Urban Stadia: Integrating Stadium Design with Mixed-Use Building Tactics to Rejuvenate an Urban Neighborhood

Final Research Report

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Figure 01 - View from potential MN United Stadium site

Table of Contents

List of Tables and Figures

Research Abstract

Sporting stadiums impact the socio-economic capabilities in all of the areas in which they exist. Some have a good impact, they are able to fully integrate into the urban environment and benefit the area through areas such as economics, walkability, transportation, etc. But there are many that do not accomplish this. They essentially become ginormous concrete structures that are surrounded by thousands of asphalt-laden parking spaces and they only end up serving the community on the days in which the sporting team plays, usually once or twice a week. What if the same tactics we are using to rejuvenate our downtown areas can serve a bigger part in getting one of the most expensive typologies in this world back on track? With this research report, I look to delve into just what type of impact a stadium will have on an urban environment, when combined with mixed-use building tactics.

User / Client Description

What is this research directed to?

Minnesota FC United Soccer Team and Their Future Soccer Stadium

Figure 02 - Minnesota FC United soccer team logo

Who else will use the stadium?

Retail Stores

Businesses (Office Spaces)

Minneapolis Farmers Market

Apartment Tenants

Restaurants / Bars

Coffee Shop

Theoretical Premise / Unifying Idea Research

A soccer stadium is needed to house the brand new Minnesota soccer team FC United. The new U.S. Bank stadium that is being constructed for the Vikings is not an effective stadium option for the team as it houses three times more than the team is looking to have for a capacity (approx.18,000). FC United wants a more intimate venue for both themselves and their growing fan base to enjoy. Stadium design has gone through a lot of stages of evolution, and I look to continue this process by developing a process on how to design a stadium with integrated mixed-use and a process with which to assess how the design works or is effective.

There are many texts that will help me with the developing of these processes, but two that will help most with the research involved for the following research journal. One will allow me to pull ideas from past stadium designs when designing a structure that incorporates both mixed-use and stadium design techniques. Another book will allow me to study different stadium designs while looking at some of the economic statistics of each design and what each one is used for.

One book titled Sports Architecture by Rod Sheard includes features many different stadium designs that are for many different sports and it also includes many of the facts about the capacity of each stadium, the location of each stadium as well as the cost of each stadium. There are also floor plans and sections in the book which will give me many clues into which spatial and circulation designs would be most appropriate for the mixed-use design that I am planning for the Minnesota FC United Soccer Team. Rod Sheard is one of the principals of Populous Architects who has done the majority of major sporting stadiums in the United States and around the world and the book includes many of the lessons that Rod and his staff learned with each of the projects which is a valuable resource for me as I try to define a revolutionary process to designing urban stadia.

Even when this book was published in the year 2000, Rod Sheard and his staff at Populous architects are at the leading edge of transforming stadium design in order to bring it into the next century. They understand that stadiums and their design are not only important to the

economic success of their own venue but that they can also be lightning rods of commercial and economic success to the areas of the city around it. In the book there is mention of economic studies that were conducted in Britain and America showing that for "every pound or dollar spent inside a stadium, between five and ten are spent outside, in the city itself". They also have drawn comparisons between the evolution of airports and what stadiums are trying to evolve into. The studies they have derived from airports show that "40 per cent of the total revenue generated at airports derives from merchandising- a figure which is increasingly being met by leading sports clubs and stadium operators." The reason why this research is so important to stadium development is the fact that people often spend the same amount of time in both types of buildings, usually 2-4 hours. This comparison shows that stadiums, if they want to evolve in how economical they can be, they will take a page from the airports playbook and design their buildings to include many more ways that people can be spending their money. That's why so many airports now look like shopping malls with airports attached to them, there is a large amount of time that a lot of people spend in those buildings and they are now designing them to take economic advantage of that fact.

There are also many other areas of stadium design that can be learned from Rod Sheard and his staff. There are chapters that are designed to teach how to design for the comfort of the fans by allowing appropriate dimensions to each spectators seat (between 475mm to 500mm wide) and depths of the tread that they sit on (between 760mm and 800mm deep). They also state some of the requirements they have in certain countries for how many spectator seats can be placed in a row before there needs to be an aisle. Sheard lists the range of 24-32 seats being the right range of seats per row, but he also states that some countries allow up to 40 seats to be placed in a row while the UK only allows up to 28. Rod and his staff also have an equation they use to see whether or not the viewing angle for all of the spectators in the stadium are adequate or not.

Another book that I will be using in my research is titled Developing Sports, Convention,

