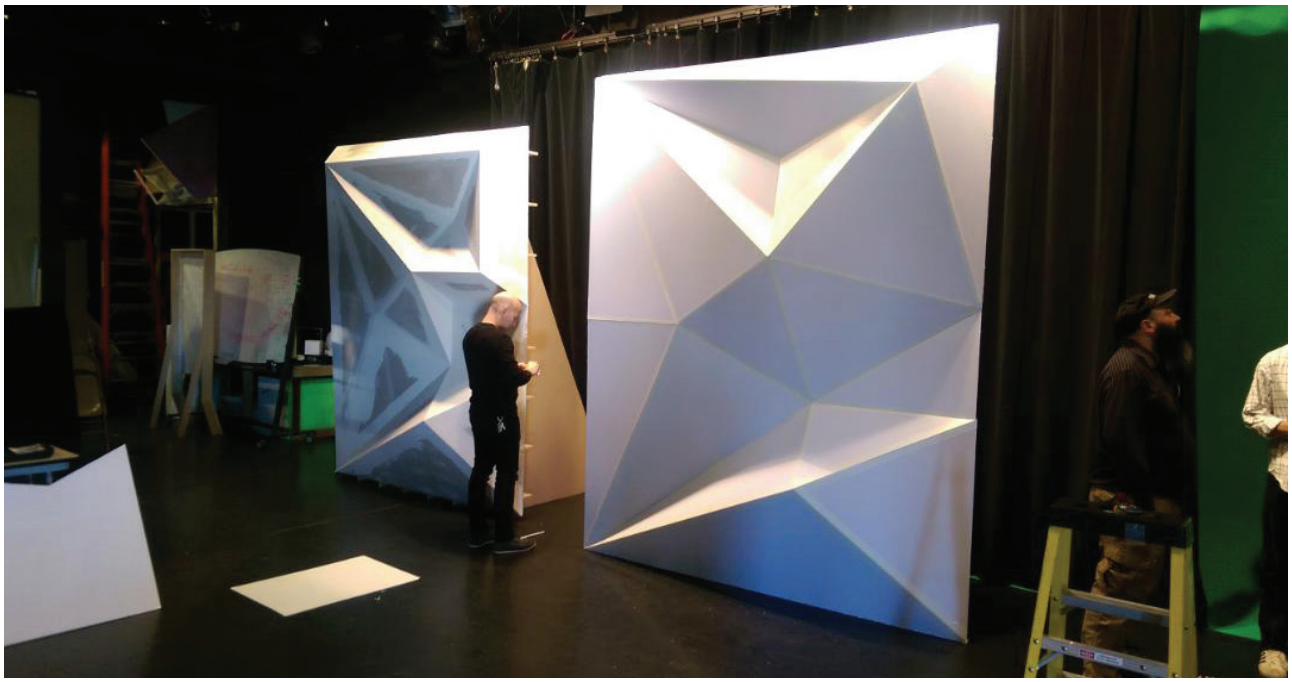

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Figure 2: full-scale mock-up

A social media component was then integrated to allow Millennials and Generation Z (integrating the universities target demographic) participants to engage in the hyperspace world that they are connected to. Twitter handles, Instagram and website development was integrated into the motion narrative. This produced a scalable media propagation that engages the local context but exists in the global fabric of the digital age. The open source nature of the project allows for constant and continual updates to the motion graphics, transitions and interactivity providing opportunities for educational courses to explore ideas using these technologies.

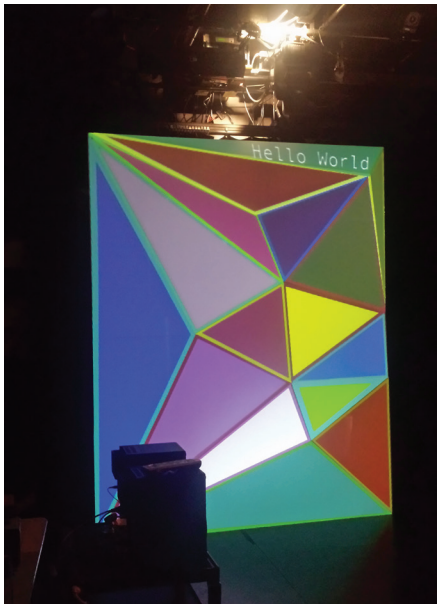
THE FABRICATION PROCESS

The fabrication team has a wide array of experience, both traditional and digital CNC controlled production. The team has worked on community engaged design-build projects, blockbuster movie sets, CNC production, and has conducted research in digital fabrication. The team works concurrently through CRAF+T (Center for Research in Advanced Fabrication and Technology) researching digitally designed and output constructs.

