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According to architectural theorist Grant Hildebrand, the attributes of a space can do far more to create a distinct user experience than they have been. Other architects and designers, such as Valve Software's Chris Chin, blame the lack of distinct experiences on the design methodologies that have descended from those of the Post-Modernist movement. Post-Modernism's focus on form has generated a largely top-down, two-dimensional design process that allows architects to design from geometric parti sketches. These provide useful, macro-scaled views of their eventual designs through plan, section, and model but fail to allow architects the ability to create the same experiences for occupants that were common before the institution of Post-Modernism, allowing many buildings to only be read by those who are educated in architecture.

Architecture students today have reported becoming bored or even frustrated with this outlook on design, which is now the basis of many architecture schools' curriculums. This project looks to another field of design to which user experience is crucial, game design. Game design focuses on design from the user's perspective, seeking to create meaningful and memorable experiences, albeit within a fictional game world where reality can be bent and shaped, unlike the world of real architecture. Game designers begin their designs by considering the actions players will take within their game, and then identify the psychological, emotional, or interactive elements that will ultimately provide a pleasurable experience.

This project looks at game design to provide a useful supplement to architecture and the current architectural pedagogy. By pushing architecture through the filter of game design, this project proposes the creation of a hybrid design method that can be used to create real pieces of architecture that not only create meaningful experiences for occupants, but also responds to new technologies that can transform perspectives on real-world environments in ways that are hinted at or described through games.

This thesis by Christopher Totten fulfills the thesis requirement for the master's degree in Architecture approved by Matthew Geiss, MArch, as Thesis Coordinator, and by Matthew Geiss MArch, George Martin MArch, Carlos Barrios PhD., and Chris Chin (degree) as Readers.

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CHAPTER I

INTRODUCTION – ON THE DESIGN OF ARCHITECTURE AND GAMES

Games and buildings are two very different things. Buildings are firmly rooted in the real world; they house functions that are relevant to the everyday lives of human civilization, they respond to and interact with the context of buildings that surround them, and they have to be built to meet real world considerations such as environmental conditions and zoning codes. The design of buildings today is focused highly on the articulation of form, whether they are the artistic forms that have thrived since the advent of the Post-Modernist movement, or the highly utilitarian forms of buildings designed to maximize the envelope allowed by local codes and the financial returns of people renting out the spaces within.

Games, on the other hand, exist in the much more fluid world of the imagination, and more recently, the computer. In *Homo Ludens*, Dutch historian Johan Huizinga describes the "Magic Circle", the worlds that games create while they are played. Within these Magic Circles, the rules of the game are laws which all players must obey.[1] Even games that do not take place in imaginary worlds, such as sports or other physical games, create these spaces for themselves. It is for this reason that many consider games to be a release from the real world, or even a

[1] Huizinga, Johan. *Homo Ludens: A Study of the Play Element in Culture*. Boston: Beacon Press, 1955. – The Magic Circle is defined as: The space within which the game takes place. It is not always a physical space or the levels in a video game, but instead an implied "other reality" where the rules of the game are the laws upon which the reality operates. Huizinga was inspired to describe the idea of a "magic circle" when observing the chalk circle that makes up the boundaries in a game of *Marbles*. The Magic Circle idea was then later expanded upon in *Rules of Play: Game Design Fundamentals* by Katie Salen and Eric Zimmerman as the sphere of influence that games carry both in their own implied realities and in the culture that surrounds the game.

"waste of time." Architects Donlyn Lyndon and Charles W. Moore have even gone as far as denouncing the worlds of modern games as, "virtual reality assembled in computer networks—Memory Palaces dislodged from the earth and inhabited by electronic speculation."[2] What games have that buildings today often do not, however, is a focus on the user; the inhabitant of the Magic Circle. Be they visiting for a quick pick-up game of Touch Football or an all-night online play session of *Team Fortress 2*, the game is designed to keep their attention and maximize their enjoyment. Much of this is accomplished with the conflict of the players against one another or even computer generated monsters, but these artificial conflicts are only a small part of a much larger system[3]. Game designers ultimately create user experience through the articulation of a game's rules, the guidelines that constrict player movement within the world of the Magic Circle.[4]

While this still seems like a topic that is far from the discussion of real-world architecture, many game designers, such as Katie Salen, are suggesting that game design be adopted as a supplement to the design of buildings to create more consistently "dynamic"

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[2] Lyndon, Donlyn, and Charles W. Moore. *Chambers for a Memory Palace*. London: The MIT Press, 1996. P. xii.

[3] This sentence mentions both artificial conflicts and systems, the latter of which will be repeated often later on in this thesis. The idea of an artificial conflict is important to understand since it comes from Salen and Zimmerman's definition of games: A system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome (p. 80). "Systems", in this thesis, will be described in a similar manner to how Salen and Zimmerman look at the systems of games, but will be used to describe the formal, spatial, and experiential systems of buildings. According to Salen and Zimmerman, systems consist of objects that have their own individual attributes that cause internal relationships to develop between the objects, all within an environment. This definition can certainly be used to described any system, but this thesis proposes that the human's interactions between other objects within the building's system be considered.

[4] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 122-123.

architecture.[5] In the professional world, architects such as Valve Corporation's Chris Chin and Yasser Malaika, are leaving firms to explore the gaming industry and the tools it uses to guide users through spatial experiences. Even in academia, students are becoming frustrated with the top-down approach to architecture taught in schools, and are looking to other design fields to bring back inspiration that will allow them to create spaces that even those not educated in architecture can enjoy.[6]

While game design and architecture are vastly different, they do have one thing in common: they are both fields of design. Though approached from many different ways, design is thought by many to be universal, with successful designs always ending in a meaningful articulation of parts to form a functional and elegant whole. Salen and Zimmerman's definition of design is particularly useful: The process by which a designer creates a context to be encountered by a participant, from which meaning emerges.[7] Looking at design in this way, one can see that this definition proposed by two game designers is not so different from what the design of architecture is, or rather should be[8]. Architectural design since post-modernism has

[5] Hall, Peter. "Principals of Play." *Metropolis*, September 1, 2006: P. 109-111; 150-151.

[6] Survey taken as part of the Game Design and Architecture class at The Catholic University of America's School of Architecture and Planning. I issued the survey to get to know my students as architecture students and gamers. I also wanted to test how these students felt about aspects of their architectural education in relation to observations I had made as a student and teaching assistant.

[7] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 41.

[8] A follow-up to Salen and Zimmerman's definition of "design" as it applies to *Game Design and Architecture* would read as this: the architect is the designer, the context is the building or urban space they create, the participant is the occupant or visitor within the designed space, and the experiences they have there are what give meaning to the architecture.

focused heavily on aesthetics and form, but according to architectural writer Grant Hildebrand, it can do far more to create a meaningful spatial experience for a user than it has been.[9]

Today, architecture is taught as a very top-down method of design, perhaps best described by two images of Franco-Swiss architect Le Corbusier : one holding his hand out over the model of his Ville Contemporaine as though it were the hand of God, and the other of the hand placing a modular apartment piece within a model of Corbu's Unidad De Habitacion. This design method usually begins with the architect looking down on a site plan and documenting various aspects of it, then creating a geometric parti shape, the formal generator for the building. From here, the architect designs how the spatial program of their project will fit into this parti, generating the two-dimensional plan and section drawings that will allow them to show macro-scaled views of how the spaces of the building will be. While this method is very efficient in showing how the building will interact with its site and the surrounding context and giving the architect the ability to organize the spaces within the building, it distances them from the actual experience of being inside a space and potentially alienates the occupants for whom the building will ultimately be created.

Game design is on the other hand a bottom-up, or rather, a *user-out* approach. The game designer begins with the actions that players will take while playing the game, and designs a set of rules, or in the case of video games, spaces that will facilitate these actions. To construct effective game spaces, designers use various tools and methods that allow them to see their designs from both the macro scale and the user's perspective. Another method that is prominent in the game design studios for measuring user experience is *playtesting*. Playtesting is a

[9] Hildebrand, Grant. *Origins of Architectural Pleasure*. Berkeley: University of California Press, 1999. P xv-xxiii.

phase of game development where players are brought in from outside the development team to play levels of a video game and confirm the effectiveness of their experiential and spatial qualities. From playtesting, designers can observe and record data on the feelings or emotions of players as they interact with the rule-based systems of the game. According to Dario Casali, level designer at Valve Corporation, "Playtesting is the only way to get from the concept you start with to an execution you are happy with. A concept is only as good as its execution. Playtesting is the only way."[10]

As stated before, game design is very useful in developing a user's experience in a space and has much to tell architects about the ways that these experiences can be crafted. Game design is lacking, however, when compared to architecture's ability to take real-world considerations into account. With that, this project proposes a new design process for architecture that pushes architectural design through the "filter" of game design to create a hybrid design process: one that looks at a building from the user-out to generate a meaningful user experience, while taking into account the real world considerations that architects must face on a day-to-day basis. The hope of this is to create more spaces which both those educated and uneducated in architecture can interact with and appreciate, while also energizing a generation of architecture students that is in danger of burning out and leaving the profession, by offering a refreshing new design method that addresses many of their qualms about design.

[10] Casali, Dario. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

CHAPTER II

PARTI VS. CORE MECHANIC – GENERATORS OF DESIGN

In professional practice, the architectural design process begins with a meeting or phone discussion with a client, who describes the project they would like the architect to design, the intended site, and the budget. In architecture school, projects begin in a similar fashion, with professors assigning students to a site and a series of goals for the project, such as the kind of building to be designed and its spatial program. From these criteria, the designer does a pre-design site analysis, then forms a parti based on the results of that analysis. The parti is the basic formal scheme or concept of a piece of architecture. More importantly, it is the generator of a design in the top-down architectural design method, from which the spatial aspects of the final building emerge.

Game designers, on the other hand, have the freedom of two different design generators: mechanics and motif. Games begun from motif are created from a narrative written by the game design staff or from a popular narrative setting, such as World War II, science fiction, fantasy, or the worlds of popular movies or television series. The more popular of the two design generation methods in the game industry, however, is the one that begins with mechanics. According to Dario Casali, many of Valve's game designs begin with the creation of gameplay mechanics.[11] One example that he described in an interview was the "Badwater

[11] Casali, Dario. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

Basin" level of the game *Team Fortress 2*[12], where players are required to either escort or stop the shipment of a mine cart along a series of tracks. The design for the map began with the idea that players would be escorting a mine cart through enemy territory. From this basic player action, the designers created a level with simple level geometry in Valve's level editing program, Hammer, and then playtested the level with players from outside the company.

This very basic level geometry is the game designer's parti, but unlike the architect's parti, which is often derived from formal ideas or responses to a site, the game designer's parti is derived from the actions that the player will take. This action is the "core mechanic" of the game, the basic action that the player will perform[13]. This design generator is often referred to as "designing by verb", since most core mechanics can be expressed through a singular verb or short phrase[14]. For example, the core mechanic of *Super Mario Bros.*[15] can be described as "jumping", since players use Mario's jumping ability to explore the gamespace, collect items, and defeat enemies. *Monopoly*'s[16] core mechanic is "trading", *Poker*'s is "bluffing", Soccer's is "kicking", and so-on. While simple, these core mechanics can be developed and spread to create complex experiences for game players through rules that are written to expand on the core mechanic.

