Using a Systems Approach to Improve the Customer Experience for UVA Football Game Spectators
(Technical Paper)

The Effect of Online Tools on Residential Real Estate
(STS Paper)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Technical Introduction

According to the previous University of Virginia football team head coach, Bronco Mendenhall, football game attendance is "conditional on opponent, maybe more than we would want it to be" (Storch, 2021). The lack of attendance at UVA football games creates numerous issues for UVA at large. Athletics programs rely on football ticket sales to fund their success, athletes rely on fans to fuel their performance and gain a competitive edge, spectators rely on fellow fans to create an energetic atmosphere, and UVA relies on its football audience to gain new recruits both on the field and in the classroom. The technical report will look to improve the experience for UVA football game spectators and subsequently address the lacking attendance issue at games.

STS Introduction

Making up about 17% of the United States' GDP, real estate is a major influencer of the U.S. economy. While the average home sale can generate approximately double the average American salary on strong years (Evangelou, 2022), housing market fluctuations during underperforming years can cause massive repercussions to the U.S. economy and its citizens. As the homebuying process changes with the increasing use of online tools, I question how new market dynamics can influence a crucial part of the economy. Even though Zillow's Zestimates are representative of a black box by converting varying housing data to home values, the estimating feature is still relied upon by many consumers to gauge market performance. The resulting effects and corresponding futures of such tools will be investigated in the STS report which is unrelated to the technical report.

Technical Topic: Improving the Experience for UVA Football Spectators

College football players often rely on the energy of the crowd to perform. On defense, an energetic crowd can disrupt the thought process and play calling of the opposing offense. On offense, a spirited crowd can uplift players to perform at their upmost potential and rally a team towards victory. In addition, college football programs rely on event-related revenue to fund their program's success; for example, the UVA gained almost $6,000,000 in revenue from football ticket sales in the 2018-2019 season. Although ticket revenues account for about 18% of all football related operating revenues, another significant portion of revenues come from alumni contributions (Mavredes, 2019). UVA often relies on surpluses from football to fund other athletic programs which routinely run deficits. For the aforementioned reasons, college athletic programs at schools like UVA are reliant on fan participation and engagement for both on the field success and financial stability. Therefore, a lack of attendance can create significant problems for these schools. The goal of the technical project is to improve the spectator experience at UVA football games by providing recommendations to improve the current system and boost attendance.

Improving the UVA football game day experience is holistic, and all aspects of the experience must be considered. Starting with stadium entry, the team will look to improve the efficiency of traffic flows for vehicles and the gate admission process for pedestrians. Ingress and egress data from Google Maps and ticket scans will be analyzed to identify possible areas of traffic flow improvement alongside help from the UVA police department. Once spectators arrive, the team will evaluate the in-game experience with concessions and entertainment. Concession stand placements will be optimized and in-game engagements will be proposed alongside help from the UVA athletics department. The team will also conduct a survey to gauge the current spectator experience. Hungenberg and Mayer (2019) conducted a similar survey at

another public Division I institution which found that the in-game atmosphere had the greatest impact on event perception which adds relevance to the team's project. Another study by Simmons and others (2018) investigated constraints to students attending football games which found that attendance limiters varied by individual fan passion levels for football. The team will implement similar surveys at UVA to compare findings and identify solutions catered to the students' image of a positive gameday experience while alleviating barriers to attendance. At the conclusion of the project, the team will provide multiple deliverables designed to improve the spectator experience at UVA football games and thus improve UVA football for years to come.

STS Topic: The Effect of Online Tools on Residential Real Estate

Purchasing a home is often one of the biggest financial decisions that someone makes during their lifetime. Before the rise of the internet, home buyers and sellers solely trusted their real estate agents to guide them through the purchasing process. A buyer's agent would listen to their client's preferences, handpick select home candidates, and negotiate with listing agents to finalize prices; however, the once simple process has changed as the internet brought a wealth of information to the hands of prospective buyers and sellers. According to a survey conducted by the National Association of Realtors Research Group (Christopherson, 2021), 51% of recent homebuyers found their new home from the internet and only 28% accredited their finding to a real estate agent. Zillow, the most popular online real estate tool, enables people to view estimated prices of nearly all homes both on and off the market in the U.S. through Zestimates. These often inaccurate home estimates and accompanying data can leave many consumers overwhelmed with an abundance of misinformation. As seen by the burst of the housing bubble and subsequent recession of 2008, the value of residential real estate has a profound impact on the overall U.S. economy, and misinformed purchases have indirect effects far beyond the

immediate buyer and seller. The STS paper will investigate how online real estate tools like Zillow have transformed the homebuying process and ponder what role these tools should play in the future.