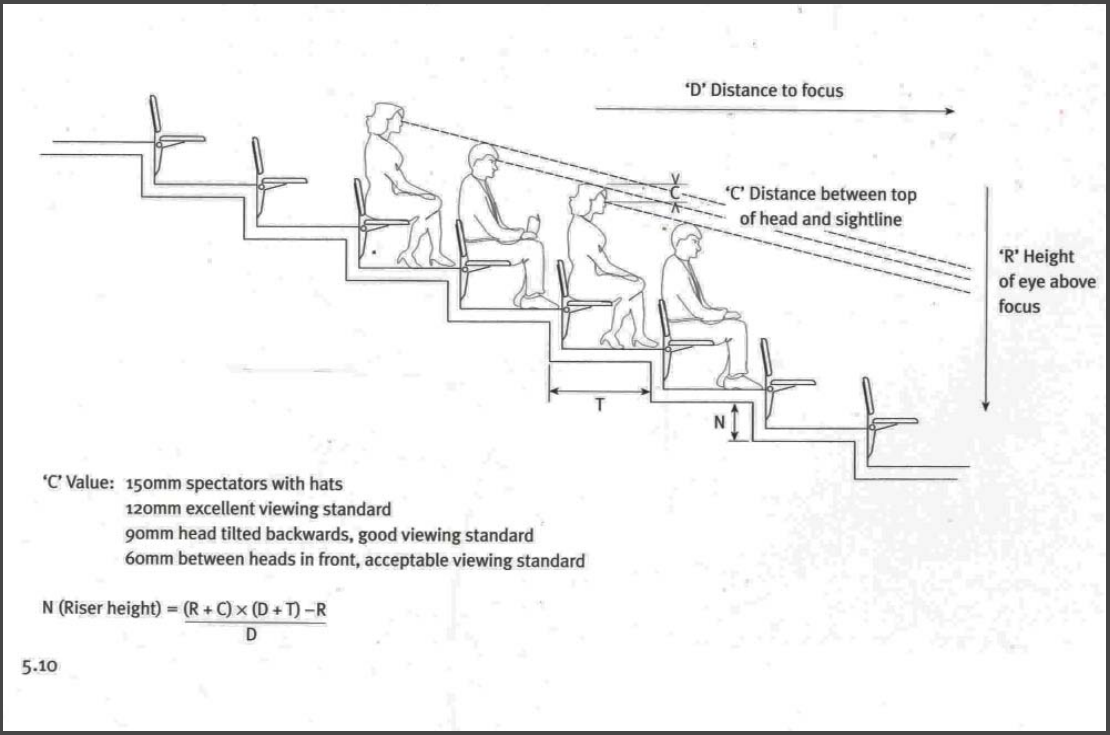

Figure 03 - Diagram with seating height and viewing calculations

and Performing Arts Centers by David C. Petersen. This book also looks at many different types of stadiums and designs, but instead focuses on the economic impact of the stadium designs and also looks at the differences that mixed-usage has on their integration into the city's activity. This book includes sections showing data from stadiums that include different sports and other things like entertainment venues and how that brings in a greater volume of both people and revenue for the city in which the stadium is located. The book also includes sections that help estimate future use or occupancy of stadiums which will be very useful to me as I try to develop a process with which to assess how the design works or is effective (one of my two secondary goals).

Unlike the previous book described, David's book focuses on the economics of stadi-

ums. This shows in many different studies shown throughout the book. The book reiterates what I state in other areas of this program that stadium design has gotten away from the design of multi-sport stadiums. They list the same reason as I have, when one large space tries to accommodate space for different sports that require such different seating arrangements for all, instead of making many different great ways to enjoy sports in one building, you are creating many different sub-par ways to enjoy sports in one building.

There is also many other economic lessons to be gleaned from David's book such as the prices of construction cost of convention/sports centers which at the time of the publication of this book (2001) was "$250 to $400 per square foot." This will have to be synthesized with current cost data, but it will still be effective in allowing me to understand whether or not the cost calculations done for the mixed-use soccer design are accurate. Extra means of revenue are also discussed within the book which include the designing and offering of premium seating options and permanent seat licenses which are also discussed later in this program. These options can be costlier to include in the design of the stadium, but with individual seat licenses now worth in the $1000s of dollars, this can be a very effective way to offset the economic cost of building a stadium that costs hundreds of millions of dollars.

Stadium design has been around for centuries and there has been many developments over the years. I am looking to create processes that designers can use to help them fully integrate their stadium designs into the urban neighborhoods that surround them. These resources will collectively help me further understand the different impacts a stadium can have and how to estimate a stadium's role in a city's socio-economic capabilities. Stadium design is a typology where it is essential that you design through looking at floor plans *and* sections. This is due to many factors, but one main one is that stadium seating takes up a large portion of the area of a stadium's space and it is placed at an angle, creating underneath spaces that need to be utilized in order for the stadium to be efficient. Using the mathematical formulas that I have found in the previous texts will help me in designing a stadium that features a cohesion between stadium seating space, circulation space, and mixed-usage areas.

Research Justification

According to Plunkett Research, the sporting industry in the United States is worth $498.4 million and throughout the world it is worth $1.5 trillion. The industry has been around for decades and sports have become part of many country's identities. Instead of trying to take down the industry and prevent spending on the sporting stadiums, I think we should study how to design stadiums so that they fit in with the cities around them and perform several functions. If we can learn to design stadiums to have a mixed-use element with them like office or retail spaces for example, the stadium is able to more easily recover the cost of the its construction and it is also able to save the city money that would've been spent constructing the spaces that are now a part of the stadium.

Plunkett Research states that the MLS (Major League Soccer) industry is worth $600 million in the U.S., showing that although it may not be the most popular sport in the country, its fan base is steadily growing. The Minnesota United soccer team is an expansion team of the MLS looking to create a home for themselves in the Twin Cities area of Minnesota. A large stadium for the Minnesota Vikings is being constructed, but the MN United team is looking to play in a stadium that has a seating capacity that is about one-third the size of the Vikings stadium to create a more intimate venue for their fans.