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[12] Valve Corporation. *Team Fortress 2*. 2007. PC DVD game. – The demonstration of this level's game design was shown during the interview with Dario Casali on Oct. 27, 2008.

[13] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 316.

[14] Mcgonigal, Jane. "Game Design as Art Practice: October 2004." Game Design as Art Practice. http://artpractice.blogspot.com/2004_10_01_archive.html (accessed November 30, 2008).

[15] Nintendo. *Super Mario Bros.* 1985. NES game.

[16] Parker Brothers. *Monopoly*. 1935. Board game

These core mechanics can, and do, exist in architecture, and can even give the phrase "form follows function" an entirely new meaning. In the architectural design process, the spaces and forms of a building often evoke the building's function. This, however, still serves the building's own function instead of how that function can create a unique experience for the people using the building. As in game design, user experience starts from the core mechanic of how a person uses a space, and also like game design, this core mechanic can be described as a single word. These words come from what the building's own function is, but instead of describing what the building is for, they describe what actions a person inside the building takes.

Using this outlook on the beginning of design, even existing buildings can be analyzed in new ways based on their experiential elements. One example is Louis Kahn's National Assembly Building in Dhaka, Bangladesh.[17] The building's function can be described through its history: Bangladesh, or East Pakistan as it was known during the time of the building's construction, was fighting to separate from West Pakistan and establish itself as a democracy[18]. In Kahn's own words on the design of the building, "It was not belief, not design, not pattern, but the essence from which an institution could emerge...[19] Analyzed as a game design, the core

[17] In my thesis research graphic materials, I describe this building as also having a spatial experience similar to a game from the *Legend of Zelda* series. As stated above, Kahn translates the core mechanic of voting into a series of walls that allow the visitor to engage in a decision-making process. Where this becomes similar to *Zelda* is in how each layer entices the visitor towards the next with hints of spaces they will visit if they choose to move further into the building. This enticement and denial turns the building into a system of short-term and long-term goals that eventually ends with the ultimate spatial and visual reward of entering the legislative chamber. This is similar to a dungeon in the *Zelda* games, in that the final goal of the dungeon is often described to the player early on, but requires them to go through a series of smaller-scaled traps and puzzles to reach the ultimate long-term goal of finishing that they are always reminded of through views, elevation changes, symbols, dangerous territory, or other spatial elements.

[18] From the Advanced Architectural Theory course at The Catholic University of America's School of Architecture and Planning, taught by Prof. Adnan Morshed. 2008.

[19] Ronner, Heinz. *Louis I. Kahn: Complete works*, 1935-74. Oxford: Westview Press, 1977. P. 236, 238.

mechanic of the Assembly Building, as a house of legislature, can be described as "voting." With this core mechanic, Kahn created a system of massive concrete rings that surround the central legislative chamber in layers. Each ring separates the visitor from the chamber within, and the entrances to the next layer are never in line with one another, requiring the user to explore the space to find their way further into the building. This system allows visitors to choose how far within the building they wish to go: viewing the building from outside, seeing the spaces inside, or working their way to the legislative chamber. This system of formal "rules" allows the even tourists to symbolically engage the democratic system as far as they wish: looking on it from the outside or fully participating in it as a politician would. This leads some citizens of Bangladesh to credit Louis Kahn as the one to bring democracy to Bangladesh.[20]

Another example of how core mechanic can influence design is Catholic University's own Crough Center, where the School of Architecture and Planning is based. The architects, Vlastamil Koubek and John Yanik, understood the student's experience of architecture studio as that of a "think tank", where the people within are free to travel through the space and exchange ideas. Like Kahn's Assembly Building, this space can also be analyzed according to its core mechanic, which will be described here as "free exchange." Because of this, this building has no definite terminus point for its spatial experience, as many buildings do. Instead, the space is laid out in a way that is evocative of Kevin Lynch's Five Elements of Urban Planning: paths, edges, districts, nodes, and landmarks.[21] Each of the major jury or presentation spaces, Koubek Auditorium, the Miller jury space, the "Wailing Wall" jury spaces, the Locraft Room, and the

[20] *My Architect: A Son's Journey*. DVD. Directed by Nathaniel Kahn. 2003.

[21] Lynch, Kevin. *The Image of the City*. London: The MIT Press, 1960.

mezzanine jury spaces, act as nodes where the activities of different students or faculty members intersect and concentrate. The hallways, especially the one along the building's central axis, provide the paths that people can use to travel between the nodes. Each studio is, therefore, a district of its own, each with its own set boundaries. The building allows the students to freely travel among this system of spaces and speak with one another, exchange ideas, help one another with projects, or even borrow studio supplies without being constrained by a linear path with definite goals. This freedom also gives the students the ability to create Lynch's other elements within the building's "blank slate" aesthetic: the students work throughout each semester is what gives each "district" its own distinctive character; the final projects on display create "landmarks", and spaces can be changed to create new boundaries[22].

As stated previously, when level designers such as Casali create spaces for video games based on a core gameplay mechanic, they begin with a basic spatial parti that is developed from that mechanic and playtest it with players from outside the company. This allows the designers to see if their gameplay goals are effectively executed by their design. Additionally, the parti's basic layout allows level designers to change geometry very quickly and eliminate areas that do not fit the intended experiential goals. With every iteration of the design, the level geometry is changed and playtested until less and less is edited. This eventually results in the final, more

[22] Similarly to how Kahn's Administration Building can be described as a *Zelda* game, this analysis leads to the Crough Center also being analogous of a game series. In this case, the game is *Grand Theft Auto*. As stated above, the building follows some of Kevin Lynch's urban design Elements. These are also very important in the *GTA* series, since each game takes place in a fictionalized version of a real-world city. Since each is in a video game, however, these cities cannot grow as organically as their real-world counterparts, and must emphasize spatial elements similar to Lynch's to keep the player oriented within them. Similarly, these games allow players the ability to go anywhere within the space and interact with anything or anyone in any way they choose (despite the game's reputation for only providing violent choices.) This closely mirrors the freedom that architecture students have within their own studio spaces. The *GTA* analogy is completed by the fact that yes, some students do steal from one another.

meaningful product. As a generator for architectural designs this is where the true potential of the core mechanic lies: in the ability of the designer to prototype a design for an audience and change the parti quickly to better fit the building's intended function if it does not fit. As long as a building's experiential qualities remain indicative of the core mechanic, the form of the building itself can be exchanged many times over the course of the design process without losing sight of the design's overall goal. As a result, this new way of describing a building's function creates forms that not only follow but become infinitely more flexible for the designer.

CHAPTER III

NARRATIVE AND MEANING – A SECOND GENERATOR OF DESIGN

As stated previously, game designers have two different generators of design: mechanics and motif. While mechanics are the standard within the game industry, some designers, such as Obsidian Entertainment's Chris Avellone, would like to see games based on narrative motif elements become more prevalent in the industry.[23] When a game is designed from narrative first, mechanics are implemented in such a way that supports a story, instead of that story being used to support gameplay. Whenever narrative is used in a design, it gives meaning to actions that people take within. For example, the narrative found in the instruction booklet of the Atari 2600 game *Super Breakout*[24] turns a game of hitting balls against a wall of breakable tiles into an intergalactic conflict with an evil alien force field[25]. Narrative is important in architectural space as well. Narratives or other symbolic meanings allow buildings to have contexts that reach far beyond the physical spaces of the structure and site, and into the culture that surrounds the building. While this is certainly not a new idea for architecture, game designers have methods for using narrative as a generator for design similar to those for designing with mechanics.

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[23] Chandler, Rafael. *Game Writing Handbook (Charles River Media Game Development)* Rockland: Charles River Media, 2007. P. 17.

[24] Atari Inc. *Super Breakout*. 1978. Atari 2600 VCS game.

[25] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 399. – This concept is called "narrative descriptors." It describes how packaging, instructional text, artwork, and in-game cinematics work together to build the game's narrative structure which, in turn, gives context to the game's mechanics and the actions that players take within the game.

These methods help keep the design grounded in the original experiential goals for the project, those based on the transmission of narrative.

Some of the most successful designs in both game design and architecture have started with a story. In 1987, a failing Japanese game company called Square had only enough money left to finance one game before shutting down. Knowing this, a young designer named Hironobu Sakaguchi described how he would design the project by saying, "I don't think I have what it takes to make a good action game. I think I'm better at telling a story."[26] He created a game based on a fantasy story that he wrote and, as an inside joke about how it was Square's last game, decided to name the game *Final Fantasy.* Today *Final Fantasy* is still one of gaming's most popular franchises.[27] Likewise, when Frank Lloyd Wright was approached to build a house for the Edgar J. Kaufmann, owner of a Pittsburgh-based chain of department stores, and his family near Mill Run, Pennsylvania, Kaufmann told Wright the stories of his family's visits to a waterfall where they would lie on a rock and sun during the daytime. Wright was expected to build a house viewing the waterfall but instead decided to build it over them, creating his most famous work, Fallingwater. Based on Kaufmann's story, the sunning-rock formed the foundation for the hearth, which Wright famously championed as the psychological center of the home.[28]

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[26] "Final Fantasy Retrospective Part I." Gametrailers. www.gametrailers.com/player/22250.html?type=flv. (accessed September 21, 2008).

[27] At the time of this writing, the *Final Fantasy* franchise of games is approaching the release of its thirteenth official game. There are, however, dozens of spin-off games, television shows, movies, music CDs, toys, and other pieces of merchandise associated with the franchise. Square obviously never went out of business and even bought out their biggest competitor, becoming Square Enix.

[28] Information learned during the History of Modern Architecture course at the Catholic University of America's School of Architecture and Planning, taught by John Yanik. 2004.

Fallingwater demonstrates some of the design principles described by MIT Comparative Media professor Henry Jenkins, specifically the idea of "narrative space." As Jenkins describes it, narrative space is any space that "shapes a narrative frame and experience."[29] These narrative spaces can be broken down even further into four types: staging, evocative, embedded, and resource providing. Wright's building is an evocative narrative space, meaning that the way a space is formed, the materials used, or even the vernacular to which the building was designed, evokes some narrative meaning. In this case, the stories of the Kaufmann's vacations to the site are evoked through on-site materials and embellishments on the experience of being on Kaufmann's favorite rock. Another example of such a space is the National Holocaust Museum in Washington, D.C. The materiality and language used to construct many of the building's spaces evokes the language of Nazi concentration camps and train stations during World War II through brick, iron, arched openings, and other details.

Narrative spaces for staging involve creating spaces where specific story elements or symbolic rituals are enacted.[30] In games, these spaces are used as sets, in-game movies, or for areas where players can have some repose from the game's action to watch characters interact with one another; as in the game *Half-Life 2*.[31] Valve animator Eric Strand describes the challenges of creating staging narrative space in the game *Half-Life 2: Episode Two*[32] through his work on a character named Arne Magnusson. In the game's story, Magnusson is a scientist who

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[29] Jenkins, Henry. "Game Design as Narrative Architecture." Found in Zimmerman, Katie (Edt)/, and Eric (Edt) Salen. *The Game Design Reader*. Cambridge: MIT Pr, 2005.

[30] Jenkins, Henry. "Game Design as Narrative Architecture." Found in Zimmerman, Katie (Edt)/, and Eric (Edt) Salen. *The Game Design Reader*. Cambridge: MIT Pr, 2005.

