OLD IVY ROAD MIXED-USE DEVELOPMENT

FROM CAR CULTURE TO MULTIMODAL METROPOLIS: RETHINKING AMERICAN TRANSPORTATION SYSTEMS

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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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Introduction

The built environment consists of a combination of spaces designed to serve society's diverse wants and needs. The designs of these spaces are constrained by local, state, and federal regulations that influence choices made by various stakeholders. One type of development is a mixed-use development, which is a project that combines multiple uses such as retail, residential, and recreational spaces (Niemara, 2007). The United States has recently witnessed an increase in the popularity of this type of the development, in part due to a decrease in challenges faced by developers (Metzinger, 2021). Mixed-use developments are typically denser and more walkable than their single-use suburban counterparts. They also tend to include diverse transportation infrastructure, which is essential for fostering economic growth, enhancing mobility, and elevating quality of life (Cervero, 2009).

In "Where we want to live: reclaiming infrastructure for a new generation of cities," author Ryan Gravel remarks on how his time studying abroad in Paris made him appreciate how transportation infrastructure constructs our way of life (2016). This message resonated with me because I had a similar epiphany while studying abroad in Valencia, Spain. Using transportation methods other than cars allows for greater connections between people and their environments. Cars isolate individuals, whereas alternative forms of transportation like walking or using public transit foster connections and interactions among people.

In 2019 just 5% of all U.S. workers traveled to their workplace via public transit, whereas 75.9% drove alone (Burrows et al., 2021). Figure 1, below, shows how this proportion varied greatly depending on the geography of one's environment. US cities focusing on public transit have seen notable success, such as New York City, where 55.6% of commuters opted for public transit (ibid).

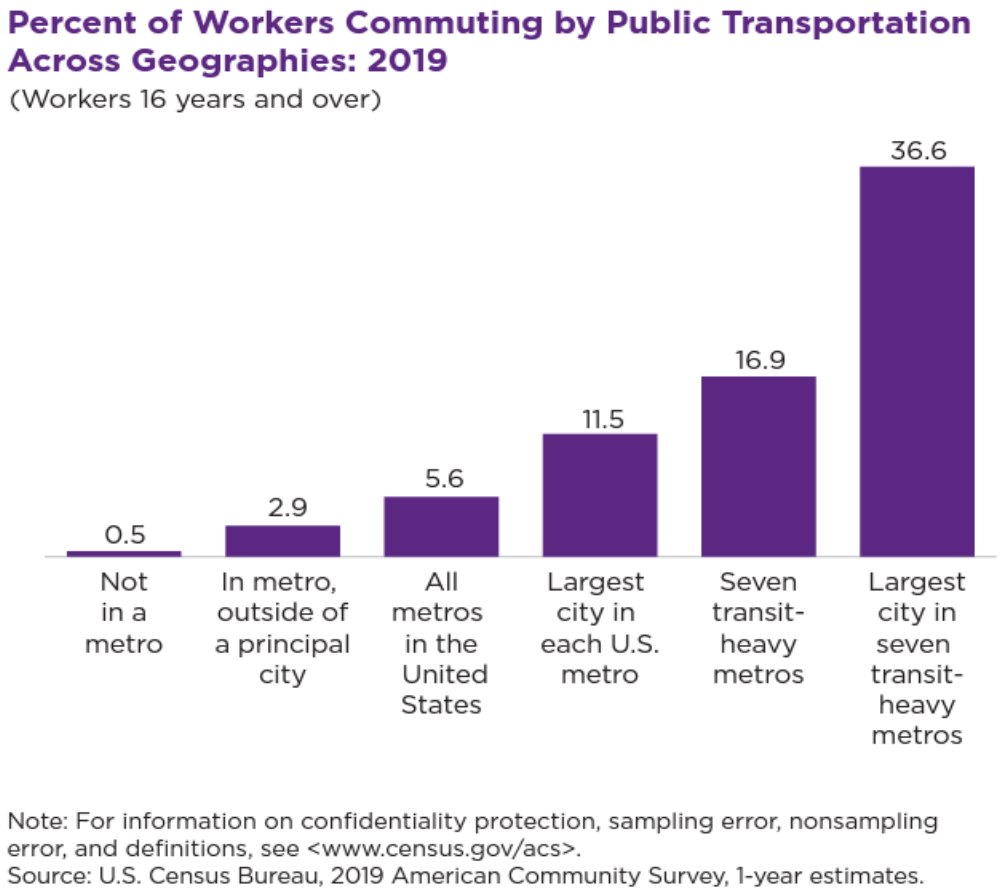

Figure 1. Percent of Workers Commuting by Public Transit: 2019 (U.S. Census, 2021)

