

Article

## Digital Imagery and Architecture Explored in the Architectural Education Studio

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### Abstract

Projecting images on architectural surfaces is as old as architecture itself, arguably even proceeds architecture as it is traced to cave paintings. This phenomena of artificial space (image) within real space (architecture) has evolved in complexity and sophistication over the years, attempting to expand physical presence beyond the immediate space and time. Large glass panels, as they evolved early in the 20<sup>th</sup> century, blurred the distinction between interior and exterior space, and became, undoubtedly, the most dramatic architectural material of the 20<sup>th</sup> century. Digital imagery, moving image technology, and projection screens technology emerged late in the 50's, further enhanced the possibilities of spatial complexity. In the 21<sup>st</sup> century, accelerating technologies freed the 'moving-image' from the confines of the TV and the cinema theater to become a common building material. Digital imagery and projection screens are dominant in contemporary life and culture. Projection screens can be made of almost every size and shape, they are sustainable to weather and light conditions, and can easily portray an endless variety of content. At this point the relationship between image and architecture are, most then ever, in need to be questioned and reevaluated.

The paper begins by establishing, in architectural terms, the background of the issues surfaced by transparency and projection screen technology. This reality confronts us with new challenges, not the least within the confines of architecture education. It has become essential to develop and research new practices, design problems, and correspondingly relevant design exercises. The paper examines the subject by a case-study of a design exercise developed by the author and conducted with design students over the past several years. The design exercise suggests a framework to experiment with digital imagery and projection screens as a building material. The paper analysis the methodology of the exercise and evaluates its implications and outcomes. The paper concludes with a discussion of some questions and ideas for further discourse into the issue.

**Keywords:** architecture, architecture education, digital imagery, projection surface.

### Introduction

The reality of society and culture in the 21<sup>st</sup> century is marked by tendencies of flatness and complexity. These conflicting phenomena are augmented by the rapid advances in technology and globalization. As is marked by several researchers of contemporary architectural education this cultural reality is very much delivered and understood via the image, the visual rather than the haptic. The image and its possibilities of digital projection

are currently abundant like never previously in history, it is consumed by society in an unprecedented rate. The influence of digital-imagery-overload is central to understanding contemporary society and culture. This reality is touching upon every cultural aspect, transforming society, art, and not the least architecture. The roots of these transformations can be traced back to the history of art and architecture (Evans, 1997). The paper begins by establishing, in architectural terms, the background

of the issues surfaced by digital projection technology. It then investigates implications of digital projection imagery on architectural design education. Historically architectural education responds to transformations in technology and culture. It not only reflects them but rather confronts them and experiments with their possibilities and suggested outcomes (Ockman, 2012).

The question asked here is what are the implications of digital projection imagery upon architectural education? And also, how can we examine the use of digital imagery within architectural education in order to understand its impact on architecture and society? In order to tackle these questions, the paper presents a case-study of a design exercise developed by the author and conducted with design students during the previous three years. The design exercise suggests a framework to experiment with digital imagery and projection screens as a building material. It then analyzes the results by means of visual qualitative research. Visual laden culture should be understood through research tools which arise from this condition. In which case the visual qualitative research is highly relevant toward an understanding of contemporary culture and society (Rose, 2012). The paper analysis the exercise and evaluates its implications on architecture education and architecture.

### **The Real and the Represented**

The understanding that the concrete, realistic space which we occupy can be enhanced by adding an image of another space within it is ancient as inhabiting space itself. It can be said that the portraying of an imagined or remembered space within real space, prefigure the actual production of architectural space. This can be seen in cave paintings which portray the space of the hunt, space within a space, the imagined superimposed with the real. This can take place because we have memory, imagination, creative impulse, and the desire to represent. Human beings can create images, imagined spaces, and have a capacity to appreciate them. The complex relationship between the spaces and their representation has evolved and continues to evolve ever since such images were marked on cave walls. 'Projected surfaces', although technologically advanced, emulate this crude, ancient concept.