Stadium design has become more advanced over the years, becoming more tech-savvy and environmentally friendly. Stadium designs still leave much to be desired when it comes to truly fitting into an urban streetscape and feeling like a building that you could as easily walk into off the sidewalk and enjoy a cup of coffee as you could watch a sporting event in. With this thesis project, my goal is to create a process that allows stadium designers to more fully integrate their stadium ideas into the surrounding cities while designing a state-of-the-art mixed usage soccer stadium for the MN United team in Minneapolis, MN.

I believe that although the amount spent on stadiums on a world scale is staggering, we can create a process for designers to make their stadium designs work more for the city around them and also look more like the city around them. If this process can effectively change the way

we design our stadiums, then a huge impact will have been made on one of the largest and most expensive typologies exisiting. Stadiums will become urban nodes of activity and not just on the days that a sporting event is taking place, it will be one everyday, just like the rest of the city.

Figure 04 - Proposed Detroit Events Center featuring fully integrated mixed-use spaces

Historical,Social and Cultural Context of Sporting Stadiums

Historically, sporting events have drawn the attention of millions. Sports are something that can rally a whole city together for one cause. They are so engrained into the fabric of our world's culture. The first stadium ever designed was in the 8th century BC in Greece and there have been 1,000s of stadium designed and built since then. Some have taken steps back in stadium design and some have introduced elements that change the typology forever. Many have been successful from a safety standpoint, but some have failed in that regard. When a stadium design truly works, it can be a symbol of pride for the city and country/state for which it is in. When a design goes wrong, the result can be catastrophic because of how many lives occupy the space of a stadiums. Stadiums can have the power to drastically change its surroundings in good ways and bad. Stadiums and their designers are starting to evolve with the world around them. There are now many stadiums with retractable roof systems, mixed-use spaces, green roofs and other state-of-the-art technology featuring video screens that are thousands of square feet large. Some stadiums have been able to integrate into their environments, but stadiums still have yet to fully fit into the urban streetscape around it and blend in. Buildings that are thousands of square feet large are hard to blend into the environment around them, and it may take many advances in the typology in order to accomplish this, but I believe it can be done.

There are currently just over 60 stadiums being constructed at this moment with many of them costing millions of dollars. There has been much controversy over the massive amount of money that is put into stadiums and where is comes from. There has also been controversy about the construction techniques of stadiums in countries like Qatar and Brazil where many workers are migrants who come to those countries looking for work and get treated and paid very poorly and many die due to the grueling conditions they are put under. There are many reasons why people are against the building of stadiums, about as many as there are for their building. My argument is this, as long as stadiums are going to continue being built at the rate they are today and there is little we can do to slow them down, then why don't we work to reform the way that they are built? Let's work to make sporting stadiums work for our cities once again.

Let's create a methodology for designers that helps them create spaces that aren't large empty reminders of mis-spent money or mis-managed construction, let's take what we have learned from stadiums in the past, combine it with what we have learned about them in the modern era and form a new era of stadium design where large stadiums are large for a reason. Let us make that reason be that they are constantly brimming with activity due to successful integration of the stadium into the urban landscape of our cities. Let us make sure that all future stadiums are accomplishing this through successful integration of mixed-use spaces in the stadium to bring constant traffic throughout the building. Effective integration of multiple modes of transportation with a stadium can help. Site placement can also be a big difference in whether a stadium is economically viable because stadiums can have as much mixed-usage incorporated into its design as the client wants, but if the stadium is placed in an area where there is no foot traffic, then those business' might not make any financial impact for the stadium whatsoever. There are many other factors that go into designing a stadium that has a beneficial impact on the neighborhood or city around it. In order to study all of these factors more closely and see whether different design choices worked or didn't work for the financial feasibility of different stadiums, we need to delve deeper into the history of stadiums and how they evolved into mixed-use stadiums and what things along that creative path worked or didn't.

In the 70's and 80's in America there was a large number of stadiums built in the cookie-cutter style. These were coliseum-type stadiums that weren't designed for any sport in specific, they instead were designed in a mostly circular shape in order to house many different configurations of seating. Some examples of this type of stadium was the Coliseum in Oakland, Candlestick Park in San Francisco and the Metrodome that was located in the same city as the one my MN United design iteration is meant for. All of these coliseum-type stadiums were able to house many different sports because of their simple shape, but because of this design there was much lacking from the spectators experience in whichever arrangement the stadium was in at the time. Instead of these stadiums being purely designed for one sport with one config-