[31] Valve Corporation. *Half-Life 2*. 2004 PC DVD game.

[32] Valve Corporation. *Half-Life 2: Episode Two*. 2007 PC DVD game.

develops a new weapon for the player to use against enemies. One of Magnusson's key scenes involves the character teaching the player how to use the weapon. Through playtesting, Strand and other Valve employees noticed that impatient players often missed Magnusson's explanation, running past his position in the center of a room on their way to the next action sequence. This led Valve to change the context of Magnusson's narrative sequence to a room where he would be up against a wall as though he were lecturing to an audience rather than gathered in the center of a thrall of soldiers. This simple change better enabled the character's monologue to be viewed by players who likewise changed their behavior to listen to Magnusson. This also aids the characterization of Magnusson himself, who is written as a pompous and arrogant man who is frequently lecturing the other characters.[33]

The idea of having characters deliver lines of dialog within a game is an example of embedded narrative space, which describes a space where narrative elements are programmatically placed within the actual space itself. Many Gothic churches can also be described as embedded narrative spaces, where images depicting Biblical events were placed in key sections of the church; such as the relief sculptures over the entrances and the stained glass windows in the transept and apse; so the illiterate populace of the middle ages could see the stories in the same way a literate person could read them in the Bible.[34] The Holocaust Museum also features sections of embedded narrative space, specifically in the "Daniel's Story" exhibit. This exhibit is based on a children's novel by Carol Matas, and uses evocative spaces and strategically placed pages from the fictional boy's journal to tell the story from the novel.

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[33] Strand, Eric. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

[34] Information learned during the History Architecture II course at the Catholic University of America's School of Architecture and Planning, taught by Adnan Morshed. 2008.

The final type of narrative space describes one which game designers are very interested in, and one that is enhanced by the playtesting process: narrative space that provides resources for emergent narrative. Emergent narrative is the events that happen through the player's interaction with the game's formal set of rules.[35] The best way to envision this type of narrative is to imagine a game as a book being written in real-time during gameplay: the story has preset events of dialog and character development, but the gameplay between these narrative scenes are what write the action scenes. Game designers are interested in this type of narrative because it allows players to each have their own unique experience of a gamespace that will allow them to walk away from the game with their own version of the game's events. Playtesting aids in the placing of resources that allow emergent narrative to happen within games, since props and spaces can be tested and changed to see how many possible actions can happen within them.[36] Designers will never predict every action that is possible within their own spaces, since many players devise their own strategies for using them, but playtesting does allow designers to find

[35] This concept of "emergence" is possible through several concepts that describe how each person playing a game is different and will therefore, have their own reactions to the game's system of rules: the simulation gap and the immersive fallacy. Simulation gap is a term coined by game designer Ian Bogost in his book, *Persuasive Games*. He uses this to discuss how the violence in video games affects people with different mental states differently in an extreme example, but can more commonly cause people to concoct different strategies for getting through a game based on its set of rules. The immersive fallacy, as described by Salen and Zimmerman, is a belief that emergence exists in games because games are not wholly immersive, as many other game designers would argue, and allow players to react in ways that are based on their own personalities, life experiences, and priory knowledge. The argument between immersion and the immersive fallacy/simulation gap closely mirrors that between those who believe in architectural phenomenology and those who do not. I feel that the crossing of these two arguments is important and can shed light on one another, but can and should be saved for future discussion as they do not fit into this paper.

[36] Speyer, David. "Valve's Design Process for Creating Half-Life 2." Game Developers' Conference, San Francisco, CA, March 24, 2007 – One of the emergent events created through playtesting was "barnacle bowling." In the *Half-Life* series there is an enemy called a barnacle that sticks (cont. on next page) to ceilings and traps players with a sticky tongue. Playtesters invented a way to kill them by rolling an explosive barrel down a hill to be caught by the tongue and shooting the barrel to make it explode. Areas were added to the game where players must kill large groups of these enemies by "bowling" an explosive barrel towards them and setting it off.

some emergent possibilities within their spaces. As designers discover these possibilities, they may place resources for them to occur and as a result, unwittingly add the resources for infinitely more[37].

In a similar way, architects can playtest to the individual experiences they try to create within a space. As in games, the actions occupants will take within a space can only be predicted so far, and important spaces within a building or important parts within the building's symbolic narrative can be lost. According to Valve art director Randy Lundeen, the power of playtesting an architectural space within a game engine has the potential to allow architects to test their hypotheses on what a person's experience of a space will be or how occupants will respond to the different types of narrative space within a building. In his own words: "Architects can track where people will look – will it be where the architect wants them to look? Will they be able to find the bathrooms or cafeteria in the building?"[38] Another Valve designer and a former employee of Google SketchUp, Yasser Malaika, has been working with game engines to test user experiences of buildings for years. In an atrium renovation project for an artist colleague of his, he visualized an M.C. Escher-like sculpture that the artist intended to place among the staircases of the atrium itself. The artist provided a perspectival sketch of what he intended the experience of the sculpture to be, but Malaika argued for the use of the Unreal game engine to be used for

[37] The idea of emergent narratives closely parallels the arguments of urbanists Jane Jacobs and Kevin Lynch. In their respective books, *The Death and Life of Great American Cities* and *The Image of the City*, they outline methods that they believe will allow people to populate any section of a city during any time of the day and therefore have "random encounters" with one another. Jacobs argued for mixed-use buildings and the preservation of neighborhoods that allow people to live close to and meet one another while running errands in their neighborhoods. Lynch similarly argued for spaces in cities to allow people to orient themselves and gather at nodes and landmarks that would facilitate meaningful interactions. These ideas contrast those of CIAM urbanists such as Le Corbusier who argued for the separation of functions within a city to streamline day-to-day activity and keep the population on a linear path through their own lives.

[38] Lundeen, Randy . Interview by author. Personal. Valve Corporation - Bellvue, October 27, 2008.

the visualization. He argued that without using a game engine, the sense of walking in, discovering the sculpture, and the "layers of experience" that occur as the occupant sees the sculpture from different angles while climbing the staircases would be lost.[39] If the experience of the sculpture did not match what the designers intended, they could make changes based on their findings, if playtesting is used early on in the design process.

The ability for designers to create spaces from narratives is one that has existed in game design for decades. Players in a game of *Dungeons & Dragons*[40] literally generate dungeon spaces and towns based on the story written by one player who leads the game, known as the Dungeon Master.[41] Modern game design techniques featuring prototyping and playtesting within a digital game engine enables elements of the narrative and the narrative spaces used to tell them to be tested, as one would the actual gameplay mechanics. Through the prototyping and playtesting process, the effectiveness of narrative spaces in both games and architecture can be evaluated and places where the narrative is not perceived can be changed or edited out altogether.

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[39] Malaika, Yasser. Interview by author. Personal. Valve Corporation - Bellvue, October 27, 2008.

[40] Team, Wizards RPG. *Dungeon Master's Guide: A 4th Edition Core Rulebook* (D&D Core Rulebook). Wizards Of The Coast, 2008.

[41] "The Dungeons and Dragons Experience." YouTube. http://www.youtube.com/watch?v=lPCn3KcuYYs. (accessed June 1, 2008). – Describes the creation, history, gameplay, and players of *Dungeons & Dragons*, the world's first table-top role-playing-game.

CHAPTER IV

THE RULES OF GAMES AND SPACES

Both game designers and architects control the movements of the people that inhabit the spaces they create. In game design, this is accomplished through the creation of rules, guidelines that control the behavior of players within a game and restrict the actions and movements that players may take.[42] Architects do this with form and space, physically limiting the occupant through the walls, spaces, and forms of the building. As stated previously, these guidelines seem rigid, but actually allow for a variety of emergent behaviors to occur. An example of this occurs in the game *Chess*, where each piece on the board may only move a certain way, but different combinations of these rules and how a player uses them may form complex strategies. It is for this reason that game design is a second-order design problem[43], meaning that a designer creates a formal structure that facilitates unique user experiences. It is this iterative outlook on design that architecture can adopt in order to change from a "top down" method to a more "user-out" method. In order to accomplish this, architects must understand how building a set of rules from one of the previously discussed design generators works, how these rules ensure a successful formation of user experience, and how game designers have customized their process to make this relationship more effective.

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[42] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 122-123.

[43] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 168.

The physical spaces of architecture and the systems of rules that create games share an almost one-to-one relationship, especially in video games, where programming languages assign behaviors to digital models that resemble the elements of physical space and constrict movement. While it is seductive to base most comparisons between game design and architecture on this concept, it is useless to do so without exploring the ways that game designers use rules to create truly meaningful designs. According to Randy Lundeen, the "common denominator" to all game designs is user experience.[44] Playtesting helps game designers test the user experience and make sure every element of the game, from technical aspects of the game to the overall mechanics and narrative, creates a cohesive whole. This concept is known as meaningful play, where every part of a design contributes to the overall product.[45] The process of creating a game from the two previously discussed design generators, and using meaningful play to ensure their success, can be described through two theoretical design projects, one mechanic based and another based on a narrative.

The first game is entitled *X3n0s: Viral Infection.* The game was built up from a core mechanic, which in this case was "destruction." From this single word, the designers envisioned a two-dimensional action video game that would feature shooting and platform jumping similar to Nintendo's *Metroid* or SNK's *Metal Slug.* The designers further refined the mechanics, using the core mechanic to make the game's environments destructible. This gave way to the creation of secret rooms and the implementation of different types of weapons that would entice the

[44] Lundeen, Randy. Interview by author. Personal. Valve Corporation - Bellvue, October 27, 2008.

