Gulf Material Traditions Semantically Reconsidered

A CASE STUDY OF THREE DIGITAL APPROACHES IN FURNITURE DESIGN AND FABRICATION

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ABSTRACT:
Oil-driven development and globalization in the Middle-Eastern Gulf Region in the 1970s induced a rupture in an already attenuated indigenous crafts and material culture. Simultaneously, it brought an influx of people from around the Middle East and beyond—creating a pan-Arabic cultural melting pot. The introduction of digital fabrication equipment at one university in the UAE has provided the opportunity to reconsider the region’s material traditions. Through a required furniture design course, and more recently an elective entitled Form, Furniture and Graphics, architecture, interior design and graphic design students have begun to grapple with the intersection of a critical design process and the needs of particular local cultural conditions. Students have utilized one (or more) of the following approaches to semantically and digitally reconsider Gulf material traditions: pattern paneling, text-based manipulations, morphing of historical typologies.

KEYWORDS:
Furniture; Digital; Fabrication; Paneling; Semantic; Dubai; UAE
1. Introduction

“One of the key issues facing contemporary designers is how to address the fundamental human need for physical, tangible memories ... Every culture uses objects as a means of embodying the memories and meanings that define it.” (Sudjic, 2012, p. 9)

Oil-driven development and globalization in the Middle-Eastern Gulf Region in the 1970s induced a rupture in an already attenuated indigenous crafts and material culture. Simultaneously, it brought an influx of people from around the Middle East and beyond—creating a pan-Arabic cultural melting pot. The introduction of digital fabrication equipment at one university in the UAE has provided the opportunity to digitally reconsider the region’s material traditions. Through a required furniture design course, and more recently an elective entitled Form, Furniture and Graphics, architecture, interior design and graphic design students have begun to grapple with the intersection of a critical design process and the needs of particular local cultural conditions. Students have utilized one (or more) of the following approaches to semantically and digitally reconsider Gulf material traditions: pattern paneling, text-based manipulations, and morphing of historical typologies.

These approaches build on traditional material cultural conditions in the region: pattern in architecture and art, contextual furniture typologies or morphologies, and calligraphy. With figural art forbidden in Islam, the dominant art forms traditionally became explorations in pattern-making and calligraphy (text). These two artistic modalities similar in their abstraction differ in execution: one mode expressed through repetitive geometry devoid of semiotic content, with the other expressed through singular and semantically charged compositions. Students reconsidered these modalities, in some instances questioning the dichotomy (see Figure 1 for an example of hybridizing the two modes of expression) and in others leveraging the modalities for some new intent or effect.

![Figure 1 – 3D print of chair designed to rock to aid in the motion of Islamic prayer](image)

2. Form, Furniture and Graphics course

Following five years of teaching a required furniture design course at American University of Sharjah (UAE), I collaborated with a graphic design colleague, Associate Professor Amir Berbic, on a cross-disciplinary furniture design course entitled Form, Furniture and Graphics. Students in the course explored the potential reciprocity between 2-dimensional graphics and 3-dimensional form. This course addressed two basic objectives: 1) the desire to increase cross-disciplinary collaborations in a college where graphic design and architecture programs operate largely in silos, and 2) to help students
begin to define possibilities for a new material culture through furniture design and fabrication in the Khaleeji (or Gulf) region—a region largely lacking an existing local material culture.²

The ambitious brief for the course included several introductory exercises exploring 2-dimensional pattern-making, 3-dimensionalizing those patterns (see Figure 2), and ultimately the design of a furniture piece that explored the relationship between 2-dimensional graphics and 3-dimensional form.

Finally, the students fabricated their furniture designs. The cross-disciplinary nature of the course increased the degree of difficulty—half of the students enrolled in the course were graphic design students with no background in the physical act of making. This inexperience emerges from a larger cultural context where prejudices against physical labor and other economic realities have all contributed to the rupture between this generation and their forbearers’ material traditions. This design/build furniture course represents one attempt to heal this rupture.

The furniture project built on earlier explorations in the semester with the additional considerations of function and semantic clarity, as well as a response to the theme of the course—the potentially reciprocal relationship between 2-dimensional graphics and 3-dimensional form. The project objectives were to establish a conceptual underpinning for all formal design decisions, to solve functional problems through the reciprocal relationship between 2-dimensional graphics and 3-dimensional form, and to integrate language and/or a semantic reference (that can be “read”) into the furniture design.