Buehler (2009) conducted a multivariate analysis revealing that neighborhoods and areas featuring mixed land use developments and higher population densities experienced decreased car usage by their residents. This is because mixed-use developments allow residents to be less car dependent due to their characteristics of being denser and more walkable than typical single-use neighborhoods. By providing spaces with various uses, such as shopping and dining, mixed-use neighborhoods reduce strain on nearby roadways by decreasing overall traffic outside of developments (Sperry et al., 2012). Mixed-use developments not only decrease car usage, but also encourage physical activity by countering the sedentary lifestyle promoted by modern

conveniences like automobiles (Burbidge, 2008). Pedestrians should come first when planning for travel because pedestrian activity benefits physical health, mental health, and reduces environmental impacts (Barton et. al., 2021).

The design of the built environment has a profound impact on people's daily lives, particularly in how they move about. Transportation infrastructure plays a crucial role in enabling this movement. This capstone project will focus on the engineering and planning of a mixed-use development in Charlottesville, VA, and the thesis will examine the significant dependence on cars within U.S. transportation systems, as well as cities that have embraced alternative transportation methods.

Technical Topic

The project will offer a design for a 35-acre mixed-use residential and commercial development at 2454 Old Ivy Road in Albemarle County, VA. The site's existing conditions are shown below in Figure 2. The deliverables will include a site plan, stormwater management plan, grading plan, traffic design, and trail relocation plan. A site plan is a drawing, typically created using AutoCAD software, that shows existing and proposed changes to a site. The site plan will include residential units, commercial spaces, parking lots, and additional amenities. The grading plan will show existing and proposed topography, which is closely related to the stormwater plan that will control water runoff. The traffic plan will include a network of new roads, a new intersection on Old Ivy Road, as well as an analysis of whether Old Ivy Road will need to be widened. A portion of the Rivanna Trail runs through the existing site and the trail relocation plan will address changes and improvements that will be made to this section of the trail. The group is being advised by a team of engineers at Dewberry who are currently developing the

same site, but are more limited by financial constraints. This freedom gives the capstone design more flexibility, allowing for the incorporation of affordable housing and diverse transportation infrastructure.