[45] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 34 – The full definition of meaningful play is: The idea that the interactions between the player and the game and also between the elements of the game itself are discernable to the player and make sense in the overall game. With meaningful play everything in the game has a reason for being there. Meaningful play keeps the integrity of the game's separate reality, previously described as the magic circle.

player to explore more of the game world. Finally, a narrative setting was established: the player was a computer virus named X3n0s (a computer-slang version of the Greek word for "stranger) that found its way into someone's PC. This allowed enemies, game environments, and in-game descriptors to be designed according to the appropriate narrative context.[46]

The same designers also created a game based on an original narrative called *Survivors of Atlan*. The game is a science-fiction based role playing game where players take on the role of Carc, a young man who is seeking revenge against the evil galactic warlord who destroyed his home planet and forced him to become a violent outlaw. As the story progresses, Carc reconnects with friends from his past and must redeem himself through rebuilding relationships with them. The game's development began with *Final Fantasy*-style gameplay in mind, but the story presented some problems: in traditional role-playing games, players can explore wilderness and fight wild monsters while *Survivors* was set in outer space where the characters could only fight monsters on planets. The themes of redemption also had to be meaningful to the gameplay scenes when players had direct control of Carc himself. To fix these problems, the designers created a space-travel system where players could use a large ship to fly to planets as a fantasy RPG character would traverse wilderness to find towns. The monster battles in space were replaced with arcade style starfighter battle levels to further evoke space travel and add to the sci-fi narrative, minimizing player fatigue by changing game experiences. Finally, since many RPGs allow players to battle alongside parties of characters, Carc's friends were employed in such a way that they gained strength and abilities based on how much the player develops Carc's relationships with them. Likewise, certain story chapters are only accessible when players

[46] Totten, Christopher, Ian Pepek, and Jim Horstmann. *X3n0s: Viral Infection*. 2005-2007. Amateur game design proposal (in development). – This game exists solely as concept art, character animations, and technical demos. I would still like to make it someday.

complete a certain number of these character-based tasks; a mechanic that was covered in the narrative by the addition of a divine consciousness that decides when Carc is "worthy" of continuing his quest.[47]

These game design case studies give a valuable look into the process of developing rules for games based on design generators while trying to maintain meaningful play. According to Dario Casali, core mechanics and gameplay goals create constraints when designing the spaces for a game. As these constraints are overcome and mechanics are added, new constraints present themselves.[48] As architects consider designing from a core mechanic, they must consider how each element of their own buildings meaningfully work with one another to preserve the experiential goals of the space. This even applies to how a building site is used. Since the creation of user experience is central to the success of a design, it should be considered first. In this way, architects will be able to keep "meaningful play" in mind as they do their subsequent site analysis and decide what kinds of spaces can be built there. This is counterintuitive to top-down architectural design processes, but closely parallels the "gameplay then rules"[49] hierarchy of game design since it treats the site and zoning as a set of pre-existing spatial rules that the architect must work with. This outlook saves game-based architectural design methods from the fact that spatial design for games often happens in a vacuum, where

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[47] Totten, Christopher, Ian Pepek, Tiffany Gardner and Jim Horstmann. *Survivors of Atlan.* 2005-2007. Amateur game design proposal (in development). - This game is a "pet project" of mine, since I have been using the characters in this game in some form for about 13 years now in various personal projects. Right now the game exists as a script and a technical demo created in the Game-Editor program. I hope to finally make it someday.

[48] Casali, Dario. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

[49] Casali, Dario. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

designers have complete freedom to create worlds[50]. This also works with narrative based designs, such as Wright's Fallingwater. The client's story of sunbathing on a rock over a nearby waterfall inspired Wright to use the rock as the center of his design. He dictated the main floor's height based on the height of the rock, allowing him to generate the spatial rules for the rest of the design. In addition to this, he preserved the experiential qualities of looking out from on top of the rock to create balconies and views from inside the house. Through this design process, Wright ultimately created a design that was meaningful to Kaufmann's stories of vacationing at the site.[51]

To ensure the concept of meaningful play, game companies implement a back and forth design process where employees who work on seemingly unrelated parts of a game design: level designers, writers, programmers, modelers, animators, and others, work in tandem to generate the final product. They then test each other's work and find places where they must edit or eliminate entire levels, characters, or story chapters. Valve calls this design process "The Cabal"[52], and literally has spaces within their offices for this type of design[53]. This contrasts the design process of many architecture firms, where designers are placed hierarchically; with the principals acting as lead designers and new employees drafting building details. Many employees

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[50] In Valve's Hammer level editor, design literally takes place in a black void sometimes referred to as the "Twilight Zone." Users place level geometry and must ensure that their final design is fully enclosed from the void. Failure to do so creates "leaks", which makes game levels unable to compile or be playable. This is a very literal translation of the idea that spatial design in games occurs without exterior site context.

[51] Information learned during the History of Modern Architecture course at the Catholic University of America's School of Architecture and Planning, taught by John Yanik. 2004.

[52] Birdwell, Ken. "The Cabal: Valve's Design Process for Creating *Half-Life*" Found in Zimmerman, Katie (Edt)/, and Eric (Edt) Salen. *The Game Design Reader*. Cambridge: MIT Pr, 2005.

[53] Chin, Chris. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

working as one unit, each in their own area of expertise but evaluating the work of other employees through playtesting, can change the way architecture is designed and ultimately create more meaningful buildings. This would not undermine the position of principals as lead designers, but would allow them to more effectively take advantage of the talents of young employees who have newly graduated from architecture schools. Students often work in "think-tank" style studio spaces conducive for this type of design collaboration, giving architecture school studios the potential to adopt aspects of the powerful Cabal-style and can allow students to test it for use in architecture before moving into real world practice.

CHAPTER V

ARCHITECTURE: THE GAME

The preceding chapters have discussed the potential that game design methods have to influence the focus and methodology of architectural design. This has led some designers, such as Valve's Matt and Danika Wright, to even say that game design's bottom-up approach is "more logical"[54] than the more common top-down approach practiced by architects. This sentiment has been shared by other designers such as Katie Salen[55], and by architects who have joined the gaming industry looking for ways to create more meaningful user experiences within space. Unfortunately, with the exception of isolated studies of the power that game design methods and game engines can share with architecture, not much has been practically created in the industry with them. Thankfully, the transition to a hybrid of game design and architecture methods can be softened by looking at new genres of games that are designed based on the parallels between gamespaces and architecture.

Games create their own worlds, which have previously been identified as "magic circles", where the rules of the game hold the same powers that laws do in the real world.[56] In his book, *Persuasive Games,* game designer and theorist Ian Bogost states that many gamers gain the ability to identify and critically analyze the rules of games, gaining what he calls "procedural

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[54] Wright, Matt and Danika. Interview by author. Personal. Valve Corporation - Bellvue, Washington, October 27, 2008.

[55] Hall, Peter. "Principals of Play." *Metropolis*, September 1, 2006: 109-111; 150-151.

[56] Huizinga, Johan. *Homo Ludens A Study of the Play Element in Culture*. Boston: Beacon Press, 1955.

literacy."[57] Likewise, game theorist McKenzie Wark argues that "enlightened" gamers often use this ability to analyze parts of their real world lives as one would the rules of a game.[58] Like the character Neo in *The Matrix* series of films, the enlightened gamer uses this ability to see the procedures on which the world is built to their own advantage.[59] Recently, many such enlightened gamers used this outlook on the real world to create games that challenge how real world environments are seen and used.

The first such type of these games are called "pervasive games", games that use mobile and global positioning technology to allow a person's real-world actions to take on virtual-world meanings.[60] Examples include *Geocaching*; an interactive scavenger hunt-style game where players use GPS coordinates to find treasures left around the world by other players[61]; and *Pacmanhattan*; a game where players, dressed as characters from the arcade game *Pac-Man*, use cell phones to locate and chase each other around the area near Washington Square Park in New York.[62]

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[57] Bogost, Ian. *Persuasive Games*. Cambridge: MIT Pr, 2007. P. 245.

[58] Wark, Mckenzie. *Gamer Theory*. Cambridge: Harvard University Press, 2007. P. 1-18 – In this chapter from *Gamer Theory*, Wark compares the ways that gamers play games for long periods of time indoors to Plato's Allegory of the Cave from *The Republic*. He identifies the "enlightened gamer" as one that escapes the indoor arcade of "The Cave" and the shadows inside (video games), but applies the problem solving procedural literacy skills to his life in the real world. Bogost argues that this type of learning closely mirrors the education methods of Maria Montessori, whose teaching methods emphasized kinesthetic learning and absorbing sensory information. This information is then interpreted through the intellect to first solve basic problems, then reinterpret the strategies used on the basic problems to overcome increasingly more difficult ones.

[59] *The Matrix*. DVD. Directed by Andy Wachowski. 1999; Burbank: Warner Home Video.

[60] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 248-251.

[61] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 222-224.

[62] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 262-264.

These games bring the magic circles of both the real world and virtual worlds very close in sync with one another through mobile technologies. This has inspired a series of similar, non-game mobile technologies that assist people as they explore the built environment. Examples include the Seattle Mariners' implementation of Nintendo DS game systems at Safeco Field to give spectators real-time stats, analysis, and scores around the Major League or *Tinmith*, a 3D data collection and modeling software that generates computer models of a site through computers stored in a user-worn device.[63] The second genre of these games fully combines the magic circles of the virtual and real worlds, proceduralizing the laws of the both. These games are called "alternate reality games", and they inject their magic circles into our own through e-mail, phone, mail, fax, and other personalized communication methods. Characters in alternate reality games use these methods to communicate with players and send them on real world scavenger hunts to recover in-game objects and information.[64] These games began as simple media projects, but have become a powerful method of viral advertising for everything from Audi cars[65] to films, such as *The Dark Knight*.[66]

Adopting a hybrid game design and architecture method also requires architects to look at their own profession in the way that the enlightened gamer and the designers of reality-piercing games look at the world around them: as a system of cause and effect procedures,

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[63] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 346-347.

[64] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 228-229.

[65] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 246-247.

[66] Warner Bros. and 42 Entertainment. *The Dark Knight ARG*. 2007-2008. Alternate reality game promoting the film *The Dark Knight*.

much like the rules of a game. This outlook has been embodied within computer programs to create rule-based design tools such as *Kaiserot*, a computer based urban planning program that absorbs user input to generate design solutions as 3-Dimensional information, rather than the Excel spreadsheet investigations common in urban planning. It has been tested on the Oceana section of Dubai's "The World" project to generate "worst case scenario" data for the designers.[67] Concepts from *Kaisersrot* were also used in the Wijnhaven Project, an urban design project located in the Wijnhaven area of Rotterdam, Netherlands. This project implemented a collaborative, rule-based design process where designers work with clients and owners to create a cohesive aesthetic. This forced builders to invest early on in the project and secure the ability to design the look they wanted. While the design of the buildings has been described as somewhat banal, it was a successful experiment from a real estate and business point of view[68]. The project was also lacking as a game-design based method, however, since it largely ignored the aspects of user experience that has made the gaming the multi-billion dollar a year industry it is today.

The shortcomings of these projects, such as the one undertaken in Wijnhaven, can be solved using the design methods described throughout this paper: generating a design and looking at it from a user-out approach, playtesting a design to test how occupants will experience it, and designing in a collaborative "Cabal" fashion. Following in the footsteps of rule-based design methods such as *Kaiserot*, this project proposes that these methods be further investigated

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[67] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 364-365.

[68] Walz, Friedrich Von (Edt)/, Steffen P. (Edt)/ Bottger, and Matthias (Edt) Borries. *Space Time Play*. Berlin and Heidelberg: Springer Verlag, 2007. P. 372-375.

and implemented into a hybrid of game design and architectural design. Unlike *Kaiserot*, however, this project calls for this hybrid to be embodied within a proceduralized design tool that allows for the emergence of varied design outcomes and user experiences based on who uses the embodied method.

Such a design tool must also be valuable for those new to the hybrid method of design as a learning tool. Ian Bogost describes the ability of interactive rule-based systems to teach or transmit information as "procedural rhetoric."[69] Procedural rhetoric, as opposed to other forms of rhetoric, allows its target audience to kinesthetically interact with a system of cause and effect relationships that meaningfully demonstrates an argument. This makes it an ideal method for teaching other kinesthetic processes, such as design. While a computerized system such as *Kaiserot* can be very successful for teaching the proposed hybrid design method through procedural rhetoric, it bases much of its output on computerized algorithms, taking much of the human element out of design. This is where game design can once again help architecture. As stated previously, games are rule-based systems, much like computer programs, but allow for users to form their own stories, or emergent narratives, within the game's system of rules. While embodying a hybrid design method of game design and architecture in an actual game may seem shallow to some, it offers novice users a kinesthetic method of learning a new design method

[69] Bogost, Ian. Persuasive Games. Cambridge: MIT Pr, 2007. P. xi. – Bogost uses procedural rhetoric to describe how games transMIT ideas and arguments for political, commercial, and health purposes. In my course, Game Design and Architecture, I likened this to game design's idea of "metagame", which describes the influence that a game has on the outside world. This is a similar idea to those of many modern architects, such as those who formed CIAM, who argued that architecture has the power to affect the world around it. This is also a prominent belief throughout much of architectural history, as evidenced by buildings meant to embody or represent certain lifestyles or belief systems, such as the Pyramids or many types of church design.

and experienced practitioners a flexible method of design that never results in exactly the same outcome.

