Discovering and Translating Building Technology through a Cultural and Technological Investigation of Carnival

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Abstract

This paper explores design teaching methodology in a graduate design studio focused on discovering building technology and its integration in architectural design. A core goal of this approach is encapsulated in the manner Liz O'Sullivan, consultant and member of CSI's Building Technology Education Program calls attention to and defines the importance of building technology knowledge, and learning how to integrate it into design, a necessary skill that she alerts young designers have little strength in. Author Walton asserts that the design process is incomplete if technical knowledge is not made part of the creative process. This approach attempts a creative method in hopes of alleviating the weight of navigating this part of their architectural education but also to further their thinking of building technology integration, generating new and innovative ways of application. The design prompt offered a "playful" approach to the discovery, translation and integration of building technology. The prompt asks the studio to study the pre-Lenten Carnivals of three interrelated, Black African Diasporic regions – New Orleans, LA (Southern US), Trinidad and Tobago (Southern Caribbean) and Rio de Janeiro, Brazil (South America), where Carnival is not merely celebrated but venerated, and to design a 15,000 square feet community space on a given site, dedicated to the production of Carnival. Events leading up to the Carnival season, Carnival Day itself and post Carnival activities all manifest the Carnival experience and were to be synthesized in the architectural experience. Thematically, the facility is to be a place capturing the "Spirit of Carnival", a Carnival of past, present and future. Five "architectures" of Carnival were identified, researched and studied: space/venue, music, masquerade "mas", people and food. Each of these "architectures", necessary building blocks of Carnival, individually and collectively rely on forms of construction and building technology in the production of the festival. Technology, identified as a sixth "architecture" in the study, and more specifically technology used in the crafting making – the building of artifacts, provided opportunities for translating Carnival construction and technique into systems of building technology. Areas of design focus and study in generating their ideas were building mass, building structure and building envelope. The students were asked to lean heavily into researching Carnival crafting techniques such as "traditional wire bending" as seen in the Carnival productions from Trinidad and Tobago and float building construction as seen in Carnival productions in New Orleans and Rio de Janeiro. In addition to generating their ideas, maintaining a sense of cultural expression was paramount in contributing to the user experience.

Introduction

Carnival, a pre-Lenten festival tradition is celebrated yearly in the Black African Diaspora. It was imperative that the students gained a comprehensive understanding of the festival as it is portrayed across the three selected regions of the Black African Diaspora. Dissecting and analyzing the *five architectures* facilitated an in-depth study of not only the "*architecture of the festival*" but

through the Carnival lens, it revealed strong historical, geographical and cultural ties due to their colonial linkage. This reinforced the interrelationships of the regions. It allowed for the identification and comparative analysis of collector categories such as commonalities, complexities, similarities, overlaps, nuances and differences, categorizing Carnival crafting practices and construction approach in each region. This would later serve their design process as it furthered their technical discovery ─ exploring ideas and principles of size, scale, proportion, structure, materiality, tectonics and construction systems across the Carnivals in each region. Liz O'Sullivan highlights the interrelationship of systems and assemblies in a building's composition and the necessity of these parts working together to promote proper functioning of a building.[1] Elizabeth Diller offers a view of architecture as a technology that involves many inseparable soft systems like cultural, economic and political forces. [2] These two views, deemed *"hard skill and soft skill",* shaped the impetus of this creative approach. Launching the Carnival study began with a discovery exercise of the festival as it is celebrated in each region (Figure 1). Carnival celebrations are defined by the following aspects in each region. In New Orleans, Mardi Gras, the culminating day of celebration translates from French to "Fat Tuesday" and has its roots in masquerade celebrations by French colonizers since the 1600s.[3] In Trinidad and Tobago, it's earliest inception of Carnival dates to 1838 where emancipated slaves, celebrating their freedom by carrying burning sugar canes in the streets. Referred to as "cannes brûlées" French for "burnt sugar".[4] French was the language widely spoken due to an influx of French plantation immigrant owners at that time. It would be further linguistically articulated as "canboulay" in the developing dialect and is said to be the precursor to today's Carnival. In Brazil, dating back to 1723, Portuguese aristocrats in celebration of an abundance of goods paraded in masks. Carnival in Brazil varies by region and this was noted and acknowledged in the study.[5] Rio and Bahia were subjects of the study.