Many ideas, both in art and architecture, relating to this architectural spatial complexity, continued to develop throughout history. The emergence of large panels of transparent glass as a common building material has brought about new concepts and possibilities into the relationship of interior-exterior. One of the most prominent architects defining this prospect is the renowned German architect Ludwig Mies van der Rohe. In the twenties and thirties of the 20<sup>th</sup> century Mies introduced architectural visions which suggested a new direction to the problem of division between interior and exterior (Gullström, 2010). Glass with its transparent quality was envisioned as capable of eliminating the architectural skin as separating interior from exterior space. Transparency was conceived as offering total clarity, purity, and perpetual continuity. Mies avant-garde ideas aspired to break away from centuries-old dilemmas of architecture: finality, closure, completeness, and spatial separation. Mies attempted to find a way to create pure architecture in which space flows uninterrupted between these two distinct zones (Evans, 1997). In that sense Mies built and unbuilt ideas were probably envisioned as sort of redemption for humanity, a promise of freedom from architecture's limitations.

### **Digital Projection Imagery**

Painting can create or recreate an illusion of space. The understanding, early in the 15th century, of the mathematical rules that govern perspective allowed painters to depict space in a realistic fashion. Many developments have taken place since but the fundamental premise of painting has remained. Painting limitations, as an architectural surface remain as well, it is time-consuming to produce, requires technical expertise, hard to maintain, and very complex to create a large surface. The discovery of photography and cinema, and especially their reproductive qualities, has brought about a true revolution in the way culture evaluates and produces, art and visual imagery (Benjamin, 1931). TV and video were further developments. Sequenced scenes of high complexity could be produced, transmitted, and manipulated with high quality and relative ease. Yet the 'projected surface' remained limited. Film was confined to the dark space of the cinema hall while the TV was narrowed to a box-

like object located, most commonly, within the domestic sphere. It is only the fast-growing technological advances in computation, digital imagery, and the Internet that 'projection surfaces' have gained their true accord which can be accredited as a new building surface material. A phenomenon that is far from reaching its pinnacle.

In the past decade technology of the 'projection surface' dramatically transformed it from object to material. Today 'projections' emerge as having complex and varied surface possibilities. 'Projections' gained many attributes toward an understanding of them as an architectural material. They can occupy large surfaces, be merged with other materials, sometimes they are transparent or semi-transparent, and they can divide space. Although many types exist, they are characterized by producing their own light source, and of being thin. Having their own light source makes them kind of self-regulating and independent from environmental conditions. Being thin imply that they can be applied as a surface, almost like a coat of paint, and can take on almost any form, shape, or size. 'Projection surfaces' can be positioned in exterior conditions, they do not require the protective shelter of architecture, they can and are becoming the cover material itself. Recent advances allow 'projection surface' to occupy a substantial area of buildings elevation. Alongside this ability, the quality of the images, the rapidness of their transformation, ease of manipulating, and their relevance for contemporary life has drastically evolved.

American media researcher Anne Friedberg terms the 'projection surface' as a "virtual window". This window has grown far behind Alberti's notion about painting being a window into reality (Friedberg, 2006). The "virtual window's" frame or shape is almost of no limitations. The virtual window\projection screen experimented and developed not only its contents but also in the way it duplicates and doubles it. Such techniques as split screens, multi-screens, multi-media, split images, split sequences, multi-images, reached a point in which Friedberg claims that:

*"we now see the world in spatially and temporally fractured frames, through "virtual windows" that rely more on the multiple and simultane-*

*ous than on the singular and sequential."* (Friedberg, 2006, p.243)

I contend that 'projection surfaces' emerged from a status of an object to that of a building material. As an essential component in the layered composition of the thinking of architecture, of any scale or use. 'Projection surfaces' are not limited anymore only to dwelling, signs, or ads of different kinds. They can be used anywhere for any purpose, for multi-purpose, and in conjunction with other contents and mediums. They can be merged freely with other building materials and components. 'Projected surfaces' are no longer separated from the space and function of the architecture which they are part of. As is elaborated by Italian architecture researcher Paola Gregory:

*"Architecture becomes a surface of communication, sensitive, reactive and interactive: a screen on which plays the changing of actual or virtual reality, picked up and filtered by new trans-apparent screens. Obviously, this does not refer to the revolution of "electronic-glass", nor to the simple superimposition of a media skin over the covering of a building. Instead, it refers to "mediatizing" the meaning of architecture, transferring the fluidity and immateriality of the electronic media from the technological to the epistemological plane."* (Gregory, 2003, p.80)

Transmitting, manipulating, and projecting of digital images is central to current life and culture. Images are represented on a multitude of devices and projected in varied ways. Projection technologies have by no means exhausted itself, on the contrary, all indications imply that we will experience larger, better quality, and more diverse manifestations in common use. 'Projection surfaces' are evolving as substantial to the understanding and making of architectural space, intermingling with other materials and forms. The realistic spatial conditions are combined with the projected visual possibilities of the imagined and speculated. The presence of 'projection surfaces' within architectural space creates

an overload of visual content which we are submerged in. This creates an extensive effect of fragmentation, superimposition, partial views, and discontinuity of space and consciousness. In addition to blurring the distinction between interior and exterior, a new possibility is added: the elsewhere and the other-time, together with the here and the now. This condition is interpreted not merely as a visual by-product, but rather as a reflection of current culture.

### Spatial Complexity

Architectural space is experienced visually in three ways. As regular space, reflected space, and projected space. Regular space is composed of materials, can be occupied by the body, and is regulated by laws of physics and the flow of time. Reflected space is the space seen upon reflective materials. It mirrors regular space and duplicates it. It ranges from full reflection, such as in a mirror to semi-reflection of sorts on transparent and semi-reflective materials most commonly glass. Projected space is the space portrayed in or on 'projection surfaces' and generated by digital imagery. It is also an attribute of a large screen surface which can seemingly absorb the viewer and extend even behind the viewer's peripheral cone of vision. The quality of imagery depicted is such that it duplicates completely and perfectly regular space, besides being non-haptic, and not habitable. In other words, 'projected space' is experienced only visually.

American architecture researcher Sylvia Lavin discusses the emerging relationship between the projected images and the architectural surface. Her discussion emphasizes the interaction on the surface of the architecture. Her notion of the interaction between solid-form and materiality of architecture and the 'soft', transformable nature of the projected media is correlated to the act of kissing. The hard and the soft, the feminine with the masculine, the artistic with the architectural. It is a kiss-like relationship in which each entity is different but their gentle touch not only changes them but creates a new intermingling not possible by each alone, she states:

*"... their effect on architecture is to cause architectural facades to disobey notions of frontality, coherence, and transparency. Projected*

*images break the planes of a building into parts that never come together again to compose an envelope."*  
(Lavin, 2011, p.47)

The mixture, visual effects, and possibilities of transparency and reflection were considered to be one of the most unique representations of modern culture, with special emphasis on the intense and fast-growing urban culture. As such, they became common artistic practice since the early decades of the 20<sup>th</sup> century, specifically in avant-garde movements such as Cubism, Futurism, Situationists, Dada, and others (Vidler, 1993). In photography, it was widely experimented, via such techniques as double exposure, long exposure, and cut & paste manipulations. The editing procedure in film and video, with its cuts, fades, back and forth motion, slow and fast motion, referred to as montage, are essentially processes of fragmentation and reassembling. Although the images may sometimes look chaotic or accidental, their creators took great care to use simultaneously specific conflicting conditions. The conditions which are 'mixed' are ones that are seemingly impossible to experience under 'normal' viewing conditions. They are binary, conflicting, spatially separated, and/or time discontinues. Among them we can count superimpositions such as:

- The far with the near
- The detail with the whole
- Different viewpoints of the same object
- Different perspective points
- The past with the present
- The real and the imagined - the perceived with the conceived
- Detaching the signified from its signifier