A precedent for such a design game exists in a project developed by Aki Jarvinen for his doctoral dissertation.[70] This game, entitled *GameGame*, requires players to collect the essential elements of a game design: a core mechanic, a component that the player manages within the game, a goal for the players to reach, and the victory conditions that allow players to win.[71] Only the words that form the core mechanics for players are written explicitly on the cards. Every other element that is described on the cards is defined by players based on the needs of their own design. This open-ended rule set allows for a high level of emergent outcomes to each game, an essential element for the success of any game based on design. Using this sort of design tool as a precedent, this project hopes to generate a design game that demonstrates a new method of conceiving architecture with game design techniques and tools that can create better user experiences within buildings. Designed correctly, both the hybrid method and the game that demonstrates it, can be accessible to everyone, can create different outcomes based on who plays, and can be what every game, gamespace, or built environment should be: FUN.

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[70] Jarvinen, A. *Games Without Frontiers: Theories and Methods for Game Studies and Design*. Doctoral Dissertation. University of Tampere. 2005-2006.

[71] Jarvinen, A. GameGame. 2005-2006. Game design card game. Available at: http://gamegame.blogs.com/

CHAPTER VI

DESIGNING DESIGN

To create a successful game based on design is a challenging task. When putting "design" in the context of "Game Design and Architecture", several aspects of the hybrid method had to be addressed: the generation of design from a narrative or core mechanic, playtesting, and Cabal-style collaboration. These simple factors told me a lot about how the game was to be made: architects playing the game would generate a design goal based on their intended building's use, they would somehow model and evaluate that model through real-time interaction, and they would play in teams. As with all design, however, solving these small problems only raised newer, even bigger challenges; namely; such as how many of the design elements would be prescribed by the game and how many would be left open for the designer to create, how the models would be built and evaluated, and ultimately, how a group of players could win a game based on purely subjective criteria. Another question also surfaced: if this user-centric design method could be expressed in a game, could other design methods of different foci become games as well? If so, what would they show us about Architecture?

CHAPTER VI – 1: GAME DESIGN AND ARCHITECTURE: THE GAME

I designed my first game for this project as a direct translation of the design theory developed in the "Game Design and Architecture" research project. As previously stated, the game had to properly embody the concepts of core mechanics, playtesting, and Cabal-style collaboration. An analysis of the precedent, *GameGame*, shows how only a few elements of the

resultant design is prescribed by the game, in this case, the core mechanic. For the rest of the design, *GameGame* provides descriptions of what elements make a game, while letting the players define how exactly their game will implement these elements.[72] In this way, game designers who are unable to come up with a beginning concept for a project can generate design ideas from core mechanic cards they draw during the game.

Architecture is different, however, in that the beginning definition of a project is not conjured by the designer but suggested when a client hires the architect to design, a building for them. The architect's challenge comes when they sit down to their desk and create a concept of what form or experience their building will have.

Being a game focused on a user-centric design method, *Game Design and Architecture: the Game* was designed to feature prescribed experiential concepts for the designer to choose among. It was therefore decided that players would have the freedom to choose their own site and building program. Designers could then be encouraged to create a core mechanic for their project from its use. As long as the definition of "core mechanic" was well defined for new players, they could decide on their own mechanic and use it as a simple experiential goal. This had the benefit of allowing architects to play through their actual building projects and to see how the game affected the decisions they made when compared to their normal design methods.

Once the idea of beginning the design in the game was clear, the next hurdle to overcome was how designers would use the game. The Cabal aspect became a very important, but very simple aspect to design. The nature of Cabal-style design allows designers from different areas of a project to work together in close quarters, exchanging and evaluating one

[72] Jarvinen, A. GameGame**.** 2005-2006. Game design card game. Available at: http://gamegame.blogs.com/

another's work. Since it was already decided that players would work in teams, I added the stipulation that people on these teams would divide the design work into roles such as architect, interior designer, and structural engineer. At the end of each phase of design, players would evaluate one another's work and suggest changes. Originally, the work was to be done in model, with players using a packaged set of pre-made toy pieces, similar to Lego building blocks. While a modular system seemed fun and appealing, it allowed significantly less design freedom than existing design tools. The other problem with physical models was that they inherently put the designer at a top-down perspective, contradicting the point of using game design methods in the first place. It was decided that the game would feature a computer component that could be played simultaneously with the real-life game; thus, allowing player/designers to use quick modeling and an artificially intelligent character that would "walk through" the building model at the end of each design phase and award points according to the effectiveness of the designer's use of the experiential components. This provided both a way to win and a solution to the problem of simulating playtesting.

The game then needed a real-life component to allow players to decide their design moves. In *GameGame*, the design decisions of the player are facilitated by a deck of cards, with the end of a deck marking the end of a design phase. I felt this "design phase" gameplay was important to create, especially considering the "design – playtest – design" development cycle outlined in my paper. Wanting something more physical than a simple deck of cards I decided that a board would be the real-world element of the game. I felt that gathering around a board to view and monitor each team's progress would be more fun for players and incite more design competition. Using cards would allow players to introduce more "game-esque" mechanics that would have little bearing on the simulation of the design method, but would create unique play

situations. Since the board would have to embody a cyclical design method, I chose the board from the game *Monopoly,* as a precedent, since players move around the board in laps, with "Go" acting as the starting space and lap marker. The board was then designed to have a similar number of spaces to *Monopoly*; since I felt a turn around the board in that game was of a satisfying length; but arranged the spaces in a circular pattern to visually express a cyclical design method. On this board, there would be design spaces, which would suggest varying numbers of design changes, yet leave the actual nature of these changes up to the designer. Cards would be distributed via "take design consideration" or "exchange design consideration cards" spaces; which would have players draw experiential concept cards, and "take business card" spaces, which would tell players to draw game effect cards designed as humorous business cards. With this iteration of the rules being completed, (e.g., players rolling die to reach spaces that facilitate design changes, removing parts of the design, reacting to card-described variables, and testing their teammates' designs at the end of each lap of the board in an effort to create a better design than the opposing firms), playtesting was ready to begin.

CHAPTER VI – 2: STUDIO: THE GAME AND CUBICLE!

With a user-centric design game already established with *Game Design and Architecture*, I became curious to see what a game could do for more typical design or technology-centric architectural design methods. To that end, the overall project became focused on developing games based on various classes and studios at The Catholic University of America. The first of these games was simply called *Studio: The Game.* This game would be played between two or three designer players, acting as design students, and one player who would be "the Crit", the omnipresent studio professor who can suggest changes to the designers' models. Gameplay

begins when the designers each draw a design concept card, which gives them a formal concept to use based on historical or theoretical design standards. The designers then roll a die to see how many changes they may make to their model, using modular toy pieces to best express their design concept card. The Crit comes into play when designers roll a six. This player acts as the voice of the game and draws cards from a deck. These cards explain what type of changes can be made make to one of the designers' models. After a pre-determined amount of turns, designers would present their models to the Crit, who would decide the winner by awarding points based on adherence to design goal, adherence to concept, use of site, and quality of design.

As a bi-product of this game, a design game for lay people was created called *Cubicle!*. This game pits the designers against the Crit in a race to complete a design before the studio's final presentation. Using a *Scrabble*-like board of squares, the Crit rolls a die to see how many spaces on the grid they may move, trying to get from one end of the board to the other. The designers, however, roll a die to determine how many walls they can place on the board according to design concept cards that they draw. In this way, those uneducated in architecture can learn how we define space through a strategic tile-placing game.

The advantages of these two games are their ability to be expandable. By creating new sets of pieces and cards, sets can be created to teach any number of design standards. The base set used during playtesting was based on Christopher Alexander's book, *A Pattern Language*, but additional sets could be created to educate players on other design methods. Examples of potential expansions included sets for understanding Gothic, Roman, Greek, or other historic

architectural styles; along with sets describing the theories of John Ruskin, Le Corbusier, and others.

CHAPTER VI – 3: EARLY PLAYTESTING

Having these designs established, although originally with the intent of developing a game based on a technology-based design, I began playtesting the games with students from Catholic University's Architecture school. The playtesters were Michael Kenderian, Alex DiMichele, John Nolan, Kristin Lipinoga, E.J. Crough, Lauren Sobecki, Monika Chojnacki, Miles Doyle, and Stephan Perez. The first few playtests for these games were primarily focused on perfecting the mechanics of playing them. *Studio* and *Cubicle!* required minimal changes, except for a few small adjustments that made the Crit player less omnipotent (the players thought a powerful Crit made the game too tense and similar to real studio.) *Game Design and Architecture,* however, underwent a series of interesting changes that made the overall experience more enjoyable.

As previously stated, the game was designed to be played with multiple teams of three or four designers who would be competing firms, each firm having their own piece. However, even with a full playtest session, it became difficult to arrange for more than two teams to play the game at one time. The designers who played under this ruleset also commented that the firms did not interact much with one another, even with provisions put into the game's cards for firm to firm interaction. The competition aspect was therefore scrapped in favor of turning the game into a cooperative one between two, three, or four designers. Each player would still be given a job but would have their own piece to move around the board with, while solving the issue of how to divide the prescribed number of moves for a firm among the designers within it.

This seemed to also relax the players and make them more focused on the quality of their design, rather than competing with one another. Since the intended computer program was found to be a challenge to implement by the end of the thesis design semester, its creation was put on hold while the players used Google Sketch-Up as a stand-in modeling program. The walkthrough feature was used as a substitute for traditional playtesting and evaluation of the experience of being inside the building.

The results of these playtests determined that players/designers designed differently in all three of these games: players felt that designing in a play environment allowed them to relax and have more "out of the box" ideas than they would under the strenuous studio environment. Also, aspects of how each designer interacted with one another, especially in the Cabal-like environment of the *Game Design and Architecture* game became increasingly interesting; with players commenting that the collaborative environments were better than similar ones in studio. Finally, observing their own architecture from the point of view of the occupant while utilizing experiential components, put more of the formal and functional aspects of the building aside during the game; thus creating architecture that felt very different from what participants had been taught to create. As a new computer modeling tool, and some help from the field of psychology, came to light, the evaluation of these components of *GDA* revealed some exciting discoveries of how the hybrid method could allow new perspectives in Architecture.