Fig. 1. Student Groups, Carnival Discovery Study

Three Design Areas of Study and Idea Generation

After amassing a body of knowledge of each Carnival, the study progressed into an initial idea generation and design study exercise where the students engaged in an elemental based exploration, analyzing characteristics of the five architectures, aiming to derive and define instances where crafting, construction technique and

tectonic connections were evident. Grouping the derivations by mass, structure and envelope, assisted their thinking in moving towards a catalog of opportunities for technology translation. For example, examining mass allowed their thinking to focus on how the aggregation of material and the scale of a collection of materials fit together in building composition. A discussion arose exploring how materials come together in a potential coursing of material matter or material adjacencies. Structure seemed more straightforward as the students were more able to visually parse out costuming techniques in the masquerade category by size, scale, components and connection techniques. This allowed them to think of a translation to building components and how they fit within assemblies, planar or vertical such as a wall assembly as well as connection mechanisms. Envelope offered a broader thinking in that the extraction of what might be considered building *skin*, or a segment of a covering system could be discovered in each one of the five architectures. This led to various ideas and interpretations. For instance, *music, people* and *masquerade* – a costume component may function as a skin, covering or wrap. The way a person moves the costume when *masquerading*, may change how its surface is read or the way it registers in form, as in the manner architect Zaha Hadid spoke of how she views her approach to some of her work as forms in motion.[6] Note or rhythm extractions from *music* could also be applied to envelope where direct or indirect applications and manipulations augment the surface and the experience of an envelope. This then led to a discussion around façade development, light propagation and filtration, active and passive design strategies, heating and cooling systems as well as building aesthetics. Once each of the elemental studies were explored, a shifting of scales to test various formal organizational strategies through physical site-models, were employed.

"Playing Mas(s)" – Massing Study

An expression widely heard in Caribbean Carnival. The term "mas" is a shortened version of masquerade. In this design study area, one student group (Group E+C) delved into two of the five architectures: *space*/*venue* and *food.* They examined the temporary/semi-permanent colorful wooden structures known as "vendor booths", that are erected at the main venue for the purpose of serving food and refreshments. Their analysis catalogued these structures into one story buildings, sheathed in plywood, fabricated and constructed on site in a repetitive manner, all massed similarly. Figure (2) illustrates the proposal idea, scaling an elemental one-story structure to a multistory collection of successive buildings. Their early iterations examined how different mass organizations and orientations of the "scaled booths" would affect light propagation and sound attenuation throughout the masses.

Fig. 2. Student Group (E+C) Massing Study

A second student group (M+T) focused on *masquerade* and determined the placement or collection of mass as lightly touching ground in terms of building foundation. This governed the derivation of their massing. Figure (3) illustrates their thought process, where the assembled bulk of the building mass, situates in the second story, with minimal presence on the ground floor.

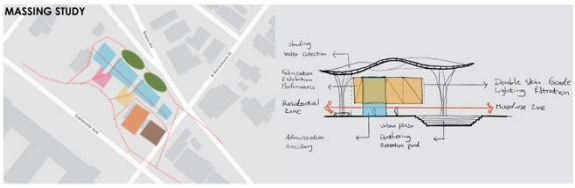


Fig. 3. Student Group (M+T) Massing Study

"Moko Jumbie" – Structure Study

The Moko Jumbie, a traditional stilt walker and dancer seen throughout Carnival celebrations.[7] Heights of up to 5-20ft are achieved through years of practice to gain the stability needed to maneuver while masquerading on the stilt. Capturing the expanse of the space occupied by a would be 'moko jumbie' in masquerade, student group (M+T) initiated their structural study by thinking of the main gathering space as a mostly continuous and elevated space. They devised a series of column trees deployed within this space to support the roof plane. Their massing strategy supports this approach to structure. Figure (4) illustrates the column tree design idea. They explored the tree in elevation, cross - section and plan. The steel pan, which is introduced and discussed in the following section, served as a form generator for the cross-sectional rendering of the column tree.