### The Position of the Viewer

The evolving interaction between 'projection surface' and architectural space suggests that the viewer is not only a costumer, nor a bystander, which became impossible. This condition, of being submerged within a complex interaction, implies that the viewer is passive and active simultaneously, either if he/she agrees or not. One's position is always known, its relative location to other elements in space is calculated, algorithmic, it influences space by its movement and simultaneously is deter-

mined by the space. As space is transgressed the viewer accumulates and distributes information and data. One leaves in his path a thread of digital crumbs, which signal intentions just as much as they determine possibilities (Vidler, 2002). Contemporary architectural thinking is experimenting with the conceivable consequences of integration of projections, data, computer generated forms and methodologies, and their influence on architecture. Works by architects like Toyo Ito, Marcus Novak, Kas Oosterhuis, among others, has aimed toward finding possibilities of integration of form, methods, and production for this new era (Gregory, 2003).

The introduction of 'projection surface' onto architectural space creates a visual mixture, a hyper-multiplicity of imagery and content. The superimposition of conflicting, and shifting viewpoints, scales, meanings, and mediums creates a flat reality of unmeasurable depth. In this condition time, space, and meaning are eliminated and blurred in unpredictable ways, characterized by constant discontinuity of space and consciousness. The unexpected is the only predictable, the unstable is the only constant, disharmony is the only rhythm, discontinuity is the only permanent, and fragments are the only whole. Our bodies are immersed in imagery overload which continues to flow endlessly, with no apparent objective, and superimposes in countless formations. In this sensory overload, we are simultaneously creators, participants, and helpless victims. This can be read as a collapse of order or rather an emphatic and human externalization of our inner consciousness. It is not a question of possible utopia or feared dystopia, the paradigm of either of them also lost much of its relevance. It is rather the here and now, it is this reality, with all its possibilities, which requires our utmost and constant attention.

### **Case-Study - Introduction**

The reality of society and culture in the 21<sup>st</sup> century is marked by tendencies of flatness and complexity. These conflicting phenomena are augmented by the rapid advances in technology and globalization. As is marked by several researchers of contemporary architectural education this cultural reality is very much delivered and understood via the image, the visual rather than the haptic. The influence and meaning of this process upon architecture and architectural education are vital for

contemporary culture and society and are in the core of current research (Ockman, 2012). The visual culture we experience and consume should be understood through research tools which arise from this condition. In which case the visual qualitative research is highly relevant toward a better understanding of current architectural education pedagogy and experimentation (Rose, 2012). The rapidly evolving conditions of technology and the conceptual developments in architecture, described earlier in the paper, needs to be addressed in more than one way. The aim of the paper is to present the possibility of addressing these issues via experimental intervention in the architectural design process, in the educational design studio.

All architectural solutions are spatial by nature, as such they strive to be spatially complex, in the sense that they are rich, articulated, elaborate, sophisticated, and so forth, this is well covered by existing studio problems and methodologies. The aim of our exercise was to confront the specific issues raised by current digital-imagery technology and its relationship with architectural spatial complexity. It confronts the issue not via the technology itself but rather via its conceptual and visual consequences. These issues are:

#### **a. Spatial complexity augmented by contemporary technological developments.**

Digital imagery today is plentiful, it is easy and readily produced and used, it is projected on displays that range in size and shape, and they are exempt from weather and light conditions, in other words, they are not confined to use in interior or darkened conditions. As such, they can be understood as a 'building material'.

#### **b. Spatial complexity - fragmentary, simultaneity, instability.**

The abundant use of glass and digital imagery greatly enhance conditions, mostly urban, which their visual attributes are fragmentary, simultaneity, and instability (or inconsistency). These are also perceived constantly in shifting and changing state. It is considered not merely as a visual condition but also a conceptual psychological state of society.