CHAPTER VII

WELCOME TO CITY 17…

During the Spring 2009 Thesis Design semester, The Catholic University's School of Architecture and Planning held a competition in partnership with The Basilica of the National Shrine of the Immaculate Conception, located next to Catholic University's campus. The purpose of the competition was to design the mosaic for the long-blank central dome above the church's nave crossing. A key component in the competition was the church's desire to have a dome that was not only interesting in how it formally reacted to other art in the church, but also in how revealed itself to visitors in a meaningful way. After previous discussions with the professors in the school on potential uses of real-time first person visualization through game engines, it was decided that the dome project would be a good time to use a game to "playtest" the entries in the competition. I reproduced the Basilica in Valve Corporation's level editor, Hammer, and provided entrants with directions on how to place their designs into the model. This allowed them to playtest their work in the game *Portal*. While the exercise did not reap any huge results, given the limited aspects of the design being playtested and the small number of students that ended up using the model, it did give me a new idea for my playtests: using Hammer as a modeling program for the game and actually playtesting the resultant buildings in another Valve game, *Half-Life 2*[73].

[73] While the Basilica project used *Portal* so I could use the game's Portal gun to reach the upper levels of the nave and check my geometry, this game utilized *Half-Life 2*. While this is a downgrade in the version of the Source engine being used, it allowed me to place friendly citizens into the models that would run up to the player and greet them with a friendly "Heeeey, Doctor Freeman!", referring to the game's protagonist, Dr. Gordon Freeman. In a

It was decided that *Studio* and *Cubicle!,* as well as the creation of a technology-based design game would be set aside in favor of *Game Design and Architecture*, the original game designed for the thesis, as it already contained the aspects of designing in a play environment, while the collaborative gameplay only hinted at in the other games. *GDA* also discussed how core mechanics and experiential concepts like "risk" or "goals" can affect how the layout of space is considered. Using the game engine, these concepts could be evaluated in real-time, with real-time lighting, physics, and atmospheric effects activated. The recording of how these things affected the designs of the resultant buildings needed to be adjusted from simply asking the designers how they felt, to marking what moves players made in response to the experiential design cards, Cabal gameplay, and other changing variables. In this way, it would be easy to see how designing in the context of a game changes how architecture is designed.

During this time, I also became aware of the cognitive scientist and design consultant Donald A. Norman. In his book, *Emotional Design*, Norman outlines how design and problem solving are aided by fun brainstorming sessions, carried out through games and similar activities. He describes an experiment conducted by psychologist Alice Isen on how emotional states affect our ability to problem-solve. Isen conducted a test where she placed several people in a room with a puzzle, telling them it was an IQ test and that their ability to solve it would determine their ability to be successful in life. She found that these nervous participants could not solve the puzzle because of their tense emotional state. On the other hand, the next group that Isen put through the test received candy beforehand, and easily solved the puzzle. Isen determined that their relaxed state of mind broadened the thought patterns of the participants,

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game based on viewing things from the user's perspective, I felt that looking at the design without other users, as is common with traditional architectural photography, would be counterintuitive.

which better lent itself to the kind of "out of the box" thinking required to solve the problem. Norman describes this type of thought process as "breadth first", while problem solving under stress uses focused, "depth first" processing.[74] While playing the *Game Design and Architecture* game, playtesters described a similar feeling to that described by Norman and Isen as "breadth first", noting that the design decisions they make while in the game's play environment are different from the decisions they typically make in the stressful environment of the architecture studio.

To test the building designs generated by *GDA* players according to these criteria, I conducted two games: one would be played by students in the school's academically lauded but student-reviled Comprehensive Building Design Studio while designing their project for the course (a transportation hub for light rail) in the game's relaxed play environment; while the other would involve students in other classes designing simple houses. Each playtest maintained the same program, but players were asked to change their core mechanic each time to see how these changed the experiential goals of each project. For example, one of the transportation hubs was built around the idea of "waiting", which created a sequence of lounges and waiting areas, while another was "movement", which created narrow interior spaces with tile floors and columns to establish a rhythm that commuters would match with quick moves to the departure platforms. The slight random elements of each game, such as the die rolling and card drawing, would ensure a different set of design suggestions by the game in each session, with players strategically making design moves or exchanging experiential concepts that would create the best sense of "meaningful play" in each building.

[74] Norman, Donald A. *Emotional Design*. New York: Basic Books, 2004. P. 19-25.

Despite questions of what type of architecture this method creates, there is little evidence to suggest that any particular "style" comes from the game. The effect is quite the opposite, with the game producing architecture based more on who plays than what the rules dictate. When I played during one of the house games, I created something close to a Frank Lloyd Wright design while Kristin Lipinoga often designed in a Corbusian style with white concrete and piloti; as much as *Half-Life's* own post-apocalyptic Eastern European aesthetic would allow[75]. With different designers having to serendipitously design by reacting to one another's moves, many of the buildings contained a patchwork of elements that worked together experientially, while forming strange combinations formally. By taking each of their moves one at a time and focusing on the number of changes made as a reaction to their latest design space rather than facing the entirety of their building design at once, the players made quick and clever design decisions in the micro scale that became entire combinations of interesting moments when experienced together in the ultimate building playtest. Even when the two groups exchanged building programs and re-enacted each others' moves from a previous session, they designed vastly different buildings, proving further the effectiveness of designing the game to maximize the human element of design.

The experience of the designers was, as intended, a relaxed enjoyment of creating architecture that allowed for more "breadth first" design thinking. As stated before, designers felt that their decisions in the game environment were more creative than the ones they made in

[75] *Half-Life 2* takes place in a fictionalized future where aliens called, "The Combine" have taken over the Earth and enslaved humanity. The atmosphere is somewhat reminiscent of George Orwell's *1984*, even featuring citizens in blue jumpsuit-uniforms. The actual setting for the game, City 17, is also strongly hinted at being located in Eastern Europe. The resulting aesthetic has been described by the playtesters as "ghetto-tastic." I have jokingly referred to the architecture we've designed in the game as the "City 17 Urban Reclamation Effort", creating interesting architecture for the post-Combine city. This is the reason for the title of the chapter.

their studio classes. Having designers engage in the same projects they had in their studio, especially for the CBDS students, allowed the contradictions between the two experiences to become even more evident. CBDS students better appreciated how the game created a collaborative environment and suggested the game as a way to introduce future CBDS groups to working with one another, or even lessen problems between current group members; which actually happened between studiomates, Alex DiMichele and Kristin Lipinoga. Designers also felt that their moves mattered more among the other players, since there was no way to refuse another's suggestions while making your own moves. Participants, in general, felt less ownership for their own designs; since at any time design concepts could change or players could land on a "remove building element" space. According to the playtesters, such spaces represented pleasant challenges to rethink a design in a different way, rather than a rejection of the current design by another designer or critic; as was the intended simulation. In this way, even the unpleasant elements of studio became fun in the context of the game.

Finally, designers enjoyed the ability to use Hammer to model their building and evaluate how the previously described criteria created a cohesive building design. When the actual building test sequences came about, playtesters appreciated viewing their designs from the user's perspective and made informed decisions regarding how their design decisions affect the way an occupant would experience their space. For example, during one of the house playtests, designers intended visitors to walk across a roof deck and have access to another deck that allowed a view of a nearby river. This worked in theory while building the design from above in Hammer, but playing the building in *Half-Life 2* revealed that another less interesting roof was more in the line of sight of an occupant while the intended deck was nearly invisible. Once a few three foot walls were added, the designer's intent became much clearer to new users of the

house, and the path much more meaningful. After each playtest was conducted, the resultant designs were tracked in graphic matrices, which compared the designers to their reactions to the individual design cards and other variable elements of the game. In this way, the outcome of each of the previously mentioned criteria for the experiment could be graphically tracked and observed, while accessing the models in real-time in *Half-Life 2* allowed observers to experience the outcomes themselves.

The building's function in these exercises was placed as a second or third order concern in favor of the production of meaningful experiences within the building's spaces. This is a result of the game's rules featuring no mention of program other than its use in generating the core mechanic of the design. Any programmed elements are put in at the discretion of the player/designer and their ability to implement them in the game's time limit of three turns of the board. This is an important distinction to make for two reasons. First, it is important for the correct evaluation of any outcome of *GDA* to understand that they are experiential schematic partis, and should not be judged based on the success of program implementation. Secondly, this discussion has so far stated that it is not concerned solely with the limitations of designing only in form, but it is neither concerned only with function. From these exercises, it is hoped that we can learn how architecture can create better experiences for the people designing it and for the people using it. Architecture is neither solely a piece of art nor a "machine for living in[76]", but a beautiful amalgamation of the two at meaningful play.

[76] Le Corbusier. *Vers Une Architecture.* Paris: Flammarion. 1995.

CHAPTER VIII

OBSERVATIONS AND FUTURE WORK

As with all good games, the success of *GDA* also rests on its ability to have Metagame influence; the ability of the game to reach beyond its own "magic circle" and influence the world around it. In the case of *GDA,* designing architecture in the play environment of a game has shown several interesting things; not only about the way we design but also how our point of view on the architecture can change the designs themselves. As stated previously, the work of Don Norman outlines how designers and problem solvers think in a more "out of the box" way in an environment that makes them happy; such as one with games, friendly conversation, or tasty food. Likewise, the previous discussion of the nature of game rules shows us that they focus player actions in such a way that allow emergent outcomes. The combination of the breadth first thinking created by gaming and the focusing nature of rules creates a design method that allows for controlled "out of the box" thinking, which I have previously mentioned results in quick and clever decisions on the part of the player/designers. Having these players/designers work in cooperative teams, without a way to both reject one another's moves while making their own, diminished the "too many cooks in the kitchen" syndrome evident in many university studios. These team mechanics also significantly lessened tensions between players, who both work in the same studio group and have played the game together. Finally, the game showed how a focus on core mechanics, experiential concepts, and evaluating the success of these things within a real-time game environment, can bring a new dimension to the way architecture is designed and perceived. None of the buildings created during the game were

seen in plan, section, or elevation at any time during their design, and the resulting buildings showed little to no evidence of being only enjoyable in any of those drawing types. The designs instead had a strong 3-dimensionality in the way that views, previews, and experiential moments could be tested in real time and in the way that some of the buildings could be appreciated from multiple angles.

As with other Metagame effects, how people perceive these outcomes will as much depend as much on what the player or observer brings into the game, as what they take from it. Someone working in a firm of two people would have little interest in changing pyramidal design structures through Cabal, but may find the discussion of how "risk" can affect the feeling of a space very interesting. However someone perceives the game, these outcomes of the *GDA* experiment bring to light some interesting new avenues for research into how the joining of game design methods with architectural design may create new and dynamic buildings. It has also brought to light mechanical analyses of how design processes work, in general. As stated previously, *GDA* is but one of the games designed during this study, and by observing how players have reacted to it, we can track the effects that such a game have on their ability to design and how they absorb knowledge of certain concepts that can be applied to their normal work. Games like *Studio* and *Cubicle!* can be implemented as educational tools for architecture professors wanting to give their students information on different design standards without putting them through rigorous work exercises, where the outcome is less about learning and more about getting an assignment done. Similarly, other methods of design, such as the briefly mentioned tool or technology-based methods can be explored as games. As discussed in Chapter five, games are, by their nature, micro-scaled simulations of cause and effect procedures. Analyses of design methods via gaming may allow us to become procedurally

literate about how we engage design problems under different sets of criteria, and may generate new ways of thinking about these processes.