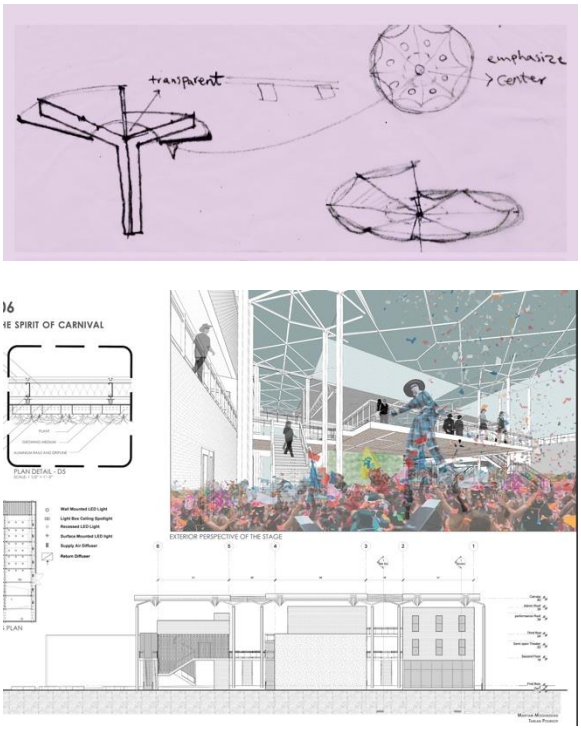


Fig. 4. Student Group (M+T) Structure Study

Student group (S+T) examined samples of *masquerade* costumes and devised a three-scheme analysis to generate their ideas. Figure (5) illustrates the three schemes. Each type of structural configuration was extracted by an analysis of selected Carnival costumes – a spaceframe, a spanning structure (the 'batwing') and a shaped structure (the 'cone' shape). Their next step incorporated a study of the method of traditional "wire bending" from Trinidad Carnival, pioneered by expert wire benders Albert Bailey and Stephen Derek, to derive prototypes of understanding in each of the identified structural categories. The traditional Trinidad Carnival wire bending method fundamentally consists of following components: wire, aluminum rods, aluminum flats, fiber glass rods, fiber glass tape and cable ties. Figure (5) illustrates how the students utilized the Bailey Derek Grammar (Vernell N., 2015)., first by making samples of wire bends, following the rules and syntax outlined in the grammar to understand the method. They accompanied their crafting with a re-written, annotated and coded form of the grammar, to document the steps followed. Their wire bending explorations were applied in the three structural configurations discovered. Figure (5) illustrates results of their exploration.