Figure 01: 'spatial complexity' – fragmentary relationship created by the effects of transparency, reflections, and projected images. existing examples. [images by the author]

### c. Spatial complexity - altering reality,

Glass and its attributes of transparency and reflectivity expose reality. Digital imagery, as it is projected, does more than that it alters reality. The projected image presents a different reality than the one we experience but once it is mingled with existing space, it alters it and the reality we experience.

A design exercise, which confronts and experiments with these issues, has been developed, tested, conducted, and analyzed by means of qualitative visual analysis methodology. The exercise was devised as a response to questions such as: how these ideas can be implemented into the architectural design process? how their products and solutions reflect and engage the students? and how, and if, do they have an impact on spatial complexity?

### The Design Studio Environment

The design studio still remains, according to many, the core of the architecture curriculum. Its content and methodology are highly varied amongst schools, students, and teachers. The studio is an intense course, it reflects not only the study of architectural expertise but also the understanding and engagement with architecture culture and society. The work process in the studio, through which students acquire their designing skills, is founded on project-based education. The studio is a space in which students spend most of their time, often in discussion, but usually working individually. At the be-

ginning of the semester, the instructor gives the students a program – a series of requirements concerning an architectural project. During the course of the semester, each student develops his solution to the given problem in the form of preliminary sketches, drawings, and models. At the end of the semester, the student presents his work to his instructor and to others (a jury), who critique his work. This description of what occurs in the studio is very general, yet it provides a clear picture of the studio framework (Schön, 2017).

An accommodating environment for the exercise was found in the educational architectural studio. Designers, by nature of their work, are engaged constantly with the visual. The use of metaphors, symbols, images, and creating interactions between them is an essential part of the profession. The studio environment as a framework for experimentation offered favorable conditions: it is confined in time and space, and it is permissible for comparison and analysis. Also, student participants are accustomed to the use of various visual tools, so it was welcomed, even enthusiastically, to accommodate new and innovative tool in their design process. Also, it was easy to collect data created, rather abundantly, by the eager participants.

### The Exercise - Description

The exercise was made of 3 phases. First students were exposed, via a series of lectures and reading, to the is-

sues that are the conceptual background for the exercise. They were exposed to the theoretical background, historical developments, examples of the technology and materials which are relevant. Also, they were presented with existing visual examples, both from art and architecture, which expose these ideas.

In the second phase, a guided tour has taken place. There were two sites visited, one is a new cars sales showroom. It is a place with a spatial typology which is rich with large panels of transparent and reflective glass. Its space is, typically, just a simple bare box with no specific or distinguished shape. The other site is a shopping mall. This environment is an enclosed space, usually with no elaborate visual connection to the outside. It is abundant with glass, reflective

materials, and most importantly there is plenitude of digital imagery 'projections surfaces' of many shapes, size, and positions scattered all over the mall. During this tour they were instructed to collect, by means of photographing pictures, conditions which are created by the mixture of transparency, reflectivity, and projection of imagery. Not confined only to these conditions as standalone but also how they mingle and influence the space. This short excursion allowed the students to see and experience the effects discussed earlier in class and how they take form in the space around them.

In the next phase, they were given a "reality". They were given three well-known photographers to choose from. [Ansel Adams- nature, Irving Penn- people portraits, Henri Cartier-Bresson - The Decisive Moment]. They were asked to select a photograph from one of these photographers. The photograph they selected was referred to as "reality". This was to be used as the "reality" which their design would alter. Although flat and black & white this "reality" was used very much like an architectural site that their proposed design was to relate to and subsequently change. The photograph that each student selected was positioned as the background or as the 'first surface'. Then they were asked to create a 'second surface' of their own design at the same size of the photograph. This 'surface' was to be placed a few centimeters in front of the first. They were allowed to use only transparent materials such as glass, Perspex, or

liquids. In the final stage, they were asked to cut a hole in the 'first surface' (the "reality") and to project through it a short video of their own making. This was done in most cases by a smart-phone or, in some cases, by the use of a projector, projecting the short video on the model. Figure 02 demonstrates the schematic structure of the final exercise.