Since the emergence of Zillow, the legitimacy of the Zestimate has been questioned. In a study from 2014 (Corcoran & Liu), Zillow was found to have a median error of 24.8% between final sale prices and Zestimates. Homes in the one-star market had a significantly greater mean error of 30.5% compared to the rate of 17.2% in the four-star market. Surprisingly, the Zestimate was almost always an overestimate in one-star markets; however, Zillow has since worked to address these overestimates. The company hosted a competition in 2019 (Esswein) which it claims will improve the Zestimate's margin of error to below 4%. Although this improvement seems promising, Zillow has historically underestimated the Zestimate's margin of error relative to outside studies. Wei et al. (2022) argue that the Zestimate suffers from uneven data quality – a problem which Zillow has ignored in their algorithms. The implications of such overestimates on communities will be investigated further in the report but could include increased taxes and deterred potential buyers.

In addition to the Zestimate, some have accused Zillow of contributing towards racial steering. Loukissas (2022) claims that real estate websites like Zillow require sellers to report transaction data which can then be used to increase rent or taxes on the surrounding community. The outcome is especially profound for predominately black, low-income residents in urban areas who could be displaced. Humber (2020) asserts that Zillow contributes to segregation by linking student demographic data on a school ranking website which could persuade potential buyers away from certain neighborhoods. By solely focusing on quantifiable data points and demographics, Zillow ignores the rich history of homes and could exacerbate racial steering.

While the future of Zillow is uncertain, it will likely go beyond just providing data to consumers. Zillow previously launched an iBuying program designed to purchase homes undervalued relative to their Zestimates and quickly flip the homes for profit. Zillow ended the campaign after selling their flipped houses for an average discount of 4.5% and recording over $500,000,000 in losses. While Zillow's CEO, Rich Barton, attributes the failure to a lack of scale, Clark and Buhayar (2021) argue the failure stems from how Zillow used the Zestimate. One cannot expect an online tool to provide accurate estimates, and Zillow's discounted home sales serve as evidence. Going forward, many believe Zillow will reintroduce a modified iBuying program; however, the effects of Zillow offering cash for homes based on uneven owner inputted data could be problematic.

Technical Conclusion

Upon completion of deliverables from the technical report, the UVA football spectator experience will be improved. The team will identify traffic barriers to improve game entry efficiency, enhance the in-game experience through recommendations on activities and stadium design modifications, and alleviate constraints to student unattendance and early dismissal. The elevated spectator experience will help increase football game attendance and address related issues.

STS Conclusion

Upon completion of the STS report, the effect of Zillow on the residential real estate market will be scrutinized. I will identify how inaccurate Zestimates can negatively affect consumers, consider how data can be used to contribute towards steering, and discuss the future of Zillow in residential real estate. The STS report will bring attention to the issues Zillow causes

consumers and potentially correct Zestimate transparency issues from estimations based upon uneven data in a market that is critical to both personal and national wealth.

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One key factor that has shaped Zillow's development is the increasing role of technology in the real estate industry. As more and more homebuyers began to use the internet to research properties and connect with agents, Zillow and other online platforms emerged to meet this demand. This has led to a shift in the balance of power within the industry, with buyers gaining greater access to information and greater control over the homebuying process without the need to connect with a real estate agent. This trend was further exacerbated during the pandemic as online pictures and virtual tours were more heavily relied upon than before.

Another factor that has shaped Zillow's development is the changing expectations of consumers. As more people have come to expect the convenience and transparency of online tools, Zillow has had to evolve to meet these expectations. This has led to the development of features such as Zestimates and online mortgage calculators, which has brought even more information to the hands of consumers. Additionally, neighborhood and school districts are ranked to contribute to Zestimates and perceived home value.

At the same time, Zillow's influence on the real estate industry has also been shaped by a range of external factors, such as changing economic conditions and shifts in government policy. For example, the recent boom in the housing market has led to increased demand for Zillow's services, as buyers and sellers seek to capitalize on favorable market conditions. Similarly, changes in government regulations and incentives have influenced the types of properties that are listed on the platform and the way that buyers and sellers interact with it.

Overall, the rise of Zillow and other online real estate platforms can be seen as a product of broader social and technological trends, as well as specific market conditions and consumer expectations. Its impact on the residential real estate industry has been significant, helping to

make the homebuying process more accessible and transparent, while also changing the roles and power dynamics of various industry stakeholders.