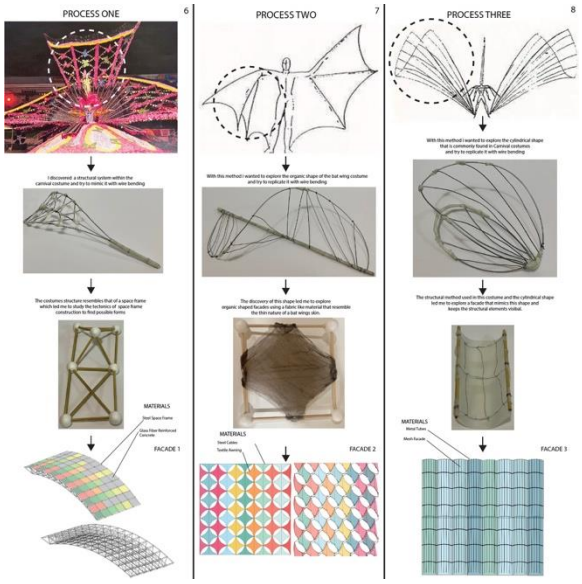
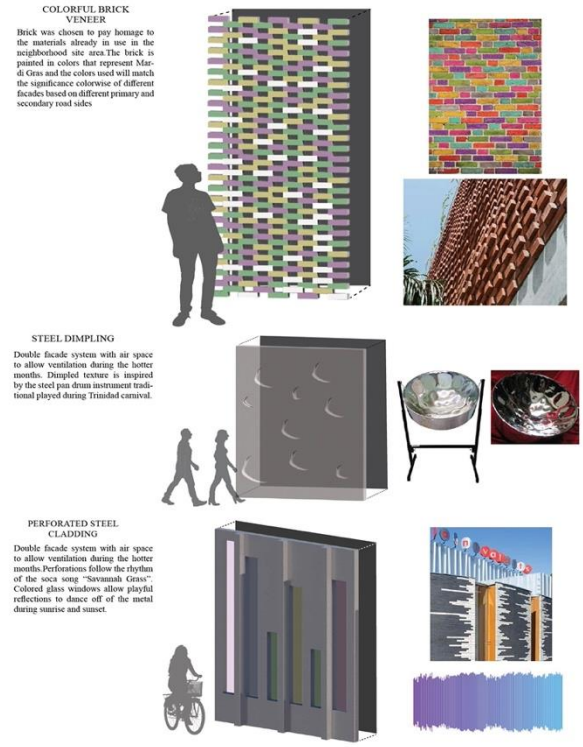


Fig. 5. Student Group (S+G) Structure and Envelope Study

"The Panorama" – Envelope Study

The steelpan, a staple of Caribbean Carnival, was invented in Trinidad and Tobago in the 1930s, and is the only new acoustical musical instrument to be invented in the 20th century. A unique invention as it is purported that other acoustic musical contemporaries of the steel pan were experimental versions of existing instruments. The steelpan is Trinidad and Tobago's national instrument and consists of multiple types of pans – the tenor, double tenor, the second, double second, guitar, cello, tenor bass and bass.[8] When arranged with accompanying parts of a musical ensemble such as percussion drums, a steelband or steelpan orchestra is formed. Each musical component carries a specific function within this system of instruments. The steel drum is crafted from an oil drum whose extreme ends have been sectioned from the main body of the drum. The ends are then tempered with heat and a hammer producing indentations in the surface (dimpling), producing notes on the musical scale.[3] Student group (B+D) researched and studied this method of "*musical note finding*" to understand material properties and the manipulation of material. They explored steel as building wrap; studying it as a single plane or sheet material where voids could be introduced into the surface to facilitate fenestration and other building openings. They interpreted the "dimpling" method as a mechanical manipulation that when scaled can respond to environmental and programmatic aspects of their building design. Further explorations involving their building façade consisted of developing a method of translating musical notes of Carnival music into rhythmic openings in the building wrap. Figure (6) illustrates their study.



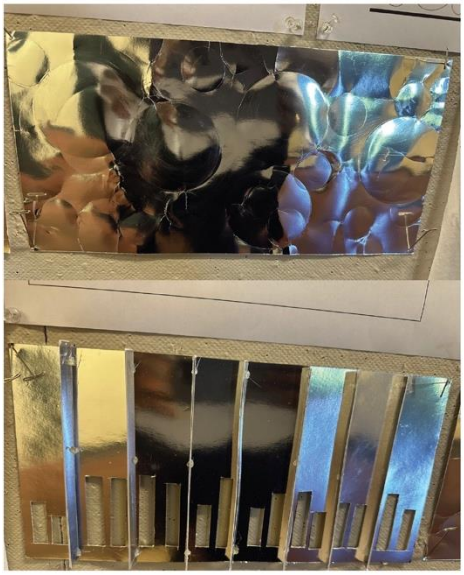


Fig. 6. Student Group (D+B) Envelope Study

Student group (S+G) continued their examination of *masquerade* costumes and devised three more schemes of analysis to generate their ideas of *envelope*. Figure (5) illustrates the three schemes. Leveraging what they discovered in their structure study, they imagined the spaceframe as being clad utilizing glass

