WALKABILITY: IMPLEMENTATION CHALLENGES IN THE SUBURBS OF NORTH CENTRAL TEXAS

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ABSTRACT

This thesis focuses on walkability efforts and implementation challenges in one of the suburbs of North Central Texas, the City of Plano, by exploring two mixed-use walkable developments and conducting interviews with local planners, developers, and academics. While the city has recognized the need for improved development patterns and has allowed higher-density, mixed-use development in designated Urban Centers, there is still a disconnect between the city’s objectives and the actual implementation. Site visits to Shops at Legacy and Downtown Plano identified discrepancies including path context and connectivity, segregated uses, quality of the pedestrian realm, continued prioritization of vehicles and minimal density increases. Interviews revealed that one the biggest challenges in the City of Plano is, and will continue to be, the city’s urban form. Observations and interviews presented in this thesis reveal that the City of Plano will most likely never be able to achieve walkability on a citywide level, nor would that be the desired outcome. Recommendations are made for potential retrofits throughout one of the sites in order to improve walkability and ultimately create cohesive livability.
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WALKABILITY: IMPLEMENTATION CHALLENGES IN THE SUBURBS OF NORTH CENTRAL TEXAS

Suburban sprawl has been extensively researched, analyzed, and studied over the past 20 years (Jaret, Adelman, & Williams Reid, 2006). Auto-oriented development patterns significantly altered the perception of urban layout and the pedestrian realm. Widespread disregard for pedestrian networks consequently led to residential development patterns based on the disjointed cul-de-sac, increasingly large block sizes, and segregated land uses (Southworth, 2005). As a result, suburbs face overwhelming traffic congestion, increasingly harmful emissions, subsequent environmental degradation and growing health concerns. A recent study attributes 15–20% of all urban and suburban greenhouse gas emissions to transportation–related activities, 90% of which come directly from vehicles and road transportation (Marcotullio, Sarzynski, Albrecht, Schulz, & Garcia, 2013).

As millions of Americans fled postindustrial urban decline, they flocked to the wide-open and non-unionized spaces of the southwest (Hurst, 2012). The North Central Texas Region provided an abundance of cheap land and rich soil which, combined with the improved transportation networks, made it one of the most commonly sought-after safe havens. Driven by rapid population growth, Texas continues to experience persistent low-density and auto-dependent development patterns.

Over the years, persistent auto-oriented development has significantly impacted the environment, giving Texas the lead in greenhouse gas emissions nationwide (Hurst, 2012). A recent study conducted by the Environmental Protection Agency, rated Dallas/Fort Worth Metroplex (DFW) 13th on the list of the nation’s 83 most sprawling urban areas (Hurst,
A 2000 Environmental Protection Agency Ozone National Ambient Air Quality Standard report revealed that vehicle miles traveled (VMT) in this region would increase over 44% by 2030, and the area will remain a non-attainment zone (Hurst, 2012).

The lack of aggressive state government action towards climate change mitigation poses serious regional weather, economic, and health consequences. Due to the growing concerns, numerous cities have taken it upon themselves and committed to rigorously reducing their greenhouse gas emissions through various local programs and initiatives (Hurst, 2012). These cities’ comprehensive plans identify problems and consequences with existing development patterns and recommend various strategies towards more sustainable and livable development. Nevertheless, despite the adoption of various sustainable principles, suburban cities in this region continue to favor vehicle-dependent development patterns.

This thesis explores just one of the many approaches towards reducing vehicular use and subsequent greenhouse gas emissions. The research focuses on walkability efforts in the suburbs of North Central Texas by exploring two mixed-use walkable developments within the City of Plano through interviews with planners, developers, and academics. The purpose is to explore existing walkability efforts and identify implementation challenges faced by local planners and developers. Identifying implementation challenges gives planners a better perspective into what is causing the gap between theory and practice. Ultimately, this research could provide insight to overcoming implementation challenges; a small but significant step in the greater efforts towards reducing the contribution to climate change.
This thesis defines walkability and organizes implementation challenges based on the insight from professionals within the field. The literature review section examines existing literature and past research on walkability in suburban areas. The research design section outlines the methodology that was used in obtaining and analyzing pertinent data. The background section provides detailed information for the City of Plano, its past and present development patterns, and its existing walkability efforts. The findings section reveals observations and interviews identifying the existing implementation challenges in the area. Finally, conclusions and recommendation are drawn based on the research.