The student outcomes to these objectives manifested in a number of ways. In some cases, the students built closely on the early pattern-making exercises to create a textural skin for the furniture piece, which also functioned semantically (see Figure 3).
Figure 3 – The typographic pattern on the skin of the Amal’s Prayer Chair is derived from the Arabic letter ‘kaf’ and refers to the “The Throne” (Ayatul-Kirs), a verse in the Holy Quran. The verse states: “His Chair doth extend, Over the heavens And the Earth...”

Figure 4 – Veto cross-sectionally transforms the Arabic word “la” into “kalla”

Figure 5 – Veto’s serial sections transforming across the piece
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Figure 6 – palimpsest-like quality of the waste sheet records the cross-sectional transformation on Veto

Figure 7 – Roman script emerging from the tablet on Phoenician Reading Table

Figure 8 – a section from The Thinker’s Chair’s being contoured on the CNC router
In another case (The Thinker’s Chair), the student leveraged the fabrication technique (serial section and lamination) to provide a textual grid on which to overlay literary passages (see Figure 10). The Phoenician Reading Table used the transition from 2-dimensional text to 3-dimensional text to partially define the form of the piece (see Figure 9). Veto takes this technique to its logical conclusion—the textual transformation literally defines the form and provides the structure of the piece (see Figures 6).

Fabrication of each furniture piece required the use of the College’s new digital fabrication equipment and provided an intense introduction to the use of the machines for both architecture and graphic design students—opening powerful new avenues of investigation for students of either design discipline. (see Figures 6, 7, 8).
3. Three Approaches

3.1 Pattern Paneling

Amal’s Prayer Chair reconnects on multiple levels to material traditions in new ways. The chair rocks to aid in the act of praying. The concept originates from the desire to aid the designer’s late grandmother who struggled to pray in the prostrate position because of physical ailments. According to Islamic tradition, those who cannot physically endure prostration may pray in a sitting position. Typically her grandmother would pray in whatever chair was available. The form and typology of the chair (rocking) came from a desire to invent a chair that would work specifically for this function. The typographic pattern on the skin of the chair is derived from the Arabic letter ‘kaf’ and refers to the “The Throne” (Ayatul-Kirsi), a verse in the Holy Quran. The verse states: “His Chair doth extend, Over the heavens And the Earth...”

3.1.1 Design process

The designer (a graphic design student) started with a sketch for a rocking chair (see Figure 11) and a letter fragment pattern (see Figure 12). Using a digital modeling tool specializing in panelizing, the designer wrapped the pattern onto the chair form (see Figures 13 and 14). The final result hybridizes the two modalities of pattern and calligraphy (see Figures 1, 3 and 19). The semantic content embedded in the letter fragment is regularized via 2-dimensional pattern-making before being applied in a 3-dimensional paneling process on the singular form of the chair.
3.1.2 Fabrication process

The designer 3D printed the chair to get a sense of balance and the rocking motion and to see the form in 3-dimensions before moving on to a larger scale prototype. The question of how to apply a relatively simple (and inexpensive) digital prototyping process to scale up without losing accuracy of the form nearly put an end to the project.

The obvious solution, serial section and lamination, was initially discarded as impracticable because of the multiple non-continuous cross-sections of the form. At any given section the form of the chair produces several disconnected shapes. Additionally, the detail of the patterned skin constituted another major hurdle. Examples of complex surfaces articulated using a laminar process provided some hope. Inspiration came after watching a promotional video for a 3D printer that uses paper as the medium and considering the process of the college’s own powder-based 3D printer. A digital bounding box could conceptually function as the powder filled printing bay. However, like the paper-based 3D printer, this process would utilize a sheet (of MDF) rather than powder to build up the shape. The form would be created by laminating square-shaped layers of 3mm MDF with the cross-sections of the chair laser-cut into them (see Figure 15)—ultimately entombing the form of the chair in a cube of MDF (see Figure 16). The prototype then had to be “excavated” much like the 3D powder printed chair.
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Figure 17 – prototype of Amal’s Prayer Chair being excavated from the layers of MDF previously cut on a laser cutter before being laminated

Figure 18 – “excavation” of prototype, discarded layers in the background (see Figures 17 and 18). The “excavation” in this case consisted of slicing through the layers of MDF and removing the surrounding waste, layer by layer. The result was a remarkably accurate prototype of the form (see Figures 19 and 20). Directionality of the laminations had a significant impact on the legibility of the pattern. Where the form of the chair faces perpendicular to the laminations, the pattern is reproduced with great detail and accuracy. As the form rotates away from this direction, detail is lost.