The exercise was conducted several times during a period of the past three years in different architectural design studio groups and with minor revisions or adjustments. It was given to first-year students and also to fourth-year. It was given as a starting exercise for a full semester project studio, and it was also given as a standalone project as part of a basic-design course. The average group size was about 18 students and it was conducted over a period of 2-3 weeks. Results analyzed were series of images from the preliminary tour, 2-3 sketch models, and the final model with integrated short video.

### Findings and Discussion

Prior to conducting the exercise, we asked these questions:

How, and if, this exercise brings to the fore ideas and concepts relevant to contemporary architectural culture?

Does the exercise contribute to spatial complexity design thinking and as a generator of spatial ideas?

How it contributes to the design possibilities of digital imagery in architecture?

Our findings were diverse and varied, raising some questions, and suggesting some insights. The initial phases of the exercise incorporated the acquisition of new knowledge and some experience with field research, via the field trip and the act of photography. This phase proved highly successful and relevant for the students. They were surprised to discover the spatial complex relationship between transparency, reflectivity, and digital imagery. In many ways it was a revelation for them to understand the effects it has upon space and architecture. Strengthened by the understanding that this phenomenon is all around us and is in common use all the time, was simple and surprising at the same time. It made them intrigued and curious about the possibilities it of-

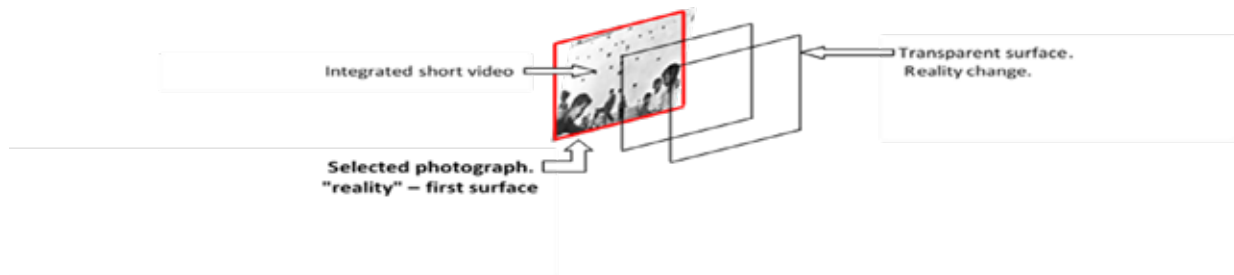


Figure 02: schematic structure of the final exercise



Figure 03: two examples from students works, final models, using water, glass, incorporating short video by using smart-phone (visible as the colored image on the black & white images). [images by the author].

ferred, and about the ways this can be materialized. Their surprise was very much influenced by the fact that they came to understand that a phenomenon they are much accustomed to and even thought of as accidental is rather of great interest and has complex design possibilities which transform space and influences culture.

The model phase consisting of: use of transparent materials only, integrating a short video, all focusing on altering the visual reality rather than the creation of form. This phase was found to be fun, encouraged creative thinking, and generated diverse solutions and ideas. It was intuitive and complex, and at the same time allowed the students to express themselves in ways that they did not expect. The understanding of the physical and conceptual components of the everyday life and how they come together as designed space has proved highly valuable and relevant.

The influence of this exercise, on the continuation of the design process or on the students thinking and design abilities, was inconclusive. During the few exercises that were used as 'initial phase' towards a longer design project, it seemed that lack of tools of representation for this phenomenon has distanced the students from continuing ideas into the evolution of the project. The issue of the relationship between the tools for visualizing and creating architecture and its results came up. Although the exercise proved relevant towards generating new ideas and understandings it lacked the proper possibilities and tools to become deeply integrated into a complex design project. It remained suggestive and episodic. Is it due to lack of technological proper tools? Are we still thinking in terms not yet synchronized with reality? And in a rather more pragmatic note, can and how this exercise be elaborated to become a full architectural design project?



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