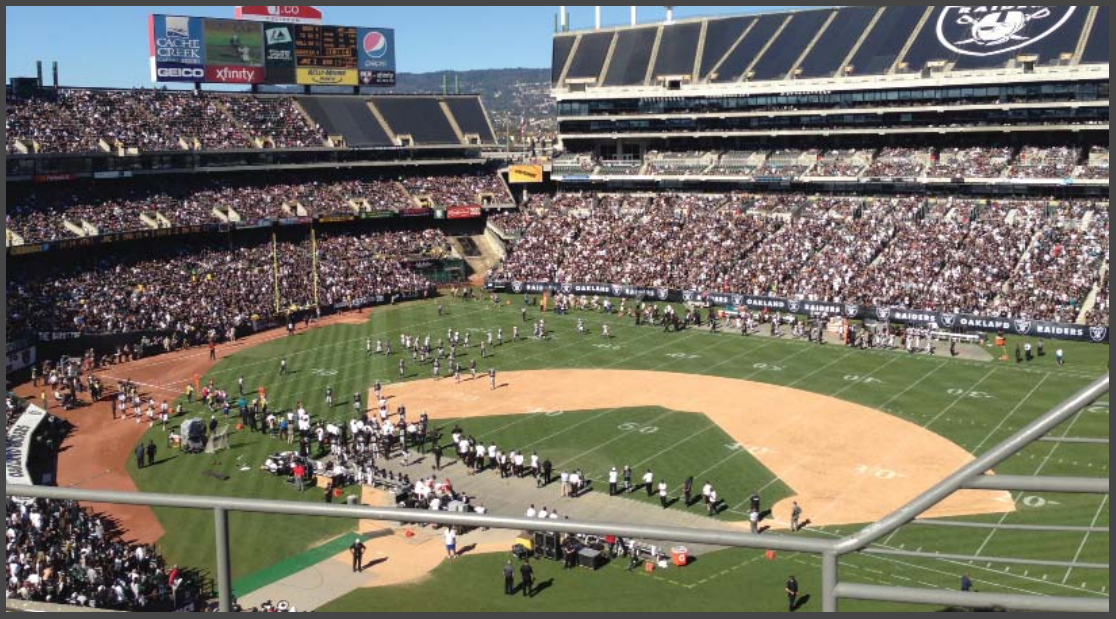

Figure 05 - Oakland Coliseum during a Raiders football game

uration, they made the necessary concessions to house all of the sporting field configurations turning a possibly great experience into more sub-par experiences. Over time, all of these cookie-cutter style stadiums started to wear down with age and stadium styles started changing. In the years of the late 90's and early 2000's stadium design in America started to transform into more sport-specific stadiums and some even started to integrate more mixed-usage into their buildings. A good example of this is Ford Field, an NFL football stadium that was built in 2002. This 1.5 million square foot stadium was built in the warehouse district in Detroit. It was the first NFL stadium to integrate mixed-use commercial development that leverages the stadium structure for year-round use. This stadium was a critical piece in rejuvenating downtown Detroit. From 2002 to 2015 more stadiums have been built and some integrated the mixed-use tactics of Ford Field into their plans and some didn't, but one thing was becoming clear, with more and more stadiums being designed for a single sporting use like they were in first half of the century,

more stadiums needed to be built to house all of the sporting teams. With more stadiums needing to be built, that meant cities and states with sporting teams in need of stadiums had to spend that much more money. Even in the late 90s and early 2000s little had still been proven that stadiums could be economically-viable ventures for the cities that they are in. This is where the location of the stadiums and inclusion of mixed-use can be so important for stadiums. If there is going to be more and more money spent on stadiums in the future, then we need to find a way to design these coliseums smarter so that they can give back to the city that is supporting them financially.

Figure 06 - Old Picture of Manchester United fans

Figure 07 - Century Link Field, home to the Seattle Seahawks NFL team and the Sounders MLS team

Socially, sports are also a juggernaut. The most popular sport in the world is soccer with approximately 3.5 billion estimated fans and even though it is not the most popular in America, it is growing in popularity every year. With this project I am looking to design a stadium that if built would cause as much positive change in the popularity of soccer in Minneapolis, MN as the design would cause for the stadia typology. The millennial generation are now adults and the social preferences of that generation is changing the world. Many of us prefer living in urban areas with lots of mixed-usage buildings. Those areas best fit our style of living, they are high energy and are connected to so many different outlets of entertainment. Stadiums are a part of those urban environments that the millenials are populating and they need to adapt to the changes that they are bringing with them. One of the biggest ways that stadiums can integrate into the urban neighborhoods around them is to study the social trends of the people in that neighborhood. In Minneapolis there is a growing number of millenials as mentioned before. If that is the group of people that will be buying tickets to see soccer games and concerts in a new stadium that is being designed, then the smartest thing to do economically-speaking is to design it around their lifestyle. Ford Field, the football stadium for the Detroit Lions football team features a team store, a nightclub/restaurant, 200-room hotel, office spaces and various retail areas. This is the level of mixed-use that needs to start being adapted into all new stadiums that hope to successfully inte-

Figure 08 - Entry elevation of Ford Field in Detroit, home of the NFL team the Detroit Lions

grate into their urban landscapes. Before the inclusion of mixed-usage to pull in people off the street and into the stadium, the stadium also needs to be placed in an urban location that is in close vicinity to a large number of people and walkable areas. The more walkable the area surrounding a stadium, the more foot traffic that stadium is going to get inside it. Kauffman stadium (MLB) and the Chiefs stadium (NFL) are both very beautiful stadiums for their respective sports, but they provide little extra earning possibilities for the city of Kansas City because they are only designed to house sporting events. And even if they were designed with mixed-usage, it wouldn't matter because both stadiums are placed in the middle of nothing in the city, they are very far away from the urban areas of the city and are surrounded by 19,000 parking spaces.