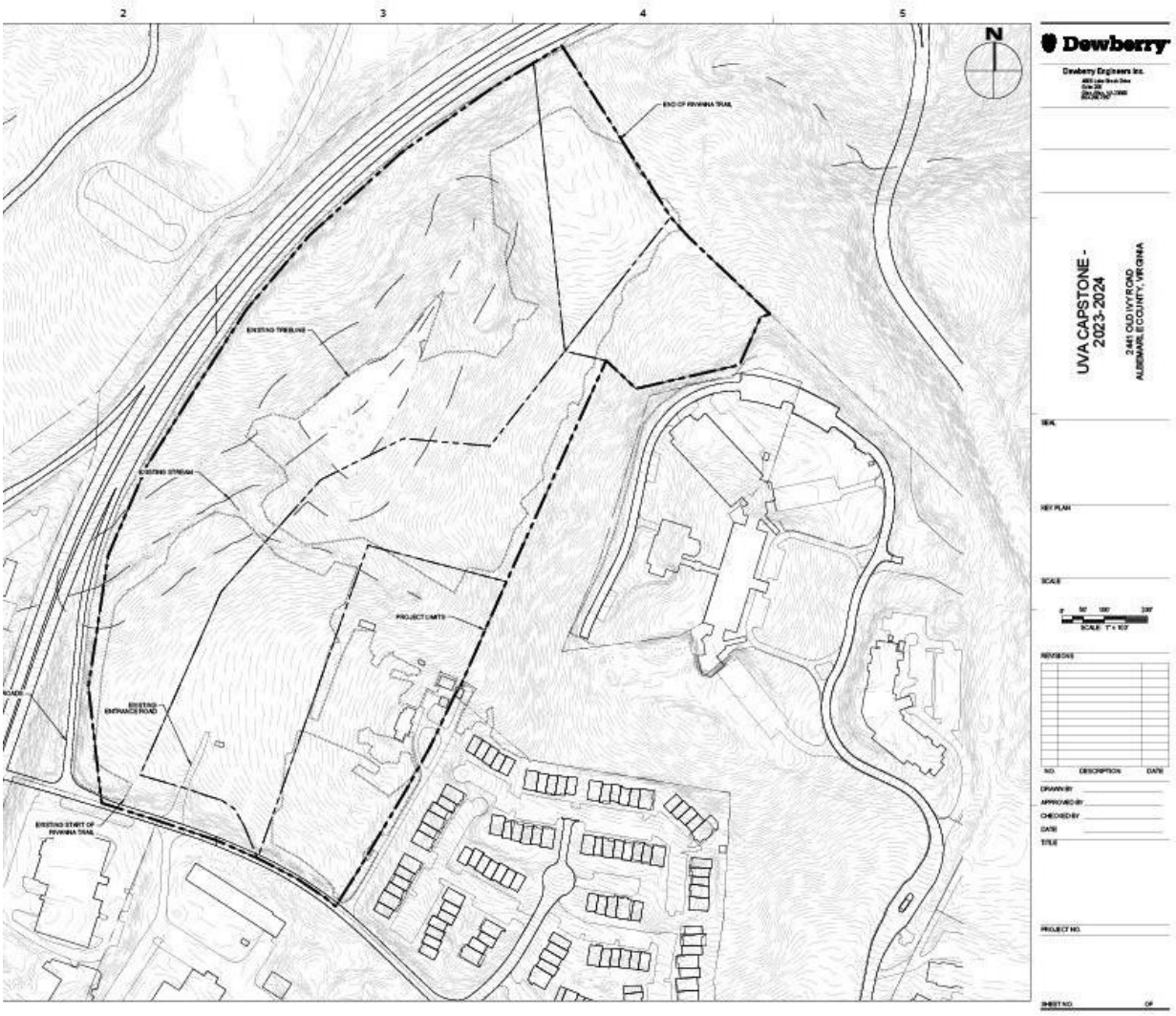

Figure 2. Old Ivy Road Development Site Map (Dewberry, 2023)

The proposed site on Old Ivy Road is currently home to one vacant single family home surrounded by farmland and forested area. The site is bordered by Old Ivy Road to the south, US 250 bypass to the west, a forested area to the north, and two residential apartment complexes to

the east (Google Maps, 2023). The site is 1.4 miles from the University of Virginia's rotunda, 1.7 miles from Barracks Road shopping center, and 1 mile from the University's law and graduate business schools (ibid). Despite the proximity to these nearby areas of interest, the transportation options that connect to these locations are limited. The only local public transportation infrastructure in Charlottesville, VA is a bus system known as the Charlottesville Area Transit (CAT), and the closest bus stop to the proposed site is 1.2 miles away (*Charlottesville Area Transit System Map*, n.d.). Although there is a sidewalk on one side of Old Ivy Road, the narrow two-lane road which connects the site to the University lacks any form of biking infrastructure. Walk Score is a tool that measures the walkability of a site based on it's surrounding infrastructure (Walk Score, 2019). The current Walk Score for the Old Ivy Road site is 48 out 100, which designates it as a car-dependent address. The design of the mixed-use development will incorporate infrastructure that encourages alternative modes of transportation. This will be done by adding elements such as bike lanes, multi-use paths, and connecting the CAT bus system to the site.

Shifting Gears: Transitioning Towards Human-Oriented Designs

New types of street designs that are not car-centric have gained popularity in recent years. These streets are characterized as being multimodal, meaning that they comfortably accommodate multiple modes of transportation and consider all types equally (Gupta & Terzano, 2008). This doesn't necessarily imply the exclusion of cars, but rather emphasizes the preference for transit and support for pedestrians through wide sidewalks, medians, and crosswalks. Another new street design concept is shared space, which reduces vehicular dominance by creating a low-speed environment that promotes various transportation modes. Shared spaces create a sense of

place for pedestrians and cyclists by allocating them physical road space, rather than segregating spaces exclusively for vehicles (Karndacharuk et al., 2014).