3.1.3 Untapped potentials

Given the time-constraints and limited digital modeling and fabrication experience of the student designer, the ultimate manifestation of Amal’s Prayer Chair leaves untapped potential. Design opportunities left untapped included semantic, ergonomic and constructional issues. Given more time, the designer intended to explore variations on the pattern and paneling of the skin including embedding more explicit semantic content, morphing the scale of the pattern based on contact with the body and exploring the degree of extrusion of the pattern away from the shell of the chair. The form of the chair needs continued ergonomic development using full-scale prototypes, as well as structural analysis (digital- and/or material-based) that might inform the shape of the piece. A resolution on a production method for the finished piece would also play a role in the final manifestation of the chair.
3.2 Text-based manipulations

Three projects from the Form, Furniture and Graphics course explored text-based manipulations as a way to respond to cultural conditions or personal preoccupations (or both). Veto intersects typography with 3-dimensional design by employing Arabic letterforms as the structure for a furniture piece. The table’s form is derived from a cross-sectional transformation of the Arabic word ‘la’ (meaning refusal, denial or disbelief) into ‘kalla’ (indicating strong disapproval, protest or objection) (see Figures 4 and 21). The concept is inspired by dissent expressed in the Arab world during the Arab Spring revolutions.

The Phoenician Reading Table is inspired by the student’s interest in pre-Islamic forms of culture from the region. The Phoenician alphabet is one of the earliest forms of writing. The table surface engraved with Phoenician letterforms provides a base for Latin script emerging from a new, “modern” tablet (see Figures 22 and 23). The tablet ultimately supports a book in the open reading position. The reader engages the table in a seated position on the floor.

The Thinker’s Chair was constructed by sanding laminated CNC-routed serial sections of wood smooth (see Figure 8) and was inspired by Rodin’s masterpiece The Thinker. The arching support compels a person to sit in a similar fashion as The Thinker (see Figure 24, 25 and 27), whose uncomfortable and tortured pose suggests a difficult intellectual struggle. The weaving pattern of text on the surface responds to grid lines established by the wood laminations, and refers to Dante’s Divine Comedy, Rodin’s original theme for the sculpture (see Figures 26 and 27).
3.3 Morphing historical typology

The form of this Syrian coffee table emerged from the desire of the two student designers to manipulate a common typology from their home country. Syrian coffee tables are typically formed as a hexagonal extrusion with decorative cutouts in the legs. The students chose to push the idea of the cutouts to their material tectonic envelope, creating a light form while respecting the basic hexagonal configuration (see Figure 28).

4. Conclusion

The use of digital tools can play a pivotal role healing the rupture in the Gulf’s material tradition (whatever the cause may be) while providing trajectories for new material manifestations.

Though maintaining a link with historical traditions is important, it is equally important not to ascribe too much significance to the issue. In reality, it is through the application of critical design skills in
solving particular local problems that a unique material culture can begin to reemerge. Critically addressing program, form, phenomenology and technique can result in place-specific furniture—though it may not be readily identifiable as such. In some cases (Amal’s Prayer Chair, for example), digital design and fabrication can provide a glimpse of the future while linking intimately with past traditions.

Figure 28 – design and fabrication process of prototype of a reconsidered Syrian coffee table

Endnotes

1 Excerpts from Deyan Sudjic’s essay for Abu Dhabi Art Fair 2013
2 What caused this relative sparsity of existing material culture? According to Rebecca Torstrick and Elizabeth Faier in Culture and Customs of the Arab Gulf States, “Material possessions were often limited, given the small size of houses, the need for mobility in Bedouin tents, and the lack of disposable wealth. While there is a minimal amount of architectural and material cultural tradition, it does not mean that people had no appreciation for aesthetics. Rather, there were limited materials, time, and options for decorative display.” (Torstrick and Faier, 2009, p. 59)
3 Rhinoceros’ Paneling Tools plug-in
4 Michael Hansmeyer’s Ornamented Columns provided one compelling example

Acknowledgments

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References

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