The next generation of sporting event attenders want to see the design of sporting stadi-

ums fit their lifestyle in the form of mixed-uses and cities want to see the mixed-usage revenue to help offset the costs that building a stadium incurs. Unfortunately, getting a mixed-use stadi um approved is hard when there are more potential owners of the stadium involved, and that can become true with mixed-usage. Trying to balance the legislation, the public and private funding, and the sporting associations when trying to get a stadium built for a single tenant is hard enough, but with mixed-use there are many more tenants and much more to juggle on the political side of getting a stadium approved. There are many stadiums in the present day that are including mixed-uses within their stadium or are spurring it on in the form of development outside the stadium walls. The new San Francisco 49ers stadium, the new Vikings stadium in Minneapolis, MN and the planned Braves baseball stadium all have plans for mixed-use residential (hotels and apartments) and retail developments (shopping centers) nearby the stadiums. This is showing that even if mixed-use isn't built within the stadium, a stadium that is expertly placed in the middle of a bustling urban area will have mixed-use developments follow. With thoughtful design, no longer do stadiums have to be located on the coasts with storied franchises to be financially successful like in the past.

Culturally, soccer has always had great influence. It is the one sport that the whole world plays. Every four years the World Cup is held and teams from all around the world compete to win the honor of being called the best soccer team in the world for the following four years. Wherever the World Cup has been held, it has always been a way for that country to show itself off to the rest of the world including the people, the architecture, the food, etc. The best stadiums around the world are able to represent the country and culture around them through their designs. With this soccer stadium design for the MN United team, I am looking to represent the city of Minneapolis and the state of Minnesota around it. The fact that the building of a soccer-specific stadium for Minnesota is even in the works is a product of cultural change in the state of Minnesota and the country of the United States. Since the modern era of American football started in 1932, that sport has steadily grown into the most popular sport in the United States by a wide

margin. Soccer was widely regarded as the least popular of the main sports in America, but that has been changing over the last 15 years or so. Even before the latest World Cup in which team U.S.A.'s participation garnered much greater soccer viewership, there has been a surge in television ratings for the games played in the Premier League with ratings nearly doubling from 2012 to 2013. Not only that but MLS teams have been noticing a greater success at the local level as well, with attendance increasing consistently over the past 14 years despite the great increase in MLS teams. Total attendance topped 6 million in the 2013 and 2014 seasons, with the 2015 season bringing in a total attendance of just over 7.3 million. Whether it is due to there being a wider cultural range of people now living in the U.S. and bringing their love of soccer with, the greatly increasing knowledge of the danger present in the popular sport of American football, the increased televising of soccer in the U.S., or the possibility of the millennial generation liking soccer more than the past generations, overall attendance and viewership of soccer is rising and the growing amount of soccer stadiums being built in the United States is showing that.

The progression of mixed-usage in stadium design and the growing popularity of soccer in the United States (12 soccer-specific stadiums have been built in the past 12 years), this is the perfect time to be capitalizing and designing a mixed-use stadium for an excellent fanbase in the Twin Cities of Minnesota. Combining the lessons learned about stadium history, the social changes that the millennial generation has brought and the ever growing culture of soccer in the United States, the MN United stadium will be designed for the team, for the fans, for the city.

Urban Stadia: Integrating Stadium Design with Mixed-Use Building Tactics to Rejuvenate an Urban Neighborhood

Introduction and Background

Principal Investigator - Mitch Borgen

Theory - Sporting Stadiums can combine the multi-use aspect of mixed-use typologies to create a stadium design that blends in with the urban neighborhood around while also creating a space that can be used for multiple functions instead of just sporting events, making it more economical for the city and more active and exciting for its citizens.

Potential Impact - To give all sports stadium designers a process by which they can fully integrate their stadium designs with mixed-use building techniques and then define a process by which they can determine whether the design will be effective in increasing the socio-economic capabilities of the neighborhood containing the mixed-use stadium.

Main Question - How can mixed-use building techniques combine with stadium design to have a positive socio-economic impact on a neglected urban neighborhood?

Secondary Questions -

1. How to design a stadium with integrated mixed-use.
2. How to define a process to assess how the design works or is effective.

Motivation - As a designer and a sports fan, sports stadium design has always been a passion of mine. I want to develop a process that helps other sporting stadium designers fully integrate their stadium designs in with the urban landscape around them by combining them with mixed-use design techniques.

Methodology

Through the initial spatial planning models of the stadium, I started to realize one of the most prevalent ways that spatial planning can impact the economic activity of a stadium is through the simple allocation of square footages. The more square footage that the stadium seating arrangements take up, the less space there will be for the mixed-use areas to be able to use to generate their revenue. Now the direct impact that the stadium square footage is having on the mixed-usage square footage is particular to some constants that have been determined by me, the researcher. One constant is the overall footprint size of the building, I wanted to keep this the same throughout all of my iterations in order to more effectively study the impact that the size of the sporting or mixed-use spaces will have on the other. Keeping the iteration's footprints the same will allow the price of the building to remain closer to constant so this study can more clearly focus on the underlying concern of the economic impact of the spatial allowance and organization of mixed-use and stadium areas. The stadium's circulation space will be kept the same for each iteration because the stadium seating capacity of each iteration is staying the same. This decision will only further specify the results gathered from this report as being due to the spatial planning of the mixed-use and stadium seating spaces. The stadium seating capacity was kept the same so that any differences in economic activity that each iteration causes will truly be able to be tied back to the spatial planning and allocation and not just changed by the number of ticket buyers that are allowed to watch each game when the stadium is at full capacity. As you can see through the new methodology below, the main purpose of this research has transformed into its most simple form by merely studying the impact that the spatial planning of the two most important typologies in this research (sporting and mixed-use) have on each other and how that impact effects the stadium's ability to economically rejuventate the area around it.