LITERATURE REVIEW

Over the past two decades, academics and professionals have extensively researched the topic of walkability and its implementation. The literature reviewed in this section is divided into four subsections: livability, walkability, walkability objectives and implementation challenges.

LIVABILITY

Livability signifies the return to a more traditional, human scale, and pedestrian–friendly community (Perry, 1933). Although it has been around for years, the concept has rapidly gained popularity in recent years in response to the growing concern over significant anthropogenic environmental impacts. The concept focuses on the creation and restoration of compact, walkable, mixed–use communities through the use of traditional neighborhood frameworks and regional design. Livability emphasizes the idea
of centrally located public uses, local circulation, clustering, and public open space (Perry, 1933).

An early response to livability was Clarence Perry’s (1933) idea of the Neighborhood Unit. The Neighborhood Unit was a response to the increasing problems of congestion, both people and traffic, and the general disorganization and spatial expansion of cities. His idea was to create a template for a neighborhood that could be applied at various scales. As depicted in Figure 1, Neighborhood Unit is a compact residential district centered on a school and open green space, making it safer and more accessible for children to walk from home. The original concept was a physical plan that would encourage social structure, decrease dangers and alienation, and enhance overall community formation, walkability, and design of the built environment. However, as schools faced increasing space requirements, they grew larger in order to accommodate students from surrounding neighborhoods. As a result, schools are now situated on the edge of communities for easier and wider access, primarily by car. While the concept of the Neighborhood Unit still exists in present neighborhood designs, the scale is significantly increased to favor the automobile.

In order to understand the concept of livability, it is necessary to define the context in which it exists and to differentiate sustainability from livability. “Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (Foundation for Environmental Conservation, 1987, p. 282). The goal is to balance the three central values of ecology, equity, and economy and manage the resulting development, resource, and property conflicts.
In practice, land–use planning proved to be one of the most important arenas in which conceptions of sustainable development are contested. Here, more than anywhere else, it has become clear that trying to turn the broad consensual principles into policies, procedures, and decisions tends not to resolve conflicts, but to expose tensions inherent in the idea of sustainable development itself. (Owens, 2002, p. 28)

The livability concept, on the other hand, encompasses the central values of sustainability, but operates on an everyday physical environmental level, focusing primarily on place–making. This approach includes elements of public space, movement systems, and building design. Livability is a vision that “expands the sustainability mix to include land use design aspects, ranging down to the micro scale of the block, street, and building, as well as up to the macro scale of the city, metropolis, and region” (Godschalk, 2004, p. 6). The concept encompasses two competing approaches: New Urbanism, an urban design movement focusing on reestablishing the making of community through citizen–based participation in planning and design; and Smart Growth, a parallel movement with similar ideas, focusing more broadly on urban planning and public policy principles while incorporating design aspects (Godschalk, 2004).

**WALKABILITY**

While the concept of livability involves numerous objectives, this thesis primarily focuses on just one, walkability. Southworth (2005, p. 248) defines walkability as:

the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network.
Continuous and interconnected pedestrian networks, easy and safe accessibility, engaging and attractive public open spaces and streetscapes, and a dynamic built environment are necessary for walkable environment. A walkable community is one that integrates pedestrian travel into the community’s fabric and promotes walking as the primary and efficient mode of transportation. The Institute of Transportation Engineers and the Congress for New Urbanism (2010) define walkable communities as those that support walking as an important mode of transportation for a person’s daily routine by creating a place with complementary relationships between transportation, land use, and urban design.

While the built environment encompasses elements created or modified by people, both are shaped by local land use planning, transportation planning, and various zoning ordinances and policies. The physical environment consists of location and design of commercial, residential, institutional, and other buildings and activities, as well as the location and design of sidewalks, streetscapes, greenways and roadways (Handy, Boarnet, Ewing, & Killingsworth, 2002). Three characteristics that have to compliment and balance each other in order to influence walkability: land use patterns, urban design, and transportation infrastructure. Therefore the built environment plays a key role in creating opportunity and influencing walking, whether for recreational, occupational, household, or other travel purposes.

It is also important to consider geographic scale. Starting at the smallest scale which consists of an individual building, site or block, the next scale consists of a neighborhood unit or several city blocks, and the largest, the regional scale, encompasses the metropolitan area and beyond. Adopting planning and design criteria that prioritize
walkability objectives at the smallest scale has great potential to impact the city and region (Frank & Engelke, 2001). Therefore, especially in suburban areas where walkability seems so unattainable, it is important to start at the smaller scales of development in order to create successful walkability.