Another potential avenue is further investigation into the way core mechanics, experiential design concepts, and immediate user feedback affect the way designers create buildings. Many game companies already employ designers with architectural backgrounds, and as such, utilize many of the same tools we use in our own profession. This has created the need among game companies to make many architectural tools compatible with their level editing software. While Valve's Source engine was utilized during this study, other studies into real-time visualization, such as those documented on the online blog, Digital Urban (digitalurban.blogspot.com), have suggested the use of other game engines for the same purpose. Other exciting possibilities include Gamebryo; the engine used by Bethesda Softworks in the games *Oblivion* and *Fallout 3*, the homebuilding tools in casual games like *The Sims* or *Second-Life,* or even Crytek's incredibly powerful CryEngine, known for its photorealistic rendering capabilities. Where these software packages really shine, however, is in their cost and efficiency, not their power. While some architectural software packages offer real-time walkthrough capabilities, they fail to have the same visual power as the non-interactive results produced by 3D Studio Max or similar programs. Game engines can offer similarly beautiful views with the ability to truly interact with the environments at silky smooth speeds up to sixty frames per second; all while remaining low-impact on the memory of even a mid-range personal computer, a necessity for maintaining engrossing gameplay. Most thrilling is the fact that many of these pieces of software cost fifty dollars or less (to be used non-commercially.) To use a game engine for visualization, architects simply have to buy a game that uses the engine they wish to use then download the game company's SDK (software development kit) and use the program.

Another potential avenue for future research is in prototyping and understanding the psychology of the Cabal, and the brain chemistry of a mind producing architecture in play vs. a mind doing so at work. My studies of how the designers felt as they designed architecture in the *GDA* sessions produced some interesting results, but lacked any formal psychological study in terms of understanding how the play environment for design activates the pumping of one neurotransmitter chemical instead of another to produce the observed effect. With the right equipment, a psychologist or the team of a psychologist student and an architect may find the answers to these questions. What is a bit clearer, however, is how the game affects team building in the context of an architecture studio, thanks to the observation of CBDS studiomates playing the game with one another.

The Cabal, by its nature, is a horizontally structured design method where everyone working on a project has an equal share in the outcome, while architecture offices often structure themselves in vertical pyramids where responsibilities trickle down the ladder. The problem with a studio such as CBDS, is that the structural intent of the firms is never quite made clear: the grouping of students, the nature of the assignments, and the physical studio space seem to suggest a horizontal intent. However, either through the appointment of group leaders by the professors, the emergence of egos, or people simply not knowing any better; participants attempt to shoe-horn a vertical structure into their group dynamic, causing productivity, morale, and even friendships to suffer. The Cabal may be a good prototype for a re-tooling of this studio dynamic; implementing simple round-table discussions or rules pertaining to group communication. Implemented as a two-hour event, *GDA* can even be used in the first studio session of CBDS, similar courses at other schools, or in actual architectural offices. This will not only help these play groups brainstorm design goals for their project, but

will also establish Cabal-style group collaboration that will, hopefully, continue throughout the project.

The idea of generating goals for a project through the game again brings to light the actual scope of the designs that come from the game itself. As stated in the last chapter, the buildings are merely experiential schematic partis that would require further design within the phase of work known as schematic design. Viewing the game from the whole context of an architect's work begs the question of whether other phases can be realized as games. In many ways, contract documents such as AIA Contract A201 are simply sets of rules for very large and dangerous games of personnel relations that could result in someone being sued. Like games designed to facilitate Cabal-style design communication among the member of an office, games can be implemented to show architects how to properly manage their work relationships with owners, contractors, and consultants. In many ways, these exercises would be valuable to students in the same way that a game like *Studio* could be: for learning the principles of owner-contractor-architect relationships kinesthetically then applying their knowledge when faced with similar situations in professional practice.

Finally, there is the most simple, obvious, but farthest off implementation of these methods: designing a building with them. While each of these methods is simple and could greatly benefit architectural design, they are a few years from the point where they can become implemented into a firm's design process. An example of the practical benefits is how many firms are still struggling to employ building information modeling software, such as Autodesk Revit, among their older employees. Techniques like the Cabal have the potential to close the gap between experienced designers with little computer experience and young interns with BIM

expertise but who lack design knowledge. Even in this context, the use of game design methods should be rigorously prototyped in small in-firm sessions and academic studios before making the jump to real-world implementation. Even if these methods were ready for building-scale implementation, they still face the popular image of games as meaningless distractions or wastes of time. While the game industry experiences a creative and academic revolution, it still waits for the outside world to take notice and to vindicate gaming as a viable form of media, much as films and comic books once did. Used as exercises in design and problem solving, games can make us look back at ourselves and how we design architecture, they can change how we consider space, or even give us new tools for visualizing our designs. While the following quote; by Dr. Andrew Hudson-Smith of the University College London's Centre for Advanced Spatial Analysis; is from an interview that only discusses game engines as architectural visualization tools, it also illustrates some of the challenges in implementing all game-based design methods: "Game engines are destined to play an ever-increasing role in the industry; people just need a little vision, and to get over the word 'game.'[77]"

[77] Varney, Allen. "London in Oblivion: Game Engines for Architects? Architecture for Gamers? WHY NOT?." The Escapist. http://www.escapistmagazine.com/articles/view/issues/issue_109/1331-London-in-Oblivion.2 (accessed March 29, 2009).

APPENDIX A

EXPERIENTIAL DESIGN CONSIDERATIONS OF GAMES AND ARCHITECTURE

This project discusses changes that can be implemented into the profession of architecture but does not by any means recommend that the entire industry be changed. The advantage of design in general is that it is itself emergent and can be many things; people are free to develop their own methods of design. The way game designers conceive space, however, does offer many unique experiential advantages that have been mentioned throughout this paper, but have not been described in any great length. Unfortunately, the full spectrum of experiential concepts at the game designer's disposal and how they can inform architecture can form the body of an entire textbook. Fortunately, many of these concepts can be boiled down to their most essential elements: possibility space, risk, narrative, rewards, tunneling, and goals. Narrative has already been discussed at length due to its involvement with the design process itself, so it does not need to be discussed again. The others, however, are just as essential in the success of both gamespaces and game design-based architecture. They are also some of the core concepts that are being evaluated during the ever-important playtesting process. As an appendix, this section will outline each with its definition and then discuss both game and architectural case studies where the concept is particularly prominent.

SECTION A.1 – POSSIBILITY SPACE

The concept of possibility space is closely tied to that of emergence; the idea that varying outcomes can happen when different people interact with the same system of formal rules.

Possibility looks at this in terms of the outcomes and interactions that a formal system of rules allows. When games create the space known as the "magic circle" with their rules, they also create a space of possibilities. Salen and Zimmerman define possibility spaces as "Spaces, created by sets of rules, which allow for different and varied experiences."[78] Shigeru Miyamoto; creator of *Mario, Donkey Kong, Zelda, StarFox, Pikmin*, and numerous other famous video game franchises; uses possibility spaces regularly in his games by allowing players to interact with rich gamespaces that have simple rules. He conceives these possibility spaces in such a way that they allow players to feel as though they are freely exploring miniaturized man-made and natural landscapes. He calls this his Miniature Garden Aesthetic. [79] In games such as *Super Mario 64*[80], Miyamoto introduces the rules of his worlds and the possibilities for player movement and experience they create by leading players through linear tours of the space.[81] After these tours, players are free to explore the possibility spaces as they wish and reach new goals. This experience, combined with the miniature garden aesthetic, makes players feel as though they are pioneers in an unexplored digital landscape.

Many of the buildings designed by I.M. Pei follow a similar experiential principle. Many of his buildings feature spaces that give a tour or overview of the spatial rules he sets forth in his design. For example, the Rock n' Roll Hall of Fame and Museum in Cleveland, Ohio features a

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[78] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 66-67.

[79] Gingold, C. "Miniature Gardens & Magic Crayons: Games, Spaces, & Worlds." Thesis. Georgia Institute of Technology, 2003. - Miyamoto's worlds function much like a Japanese garden, which traditionally uses articulations of small bushes, ponds, trees, and rocks to simulate vast natural landscapes such as forests, mountain regions, and oceans. Like the levels of a video game, their miniaturized size makes them easily accessible and interactive as part of a larger journey.

[80] Nintendo. *Super Mario 64*. 1996. Nintendo 64 game.

[81] Gingold, C. "Miniature Gardens & Magic Crayons: Games, Spaces, & Worlds." Thesis. Georgia Institute of Technology, 2003. P. 9-11

large glass pyramid that forms the entry atrium to the building. When a visitor first enters they see exhibits and attractions on the floors above them, but are instead lead down an escalator to the floor below where they must first traverse a linear exhibit on the history of rock music before being allowed to freely explore the exhibits on the upper floors as one would the possibility spaces within a game.

SECTION A.2 – RISK

Risk is essential to games. Many games build a feeling of uncertainty or risk[82] related to the amount of information that they give to players. Giving players small amounts of information helps them understand the nature of uncertain situations in games and enables them to move forward by choosing to take risks. This brings to light the question of how risk is created in games. The first method is the careful allowance and withholding of information to the player. The second involves the study of how humans react to various conditions within space. When games became digital and their rules became space, they began using principles of how humans perceive space to create elements of spatial risk. In his book, *Origins of Architectural Pleasure*, Grant Hildebrand discusses methods of creating pleasant spaces based on aspects of human survival instincts, but also discusses how some spatial conditions makes spaces unpleasant based on the same human instincts. According to Hildebrand, differences in lighting conditions[83], materiality[84], height[85], shelter[86], and size of a space[87] can change peoples' perception

[82] Salen and Zimmerman describe (p. 206-207) how games build three levels of certainty for game players: certainty, uncertainty and risk. Certainty allows players to know exactly how the outcome of a game will happen, making it not much of a game at all. Uncertainty happens when players have no idea what the outcome of a game will be. Risk is similar to uncertainty, but the player's chances of achieving different outcomes is somehow understandable, such as calculating the odds of Roulette spins.

[83] Typically, humans prefer to be in well-lit interior areas. People in dark spaces will move towards light. While dark to light is a preferable transition, light to dark can be intimidating.

of space; making them either feel confident or afraid. While in architecture, the dogma is to strive for spaces which occupants take pleasure in due to comfortable conditions. Game designers strive to create areas of danger and risk; because according to Salen and Zimmerman, there is pleasure in overcoming danger.[88] Valve psychologist Mike Ambinder also describes how creating risk for players in a game or occupants within a space can create what he calls "controlled uncertainty", where the goal of the space is obvious, but the path to that goal is not. This ambiguity requires players to make difficult decisions of what actions to take. These risk-building techniques are utilized in many places in the game *Half-Life 2*, where rewards are hidden from a player past dangerous enemy territories, dark tunnels, and dizzying heights; each containing horrifying monsters.[89] The architecture of Le Corbusier produces risk by being largely prospect-based.[90] Villa Savoye, for example, utilizes ramps that climb a series of floors that each look down on the level below. From the roof garden, much of the floor below is exposed to views from below, much like the prospect in a prospect and refuge sequence of spaces.

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[84] Humans prefer natural materials. This is why many people prefer to be near windows in office buildings and hang posters with natural scenes if they cannot. This also finds its way into many versions of the Hero Myth, where a hero ventures from a good land of natural fields or forests to an evil land of fire and machines.

[85] High areas can either be a useful lookout or induce vertigo depending on the way humans interact with the height.

[86] Hildebrand identifies a spatial condition known as "prospect and refuge", where refuge refers to a space where someone is in a covered, shaded condition from which they can look out. Prospects are well lit, exposed areas where occupants are open to being seen by others.