One approach to understanding the connections between humans and technology employs Star's (1999) theory of infrastructure. This theory relates infrastructure to a variety of dimensions that can be used to understand a technology's role in society. One assertion of this framework is that infrastructure ties into existing systems, also known as the "installed base" (Star, 1999). As new pieces of infrastructure are added to the built environment they interact with existing infrastructure. One way that this applies to mixed-use developments relates to how new developments are connected to existing transportation systems. When considering adding a bike lane to an area, it must be evaluated with respect to how it will fit into the existing biking infrastructure. Adding one bike lane will not increase bikeability unless it is part of a broader network of biking infrastructure (Codina et al., 2022). Developers seeking to encourage alternative forms of transportation should consider existing transportation networks in surrounding areas.

Another facet of Star's framework is infrastructure's relation to existing customs or "conventions of practice." This includes the customs and practices that play an important role in shaping infrastructure, while simultaneously being shaped by it. One of the biggest challenges in creating public transit systems in new markets is generating ridership (Dunphy, 2007). Most people in the United States are accustomed to using automobiles as their form of transportation, and just 5% of workers commute using public transportation (Burrows, 2021). The United States' reliance on cars is greater than that of other developed nations since less than 5% of all trips in the United States are taken using bus or train, whereas in Eastern Europe this figure is greater than 50% (Purcell, 2000). One reason for this trend is that most American cities have

been designed for cars, rather than pedestrians or public transportation networks. This layout promotes car usage, which is further affected by the availability of parking near one's residence, a factor that research has demonstrated impacts car ownership decisions (Guo, 2013). Greater car ownership rates create higher demand for parking, which creates a positive feedback loop further entrenching cars into infrastructure systems.

According to Jacobsen (2017), both presences and absences should be considered when examining social and political dimensions of infrastructures. During the first half of the 20th century, a group led by car manufacturer General Motors purchased and destroyed electric streetcar systems across the US (Purcell, 2000). This dismantling of public transportation systems, in addition to federal spending disproportionately favoring car infrastructure, has led to transportation infrastructure that is absent of alternative transportation options (ibid).

Research question and methods

My research into the history of transportation systems and infrastructure in the United States leads me to ask: How have social and historical elements shaped the development of car-centric transportation infrastructure in the United States, and how have cities succeeded in creating widely used public transportation systems? I am particularly interested in understanding factors that have led to suburban sprawl, which has played an important role in shaping transit systems and societal transportation customs for many Americans (Lewyn, 2000). I will research the history of zoning codes to understand how government policies have influenced transportation infrastructure, focusing on the impacts of the Standard State Zoning Enabling Act of 1922 (SZEA) (ibid).

As a part of this research I will use Yin's (2009) procedure to conduct case studies on the transportation systems in three different sized cities: Madison, WI, Portland, OR, and New York City, NY. Madison is a city of interest because its public transportation system exclusively uses buses and in 2019 had a total ridership of over 12.9 million people (City of Madison, 2022). Portland's public transit system includes buses, light rail, and street cars and had over 75 million riders in 2019 (TriMet, 2023). On the other hand, New York City's metro transportation system is much more complex; in 2019 it moved 1.7 billion riders on buses, subways, ferries, and commuter trains (New York City Transit, 2020). These three cities have public transit systems with high ridership in their respective markets. I will investigate the aspects of these systems, with a particular focus on infrastructure-related factors that have contributed to their success.

Conclusion

My technical project is the design of a mixed-use development in Charlottesville, VA, which will include a site plan, stormwater management plan, grading plan, traffic design, and trail relocation plan. This project is constrained by zoning regulations, developer demands, and existing transportation infrastructure. My thesis will explore historical factors that have led to these regulations, infrastructure, and customs. By examining case studies of transportation systems in cities that have gained widespread use, I hope to better understand the factors that contribute to successful public transportation systems in the United States. Understanding the historical factors that have influenced modern transportation systems and the key components behind successful systems will offer insights for improving American transportation systems in the future.

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