**WALKABILITY OBJECTIVES**

While walkability principles differ at various levels, they primarily revolve around the central idea of a safe, accessible, multimodal, and pedestrian–friendly built environment. The implementation of such principles has proven to be quite challenging. This is especially true in the suburbs where distances between destination points are much greater than the suggested 400 feet to 1/4 mile that Americans are supposedly willing to walk (Weinstein, 1996). However, measures of distance alone will not yield adequate implementation of walkability. To encourage walking and pedestrian involvement, the quality of the street network is key (Jaskiewicz, 2001). Previous research reveals seven key features of the built environment associated with walking at the neighborhood level: connectivity, linkage with other modes, fine-grained land use patterns, density, safety, quality of path, and path context (Handy, Boarnet, Ewing, & Killingsworth, 2002; Southworth, 2005).

Connectivity refers to path network, presence of sidewalks and informal pedestrian paths, path continuity without signification obstruction and “directness and availability of alternate routes through a neighborhood or street network” (Vehige Calise, 2010, p. 30). Most of the suburban landscape suffers from lack of connectivity due to disconnected cul-
de–sacs, barrier arterial streets, and highways. According to Southworth (2005), possible retrofits include pedestrian over/under–paths, traffic calming devices, and connection of disconnected paths. The ultimate street network is a grid pattern that provides pedestrians with direct routes, reducing trip lengths, while the dendritic street network creates streets that loop, form cul–de–sacs, and feed into major arterial roads intended for heavy traffic (Williams, 1988).

Linkage refers to the importance of connectivity locally, citywide, and regionally through accessibility to other modes of transportation within reasonable time and distance. Southworth (2005) points out that even the most well–designed, pedestrian–friendly neighborhood will not contribute to the reduction of VMT without adequate access to transit and a mix of land uses.

Fine–grained and varied land use patterns refer to accessible patterns of public services, activities and daily needs accessible on foot (Southworth, 2005). Land use mix also refers to the relative proximity and diversity of different land uses (Handy, Boarnet, Ewing, & Killingsworth, 2002). “Pedestrian networks should provide continuous direct routes and convenient connections between various destinations” (City of Portland, 1998, p. 3). An appropriate balance and proximity of land uses has the potential to reduce VMT and encourage pedestrian activity. Even if the destination is accessible primarily by automobile, the right use at the destination can promote walkability (Williams, 1988).

Density plays a significant role in establishing such patterns but existing auto–oriented low–density development patterns pose challenges in introducing density and mixed–uses (Southworth, 2005). Density refers to “the intensity with which an area is used or occupied, as measured by population, employment, or building square footage per unit
of area” (Vehige Calise, 2010, p. 29). Areas with higher densities are associated with fewer motorized trips, overall decreased trip lengths, reduced vehicle ownership, and increased options for various modes of transportation (Frank & Pivo, 1994). It would thus seem impossible to successfully create complete walkability in such an existing framework. Southworth (2005) suggests that the best outcome would be creating more dense small pedestrian districts with incorporated mixed-uses as enclaves of walkability within the suburb and interconnected by recreational paths.

Pedestrian safety is the most understood and fully developed of the six walkability criteria. “Sidewalks, pathways and crossings should be designed and built to be free of hazards and to minimize conflicts with external factors such as noise, vehicular traffic and protruding architectural elements” (City of Portland, 1998, p. 3). In most U.S. cities, transportation and land use policies have made the pedestrian realm inconvenient, unpleasant, and dangerous. In recent years, traffic calming has been the most common technique towards improving pedestrian safety. This is accomplished by slowing down traffic through tools like chokers, chicanes, speed bumps, raised crosswalks, narrowed streets, rough pavement, traffic diverters, roundabouts, landscaping, and various other means (Southworth, 2005). Research conducted in several cities found these tools to be usually successful in slowing traffic and reducing accidents, but they do not guarantee that drivers will slow or yield to pedestrians (Huang & Cynecki, 2001).