[87] Small spaces can be claustrophobic; large spaces are prospect-like and can lose occupants in their scale if used incorrectly. Medium spaces where the scale is accessible to those inside can feel intimate.

[88] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003.P. 348.

[89] Valve Corporation. *Half-Life 2*. 2004 PC DVD game.

[90] Hildebrand, Grant. *Origins of Architectural Pleasure*. Berkeley: University of California Press, 1999. P. 39-41.

SECTION A.4 - REWARDS

As a compensation for overcoming risk-inducing spaces, game designers often offer the player some sort of reward. Rewards in gaming often come from new abilities for the player's in-game character, access to new area, the ability for the player to maintain the well-being of their character, or even simply the joy of overcoming danger.[91] In architecture, these types of rewards can translate to many things; including allowing occupants to inhabit a monumental space after a series or risky choices, offering a place for someone to rest, or even allowing someone to freely explore a space after enduring a linear sequence, such as in I.M. Pei's Rock n' Roll Hall of Fame. In the game *Super Mario 64*, rewards are literally embodied within "Power Stars", which players reach after overcoming various dangers or solving puzzles. To do so, they must guide Mario through many risk-inducing spatial conditions; such as a dark haunted house, tall mountains, and the lava worlds of the evil king Bowser.[92] Architect Tadao Ando offers a special reward in his Church on the Water. Visitors to this building at first only see plain walls when they first encounter the building from the front and must walk around to find the actual worship space. As they move around the building, it builds a sense of risk through the denial of any type of view of the building and a withholding of information on where the occupant should go. As they continue, visitors are finally shown the chapel space, but most move through another series of spaces before actually reaching it. Once inside, the space, and the ability to worship there, are the visitor's reward.

SECTION A.3 – TUNNELING AND GOALS

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[91] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 346.

[92] Nintendo. *Super Mario 64*. 1996. Nintendo 64 game.

Players are guided from reward to reward through a concept described as "tunneling."[93] Tunneling refers to the way people are led through a series of actions in a sequence. In games and spaces, tunneling can refer to how users are guided through a formal system of rules. Much of this can be accomplished through visual means; creating forms and symbols that visitors learn to associate with various experiences.[94] These act as cues for someone lost within a space to decide which path they should take. Valve Art Director Randy Lundeen identifies that much of these visual cues can be given through contrasts: dark to light, bright to dim, natural to unnatural. He also describes how the forms of some structures can be used to create shadows that will form "lines of convergence" and bring an occupant to a specified area.[95] Much of the cues to tunnel can also involve the layout of spaces themselves. In Frank Lloyd Wright's Hannah House, he uses a honey-comb grid to create obtuse-angled turns that show parts of the spaces around every corner. This creates a condition for the human mind to mentally "complete the picture" and a compulsion for the occupant to find out if their evaluation of the space is accurate.[96] Wright's spatial configuration allows occupants to feel a regular sense of satisfaction as they move through Hannah House and find that their hypotheses on its spatial makeup are correct. Much of the experience of game design is also based on delivering rewards to players on specific schedules.[97] This creates conditions where players are motivated to continue playing

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[93] Bogost, Ian. *Persuasive Games*. Cambridge: MIT Pr, 2007. P. 59-60.

[94] Bogost, Ian. *Persuasive Games*. Cambridge: MIT Pr, 2007. P. 21-24.

[95] Lundeen, Randy . Interview by author. Personal. Valve Corporation - Bellvue, October 27, 2008.

[96] Hildebrand, Grant. *Origins of Architectural Pleasure*. Berkeley: University of California Press, 1999. P 56.

[97] Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 341. This concept, known as "entrainment", describes how rewards are delivered on an almost-rhythmic schedule that players will learn to identify. This concept, as identified by Ian Bogost in his book *Persuasive Games*, is similar to an arcade game design principle known as "coin drop." According to coin drop, games

a game to reach the next reward. Many of these concepts are based on the work of B.F. Skinner and his work with operant conditioning, the use of consequences to change or modify behavior.[98] Using operant conditioning as a guide, designers create conditions in games where players are rewarded for positive actions and punished when they fail or do the wrong thing. The use of scheduled rewards creates goals for a player, who realizes when their next reward will be and strives to reach it. In this way, games utlize two types of goals: long-term and short-term[99]; to maintain a steady rhythm of rewards for the player. Games in Nintendo's *The Legend of Zelda*[100] series are built upon a series of both long and short-term goals to keep players engaged in the game. For example, each level of the game is defined by a maze-like dungeon that players must travel through. The final goal of each dungeon is often made clear in the game's narrative: a magical item or artifact hidden at the end. However, each dungeon features a series of rooms with various traps and puzzles for the player to solve. In this way, the dungeons consist of rooms that create short-term goals for players: solve the puzzles; that lead to a larger goal: beat the dungeon. This sequence continues until the player ultimately completes all the dungeons in the game and defeats the final boss. Louis Kahn's National Assembly Building in Dhaka, Bangladesh also features a series of long and short-term goals. As described previously, the building is formed by a series of rings that terminate in a central legislative chamber. Kahn called for geometric voids to be created in the walls of each ring to look into the next section of

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give rewards to players at certain intervals and are created to be simple enough that the same players can reach them. The designers, however, design the game to be difficult enough so that the player dies several times while playing and must keep feeding coins into the machine to continue playing.

98 Skinner, B.F. *Science and Human Behavior*. New York City: Free Press, 1965.

99 Salen, Katie, and Eric Zimmerman. *Rules of Play: Game Design Fundamentals*. London: The MIT Press, 2003. P. 343.

100 Nintendo. *The Legend of Zelda*. 1987. NES Game.

the building, showing players what is to come in future spaces. This creates a goal for visitors who are exploring the building. As they overcome each ring, the ultimately find the long-term goal space of the legislative chamber, which is a rewarding space itself.

APPENDIX B

GAME DESIGN AND ARCHITECTURE COURSE AT THE CATHOLIC UNIVERSITY OF AMERICA – FALL 2008

As a part of this research, a class on the convergence of game design and architecture was conducted during the fall 2008 semester at the Catholic University of America as an independent study in the School of Architecture and Planning. The enrollment consisted of four students representing the junior and senior classes in the school. There were three seniors; Michael Kenderian, Alex DeMichele, and John Nolan. The other student, Stephan Perez, was the only junior. These students were asked to engage in a project in which they would simultaneously design a game and a theoretical piece of architecture which shared the same experiential qualities. These projects are detailed on the following pages by the students in their own words.

SECTION B.1 – MICHAEL KENDERIAN

My game is a collectable card game that takes aspects from the popular *Magic the Gathering* card game and the cult favorite *Battlefleet Gothic* table-top starship war game and combines them to make a unique system that has never been explored before. Like all trading card games players can collect and customize their deck to best fit their personalities. Cards come in four different types: power cards which are required to play any other card, weapon cards which act as players main form of offensive capabilities, operation cards that allow players to use special abilities, and component cards that become permanent (but destructible) parts of players ships and provide different enhancements. Unlike a normal card game however, players

will have an actual physical model of their ship on the table. This makes things like range, facing, and position very important in a system that never before even considered them.

The game (still to be named) is meant to be simple enough that two people can sit down and play through a few games whenever they happen to have some free time, but still complex enough to keep the game play rich and exciting after playing several games in a row. The game will be very easy to pick up if you already have some experience with card or table-top hobby games, and will mostly cater to such players. However it is still simple enough that completely new players won't have much trouble picking up the game.

The space I am using for Game Design and Architecture also happens to be the one I am designing for Studio. I found that many of the concepts covered in Game Design have been a great help when working in studio. The concepts of *oku* and *emergence* especially in this case. The project I am working on is a museum for a new collection of Viking artifacts recently found in Ireland. I wanted to create an experience that would draw people through the space rather than just setting them loose and letting them wander. This is where oku came in. People tend to let curiosity guide them, so I let the path peak their curiosity by allowing them to see, from a distance, what is to come later on. To facilitate this I based the entire building on a Celtic knot. Paths run over, under, and around one another and eventually converge around large exhibit areas.

The space also relates back to the game. In a card game players begin by drawing a set number of cards. They can begin to develop strategies based on these few options but for the most part have to rely on whatever they happen to draw to get them through the first few turns of the game. Each turn however brings a new card and new possibilities, thus by the time they have gotten halfway through the deck, they have a firm grasp on what they can do and what

strategies they are going to employ. My building has that same aspect. People begin on a single path and have no choice but to follow it. They can see other paths that go to other areas but have no idea how to get to them. Thus they are dependent on the path to get them through the first part of the building. About half way through however they have seen enough of the building know how everything works and so can begin to explore as they see fit. These emergent strategies are what make each experience unique.[101]

SECTION B.2 – ALEX DIMICHELE

My project is based on the idea of deception, like many of the party games my friends and I enjoy. My game is called *Bad Banker* and pits players in a card-based battle of wits. The objective of the game is to deceive your opponents and gain the most money. Players bluff based on information given on cards to gain more money for themselves or trick others out of their cash. For my spatial project, I decided to continue the idea of deception by allowing people to take one of three branching paths: two on the outside of the space that provide long but easy paths, and one in the center that provides a short, but more difficult path. To illustrate the concept of deception, each point along the chosen path offers small previews of an end area, showing what is ultimately desired, but preventing direct access through spatial denial concepts such as "zen views" and sequences of walls.[102]

SECTION B.3 – JOHN NOLAN

Game design is a great class that brought to my attention many spatial qualities and concepts that have helped me in other classes especially studio. There is a large quantity of psychology

[101] Kenderian, M. "Game Design and Architecture Class Project." Class project. The Catholic University of America, 2008.

[102] DiMichele, A. "Game Design and Architecture Class Project." Class project. The Catholic University of America, 2008.

involved in the class as well that helps me understand what the occupants of spaces are most likely feeling. I am designing a game space that is driven by the concept of prospect and refuge. This means that there are spaces in the open where the occupant feels unsafe and there are also spaces that are more closed and the occupant can hide in them and feel safe. This game space ties into my game design which is a sketching game that I am designing with Stephan Perez. The game consists of cards that are given to the players that have objects on them with different levels of difficulty. The players go out into a playing field and try to finish first or at least under the time limit. The better the sketches the more points the players make. Overall, I have learned a great deal about psychology and spatial concepts.[103]

SECTION B.4 – STEPHAN PEREZ

The course on game design and architecture was a real eye opener for my study of architecture. I discovered new concepts for architectural design and learned how to develop a game at the same time. What I found were new ways to see architecture and how to enhance design and how game design can help architectural design. Some of these methods included prospect and refuge, and designing by core mechanic or narrative.

From these basic methods I co-created a game utilizing prospect and refuge and a card game mechanic. We formalized it as a sketching game where one has to sketch building parts within a time limit. The game was enhanced with the trading ability of other players.

[103] Nolan, J. "Game Design and Architecture Class Project." Class project. The Catholic University of America, 2008.

As well, I was assigned to create an architectural space representing my game. I used the prospect and refuge methods in the design creation. This was contained with the core mechanic of mild interaction and scenes to sketch.[104]

[104] Perez, S. "Game Design and Architecture Class Project." Class project. The Catholic University of America, 2008.

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