fiber reinforced concrete. The geometry of the spaceframe enables notions of curvature as evidenced in the masquerade costume samples they analyzed. The 'batwing' structure led them to exploring a fabric material wrap, matching characteristics of the batwing such as thinness and tensility. In studying the conical structure, they derived ideas of curvature and looked at less rigid materials (a mesh) to more rigid materials (a metal) that could be integrated into a curved structure.

Conclusion

In summarizing the methodology and outcomes presented in this paper, the following aspects can be reflected on. The design studio has been a contentious site of design study in the acquisition of knowledge and skill in the integration of building technology in design. Many authors of the architectural design discipline, in and outside of architecture design studio have argued for its need and rightful place in design curriculum. It continues to be a relevant topic of discussion in the architectural design studio discourse. Liz O'Sullivan's points in conjunction with author Watson's views reinforce this. The explorations presented in this paper served to generate the beginning of a technical discussion via a creative process. Could this also be thought of in reverse? Could the explorations serve to generate the beginning of a creative discussion via a technical process? Ledewitz discusses the "fear of designing" in her multiple reflections of studio teaching modalities. She states that students often feel a lack of control over the design process, and she more specifically attributes this fear to the perceived wide gap of the emphatic distinction between analysis and synthesis.[9] This gap is often experienced, extended and exacerbated when building technology enters the design discussion. Watson advocates for two curriculum formats that engage technology with design – the Technology Discovery Laboratory where ideas related to technology such as structure and construction materials can be tested and the Research/Design Interdisciplinary Studio, where research and discovery-based learning underscores the methodology in design idea generation.[10] The majority of the student group explorations marked the beginning of the research and design interface. Many of the desk critiques following their initial design idea generations in the elemental study areas sought to think through formal organization and programmatic deployments while assembling a building technology language syntax, derived from their explorations and translations. An aspirational and planned revision of this creative teaching methodology takes Watson's technology discovery laboratory into consideration where testing of the derived technology ideas can be incorporated as a necessary step in the design process. An opportunity to further explore differentiations of the outcomes in their derived building technologies by diasporic region, would further support the methodology.

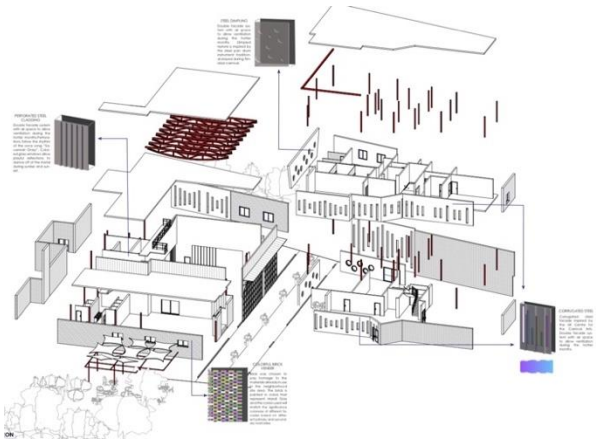


Fig. 7 Carnival Community Facility, Student Group (B+D)

Acknowledgements

I would like to recognize and thank the crafters of Carnival that through the passing on of long practiced construction technique preserve this rich heritage. I would also like to recognize and thank the students of this graduate studio for their curiosity in testing this method of design inquiry and building technology discovery.

Notes:

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