The design and fabrication of the airport façade display began with a series of 3-D models presented to the team. These models were manipulated over several weeks to accommodate the need of both the visualization and marketing components of the project. The first scaled mock-up was CNC milled from a solid block and vacuum-formed with polystyrene to create a smooth screen-like surface for projection mapping.

Through the actual mapping of this first surface it was determined some of the elements, including angles and undercut surfaces were not appropriate for the projection. After additional iterative 3-D modeling, a second scale prototype was fabricated in the same solid block CNC milled subtraction process. The enhanced version of scaled prototype number two was further refined in a full-scale mock-up.

The full-scale mock-up could not be CNC subtraction milled. The depth of the airport façade project was thicker than possible on the CNC router. If the team were able to find a CNC router that was capable of doing this operation the forms would have weighed several hundred pounds apiece. This challenged the fabrication team to use the tools at our disposal to find an alternative process. The team built the first full-scale prototype using a waffle structure with angles milled in the panels to accommodate a sheetrock skin. The assembly went together quickly with limited alterations and the visualization team tested the projection mapping. The full-scale mock-up resulted in two minor changes to address some fall-off pixelization. The full-scale mock-up demonstrated the egg-crate strength and durability were not appropriate for the needs of the traffic the airport generates. These issues were addressed in a final mock-up built for the visualization team to begin mapping the final content. This would allow the team to quickly project on to the final surface when installed.



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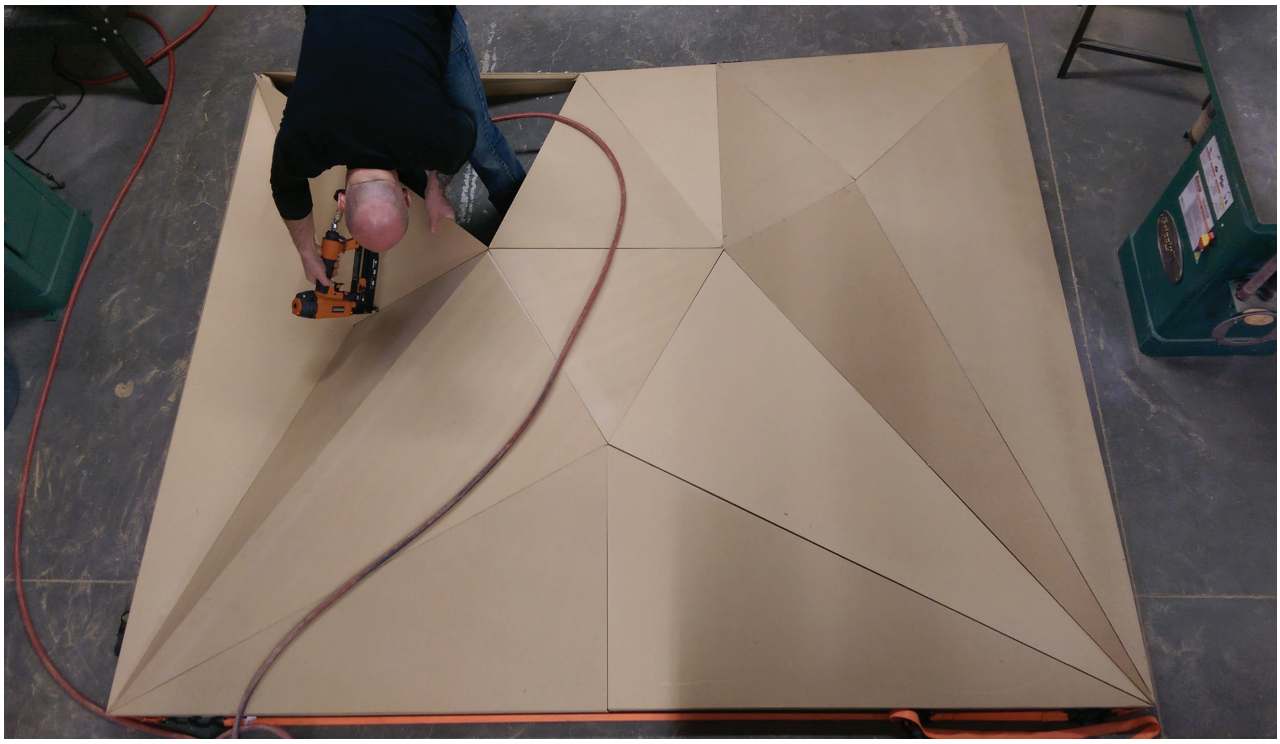