Methodology Cont.

1. Create space planning alternatives for the soccer stadium using Sketchup including measurements of the following areas:
    a. Total Sq. Ft.
        i. Sq. Ft. of Stadium Area
        ii. Sq. Ft. of Mixed-Use Area
2. Measure the economic impacts of each space planning alternative
    a. Determine how much the sq.ft. of the mixed-use area will cost to construct (using RS Means) and compare that to how much revenue the mixed-use space of each design iteration will generate by determining the revenue generated by each of the following mixed-use spaces. Percentages that each mixed-use space will take of the overall mixed-use area allowance is as follows:
        - Retail Stores (Clothing and Organic Food) - 8.3% ^
        - Coffee Shop – 3.5% ^
        - Restaurants/Bars - 21.7% ^
        - Business/Office Space – 24.5% ^
        - Apartments – 42% ^
            *Using RS Means
            ^ Percentages of each mixed-use space are calculated from the spatial requirement of each space divided by the total square footage of the mixed-use typology; this is described in the Thesis Program Draft
    b. Determine how much the sq. ft. of the stadium area will cost and compare that to how much revenue will be brought into the stadium through those seats
        * Using RS Means

Methodology Cont.

c. Determine the net gain of the two different typologies (sports area and mixed-use) and which iteration contains the spatial planning that maximizes the economic gain of the stadium

*Using RS Means

3. Determine which, if any, of the stadium design iterations most exemplify a stadium that is designed with both spatial planning and economic impacts in mind

These numbers were kept the same in all of the iterations in order to keep consistency of the factors that are besides those being studied:

Soccer Field- 225 ft. x 345 ft.
Entire Stadium Footprint- 615 ft. x 695 ft.
Stadium Seating Capacity- 18,236
Square Footage of Circulation Space- 150,000 sq. ft. (gathered from research done for thesis program)
Total Square Footage of Stadium Seating and Mixed-Usage Areas- 427,425 sq. ft. (area of entire stadium footprint, used as arbitrary constant for this study)

Research Results

Iteration #1

Total Sq. Ft. of Stadium Seating Area- 154,013 sq. ft.
Total Sq. Ft. of Mixed-Use Area- 123,412 sq. ft. (Total Square Footage of Stadium Seating and Mixed-Usage Area and Circulation Area- Square Footage of Circulation Space-Total Square Footage of Stadium Seating)
- Retail Stores (Clothing and Organic Food)- 10,243 sq. ft. at $171.94/sq. ft. = $1,761,152.91
- Coffee Shop- 4,319 sq. ft. at $232.28/sq. ft. = $1,003,236.96
- Restaurants/Bars- 26,780 sq. ft. at $191.23/sq. ft. = $5,121,052.26
- Business Office Space- 30,236 sq. ft. at $177.65/sq. ft. = $5,371,491.85
- Apartments- 51,834 sq. ft. at $178.14/sq. ft. = $9,233,659.68

Cost of Stadium Seating Area- 154,013 sq. ft. at $145.92/sq. ft. = $22,473,882.00
Profit of Stadium Seating Area- $14,328,754.64 per year
Cost of Mixed-Use Area- $22,490,593.66 ($182.24/sq. ft.)
Profit of Mixed-Use Area- $9,084,208.80 per year
- Retail Stores (Clothing and Organic Food)- $30.60 per square foot (rent) = $313,435.80/year
- Coffee Shop- $30.60 per square foot (rent) = $132,161.40/year
- Restaurants/Bars- $30.60 per square foot (rent) = $819,468/year
- Business Office Space- $30.60 per square foot (rent) = $925,221.60/year
- Apartments- 51,834 sq. ft. x $133 per square foot (rent) = $6,893,922/year

Cost of Both Stadium Seating Area and Mixed-Use Area- $44,964,475.66
Yearly Profit of Both Stadium Seating Area and Mixed-Use Area- $23,412,963.44

Research Results Cont.

Iteration #1

Figure 09 - Top view of stadium iteration #1

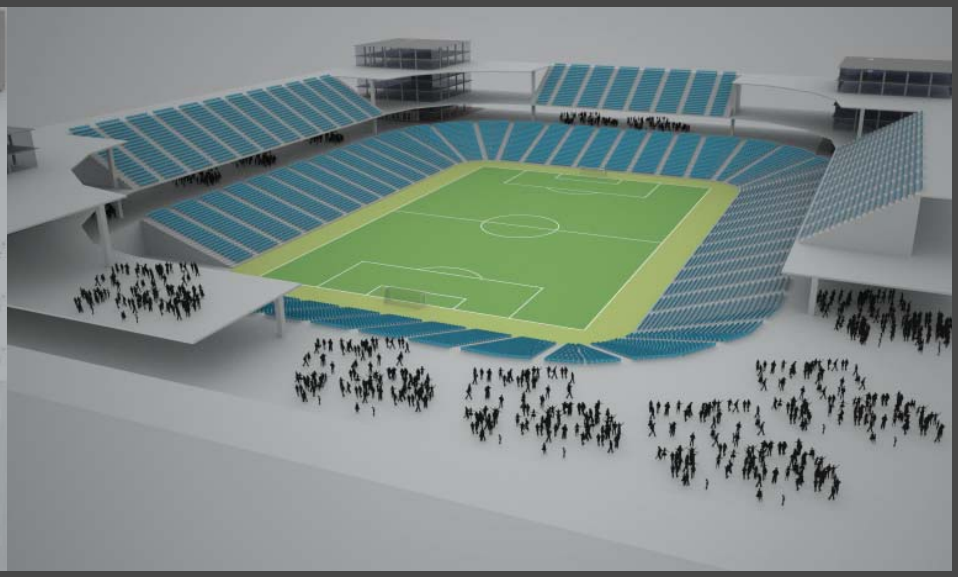

Figure 10 - Perspective of stadium iteration #1

Research Results Cont.