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The final façade was broken down into seven triangulated parts that come together to make the final façade assembly. The team re-designed the assembly sets to be CNC milled with 2-dimnesional panels, using the router to digitally control the milled angles in order to join the flat pieces in to triangulated assemblies. This process allowed the panels to come together quickly, reducing weight and shipping costs. The seven forms were sent to Warner

Figure 3: Digital mapping of surface

Figure 4: Form work molds

Bros. Studio in Los Angeles, CA. Warner Bros. who vacuum formed the panels and shipped only the skins back to the fabrication team. Similar to the re-design of the façade system, the structural system was updated for maximum durability. The design used CNC milled structural aluminum sub-frames on to a cross-braced rigid back structure. The sub-structure used racing parts and rod extenders to reach off and grab the skin at each angle, removing the need for custom-made brackets at each moment. The frames were welded and screwed awaiting the arrival of the skin.

Once the skins arrived they were bolted to one another and to the frame system, resulting in a very quick final assembly. The only part left for the installation crew was the single hinge for maintenance of TV screens on the opposing side of the installation.

The team oversaw the installation at the airport by a local contractor.

CONCLUSION

This project examined the relationships between the traditional client, consultant and architect and proved a better, more successful product is achieved when all parties are collaborators instead of the traditional hierarchy. In this case the design team included UCAM (University Communication and Marketing), ARTS Lab (Art, Research, Technology & Science) and CRAF+T (Center for Research in Advanced Fabrication and Technology) collectively at the table.

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This collaborative project required renewed roles and intense interrelationships among the larger team in the design process. The impact of this type of project is demonstrated in many ways, altering the client architect and consultant roles. By changing the expectations, restructuring the relationships, the result was one of equal input in the final execution of the project. This collaborative effort required the talents of all participants while maintaining each of the individual tastes and needs. The relationships of the collaboration created a new integrated production in the design practice.

Figure 5: final installation

The emergence of digital fabrication, digital design and technology over the last 10 years has not only transformed our design workflow, it has begun to shift the practice of architecture altogether. Specifically the digital era of architecture and a renewed role including partnerships with computer driven machines, technology and cross-discipline collaboration have provided increased opportunities for the designer to re-examine the responsibility of design and construction in the built environment. Today's design teams must be comprised of people who can join forces through interdisciplinary practice to ensure a successful project in all aspects. This collaborative practice translates to new a method of working collaboratively through a project including, design, fabrication, project management with concern for the evolution of a concept to the reality of a physical object. Today's Architect/Designer is not simply practicing Architecture through buildings, but rather they are working on design of all objects, spaces, aesthetics, and materialization of physical objects in the built environment. Using these ideas and technologies, Architects/Designers are creating complex designs, that are scalable from micro to macro and have allowed for greater efficiencies and more effective design results to be executed in our built environment.

Utilizing the expertise of digital fabrication tools and new production methods resulted in an alternate product delivery. The challenges that arose during the design evolution stems from the core values each discipline finds most important. The fabrication team was primarily concerned about the aesthetics and geometry, the visualization group was concerned about the image quality and ability to create transitions with the geometry, while the UCAM group was focused on the quality of the content and it's impact on the experience of the patron. These conflicts are resolved through better discussion of why these things are important and based on the fact that everyone was able to agree that all of these are in fact important on some level. We are able capitalize on these conflicts and able to produce a better dialogue and product because each party is willing to hold on to their identity while creating a collective vision.

This model of collaboration, where all parties have equal say and weight proves a research method without a PI but instead comprised of co-PI's increases the capacity for successful effectiveness. The collaborative relationship re-examines the roles of designers, clients, and fabricators, shifting the norms of the design,build and architecture dynamics. The increased understanding of Design research, academic experimentation and new practice models, explore a spectrum of collaborative and participatory practices by which new knowledge is created. As the architectural academy grapples with its relevance and significance, introducing practices that expand our disciplinary reach and our collaborative network is critical to producing the next generation of practitioners able to operate in an expanded professional territory.

ENDNOTES

1. Virilio, Paul, *Lost Dimension*, Autonomedia Press, Brooklyn, New York (1991)
2. Kolarevic, Branko. *Architecture in the Digital Age: Design and Manufacturing*, New York: Spon Press (2003)
3. Dunn Nick, Digital *Fabrication in Architecture*, Laurence King Publishing Ltd, London (2012)