Iteration #2

Total Sq. Ft. of Stadium Seating Area- 155,946 sq. ft.
Total Sq. Ft. of Mixed-Use Area- 121,479 sq. ft. (Total Square Footage of Stadium Seating and Mixed-Usage Area and Circulation Area- Square Footage of Circulation Space-Total Square Footage of Stadium Seating)
- Retail Stores (Clothing and Organic Food)- 10,083 sq. ft. at $173.02/sq. ft. = $1,744,533.88
- Coffee Shop- 4,252 sq. ft. at $234.31/sq. ft. = $996,277.47
- Restaurants/Bars- 26,361 sq. ft. at $191.40/sq. ft. = $5,045,492.15
- Business Office Space- 29,762 sq. ft. at $178.25/sq. ft. = $5,305,206.88
- Apartments- 51,021 sq. ft. at $178.53/sq. ft. = $9,108,651.22

Cost of Stadium Seating Area- 155,946 sq. ft. at $145.80/sq. ft. = $22,736,707.41
Profit of Stadium Seating Area- $14,328,754.64 per year
Cost of Mixed-Use Area- $22,200,161.60 ($182.75/sq. ft.)
Profit of Mixed-Use Area- $8,941,807.80 per year
- Retail Stores (Clothing and Organic Food)- $30.60 per square foot (rent) = $308,539.80/year
- Coffee Shop- $30.60 per square foot (rent) = $130,111.20/year
- Restaurants/Bars- $30.60 per square foot (rent) = $806,646.60/year
- Business Office Space- $30.60 per square foot (rent) = $910,717.20/year
- Apartments- 51,021 sq. ft. x $133 per square foot = $6,785,793/year

Cost of Both Stadium Seating Area and Mixed-Use Area- $44,936,869.01
Yearly Profit of Both Stadium Seating Area and Mixed-Use Area- $23,270,562.44

Iteration #2

Figure 11 - Top view of stadium iteration #2

Figure 12 - Perspective of stadium iteration #2

Research Results Cont.

Iteration #3

Total Sq. Ft. of Stadium Seating Area- 175,410 sq. ft.
Total Sq. Ft. of Mixed-Use Area- 102,015 sq. ft. (Total Square Footage of Stadium Seating and Mixed-Usage Area and Circulation Area- Square Footage of Circulation Space-Total Square Footage of Stadium Seating)
- Retail Stores (Clothing and Organic Food)- 8,467 sq. ft. at $181.16/sq. ft. = $1,533,902.78
- Coffee Shop- 3,571 sq. ft. at $227.24/ sq. ft. = $811,464.89
- Restaurants/Bars- 22,137 sq. ft. at $191.36/sq. ft. = $4,236,047.45
- Business Office Space- 24,994 sq. ft. at $185.58/sq. ft. = $4,638,440.92
- Apartments- 42,846 sq. ft. at $183.25/sq. ft. = $7,851,640.34

Cost of Stadium Seating Area- 175,410 sq. ft. at $144.71/sq. ft. = $25,383,221.92
Profit of Stadium Seating Area- $14,328,754.64 per year
Cost of Mixed-Use Area- $19,071,496.38 (or $186.95/sq. ft.)
Profit of Mixed-Use Area- $7,509,089.40 per year
- Retail Stores (Clothing and Organic Food)- $30.60 per square foot (rent) = $259,090.20/year
- Coffee Shop- $30.60 per square foot (rent) = $109,272.60/year
- Restaurants/Bars- $30.60 per square foot (rent) = $677,392.20/year
- Business Office Space- $30.60 per square foot (rent) = $764,816.40/year
- Apartments- 42,846 sq. ft. x $133 per square foot = $5,698,518/year

Cost of Both Stadium Seating Area and Mixed-Use Area- $44,454,718.30
Yearly Profit of Both Stadium Seating Area and Mixed-Use Area- $21,837,844.04

Iteration #3

Figure 13 - Top view of stadium iteration #3

Figure 14 - Perspective of stadium iteration #3

Research Results Cont.

Constants

RS Means Constants

In order to keep the integrity of the study, there were multiple constants that I kept when studying the construction costs of the different typologies present in this study. Here is a list of the constants that I kept for each typology:

Stadium seating area

- Material: Concrete block/steel frame
- Stories: 2
- Story Height: 20 ft.

Apartments

- Material: Face brick w/concrete block/steel joists
- Stories: 3
- Story Height: 10 ft.

Offices

- Material: Face brick w/concrete block/steel joists
- Stories: 2
- Story Height: 12 ft.

Restaurant

- Material: Face brick w/concrete block/steel joists
- Stories: 1
- Story Height: 15 ft.

Research Results Cont.

Retail Stores (Clothing and Organic Food)

Material: Face brick w/concrete block/steel joists

Stories: 1

Story Height: 15 ft.

Coffee

Material: Face brick w/concrete block/steel joists

Stories: 1

Story Height: 15 ft.

Contractor Fees: 25%

Architectural Fees: 7%

Location: Minneapolis, MN

Other Pricing Constants-

Average Retail Rent in Minneapolis, MN: $30.60/sq. ft.

Average Apartment Rent in Minneapolis, MN: $133/sq. ft.

Average American MLS Ticket Price ($46.22) x Total Number of Home Games in MLS Season (17) x Maximum Stadium Seating Capacity (18,236): $14,328,754.64 (Maximum Stadium Seating Profit/Year)

Research Results Cont.

Results

Iteration #1

Square Footage of the Stadium Seating Area- 154,013 sq. ft.

Square Footage of the Mixed-Use Area- 123,412 sq. ft.

Cost of Both the Stadium Seating Area and Mixed-Use Area- $44,964,475.66 ($162.08/sq. ft.)

Profit of Both the Stadium Seating Area and Mixed-Use Area- $23,412,963.44/year ($84.39/sq. ft.)

Iteration #2

Square Footage of the Stadium Seating Area- 155,946 sq. ft.

Square Footage of the Mixed-Use Area- 121,479 sq. ft.

Cost of Both the Stadium Seating Area and Mixed-Use Area- $44,936,869.01 ($161.98/sq. ft.)

Profit of Both the Stadium Seating Area and Mixed-Use Area- $23,270,562.44/year ($83.88/sq. ft.)

Iteration #3

Square Footage of the Stadium Seating Area- 175,410 sq. ft.

Square Footage of the Mixed-Use Area- 102,015 sq. ft.

Cost of Both the Stadium Seating Area and Mixed-Use Area- $44,454,718.30 ($160.24/sq. ft.)

Profit of Both the Stadium Seating Area and Mixed-Use Area- $21,837,844.04/year ($78.72/sq. ft.)

Conclusions and Projections

Conclusion

Iteration #1 and #2 have 25 rows of seats on the main concourse. These iterations that have more rows of seating on the main concourse take up less square footage for the same amount of seats as iteration 3, which has only 20 rows in its main concourse. This allows for both iteration #1 and #2 to have more space for the mixed-usage typology. My theory was that the stadium designs that allow for more mixed-use square footage will generate more revenue through that typology and will be the better stadium design choices, economically speaking. The results of this study confirm my theory as both iteration 1 and 2, the iterations with more space for mixed-use areas, averaged about $1.5 million more dollars in profit per year than iteration #3 according to the above calculations. The total square footages were kept the same for all of the stadium iterations so the main thing that was changing between each iteration was the percentage of the overall stadium square footage that the mixed-use and stadium seating areas took up. We can see that in iteration #1 and #2 when the mixed-use area made up just over 120,000 sq. ft. the combined cost of both the mixed-use and seating spaces was more than $500,000 greater than in iteration #3. When studying the net profit however, the case for iteration #1 and #2 can be made over #3. The net profit combines both the cost of the stadium seating and mixed-use areas and combines them with the profits they are able to garner. With iteration #1 and #2 both costing around $500,000 more than iteration #3 but able to make much more profit ($1.5 million/year), the spatial planning present in iteration #1 and #2 are clearly more cost-effective than in #3. Now to study the economic difference between #1 and #2. The spatial planning found in iteration #1 is a little under $30,000 more costly than in iteration #2, but in iteration #1 yearly profits are over $140,000 more/year than in iteration #2. This makes iteration #1 the most economical spatial planning out of all three that were studied.

Conclusions and Projections Cont.

Spatial planning is an essential part of designing a successful stadium that integrates mixed-use and there are a lot of items to consider when picking out the best plan, but the relationship between seating arrangement and mixed-use spaces in a stadium and how much square footage they take up of the total stadium square footage clearly makes a difference as shown through this study. We have determined that the most economical spatial plan was found in iteration #1 that features a rectangular seating arrangement, curved seating at the corners of the soccer field, 25 seat-rows on the first level and 20-seat rows on the second level of seating. With this study, step #1 of the design methodology has mostly been completed which was stated as : create space planning alternatives for the soccer stadium using *Sketchup.*

That being said there are still other factors that will need to go into the study of this spatial planning iteration to get it ready to use in the MN United stadium design, including the planning of club and other luxury seat options that are more and more becoming a great means of revenue for the stadium and its owners. The planning of parking around the different stadium iterations will also cause an economic affect as will the planning of different modes of transportation. There were also details in the seating arrangments in the stadium iterations that can also be adjusted in future research such as the number of chairs that are present in each row of seating. Looking at previous research, this number can be higher than some of the numbers present in the designs. This could help the seating area of the MN United stadium not take up as much space and therefore cost less. This research though is an essential start to designing an effective *Urban Stadia* for the MN United soccer club.

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Appendix : Personal Identification

Mitchell Clark Borgen

"My experience at NDSU has made it possible for me to achieve my dreams someday and design sporting stadiums. I used to draw plans for sporting fields on church service programs with no hope of making those designs come to life, and that has all changed."