Quality of path and overall aesthetics is essential to walkability and refers to “features that increase a place’s attractiveness and appeal, including landscaping, lighting, benches, shade, and the presence or absence of graffiti” (Vehige Calise, 2010). However, a majority of suburban streetscapes lack the necessary landscaping and are
instead dominated by traffic noise, pollution and vehicle signage that present an unpleasant pedestrian atmosphere. Southworth (2005) suggests that an ideal pedestrian path should be continuous, have a smooth surface, be wide enough for at least 2–3 people, consider regional geography, avoid intrusions, present landscaping elements as buffers between pedestrians, traffic and weather elements, and exhibit pedestrian scale fixtures. Overall, the enhanced look and feel of pedestrian environments should promote a good sense of place through well thought-out comprehensive design (City of Portland, 1998). The better the quality of path and aesthetics in the neighborhood, the better the perceived quality of safety and the pedestrian realm.

Southworth (2005) states that path context is important in engaging the interest of pedestrians, but it is considered to be the least developed of walkability criteria. Vehige Calise (2010, p. 31) identifies this criteria as street scale and defines it as “the three-dimensional space along the street, as bounded by buildings or other features of the built environment.” This primarily refers to competition between an automobile-oriented environment, which includes expansive parking lots and large setbacks, and the pedestrian-friendly environment, which includes setbacks of no more than 25 feet, street entrances, windows, on-street parking, and decreased traffic speeds (Ewing R., 1996). Most suburban landscapes that favor the automobile offer a closed-off, monotonous physical setting and uniform street design lacking in pedestrian appeal. Environment/behavior studies have revealed that spatial form of the street, quality of pedestrian realm, and natural features were key aspects in encouraging walkability (Southworth, 2005). They conclude that attributes like scale of the street space, presence
of trees and other landscape elements, views, visible activity and transparency, scale, and coherence of the built environment all contribute to the quality of path context.

The Charter of the New Urbanism (2000) and The Institute of Transportation Engineers identify similar principles in successful walkability implementation. The Charter of the New Urbanism (2000) emphasizes density, mixed-uses, and pedestrian-friendly environments, and encouragement of transit-oriented development; integration of civic, institutional, and commercial activity within neighborhoods and districts; physical definition of streets and public spaces through design; and automobile accommodation without compromising the pedestrian realm (Leccese & McCormick, 2000). Street, square, and building design is identified as a tool towards reinforcement of safety and attractiveness, without compromising openness and accessibility. Finally, all design solutions should observe and follow the existing context. The Institute of Transportation Engineers or ITE (2010) bases objectives for walkable communities on the importance of multimodal transportation and accessible and connected thoroughfares. ITE emphasizes compact, mixed-use, pedestrian-scale environments consistent with the surrounding context and urban character.

Southworth (2005) concludes that physical features of the pedestrian realm significantly influence the environment through individual perceptions and senses, ultimately influencing how an individual perceives the environment as a place to walk. Therefore, the necessary first step in achieving walkable cities starts with assessment of the existing walkable conditions. In order to achieve substantial results, it is important to revise pertinent land use policies and regulations, research walking behavior in different environments, promote public education, awareness, and encourage participation in the
planning process. The key step in this process is collaboration and interdisciplinary education among planners, engineers, designers and other associated professions.

IMPLEMENTATION CHALLENGES

Creating a successful walkable environment in a predominantly automobile-oriented suburb requires more than introduction of improved design objectives, it requires acceptance of pedestrian access at all levels. This type of major transformation poses various implementation challenges, mainly involving negative misconceptions of increased densities and mixed-uses by residents and businesses alike, as well as policy limitations.

According to Southworth (2005) one of the main challenges in achieving walkable cities is that over 50% of a typical American metropolis has automobile-oriented development patterns. Retrofitting existing and established development patterns is much more difficult than greenfield development. Existing policy and land use regulations pose potential impediments for increasing density and mixing land uses as well as overall resistance and NIMBY types of attitudes.

Godschalk (2004) suggests that a sustainability-livability prism can be used as a tool to assess conflicts and locate gaps within metropolitans. Once problem areas are identified, specific objectives from within each of the prism’s principles, livability, equity, economy, or ecology can be selected. Implementing metropolitan development plans requires continuous conflict resolution and consensus building. Godschalk (2004) states that, despite previous trends, design is regaining dominance as the main component of land use planning visions. The most prominent approach to developing sustainable and
livable communities is understanding equitable place-making and motivating citizen participation throughout the planning process. In reviewing various approaches towards more sustainable livable communities, the main problem with implementation is lack of profession-wide consensus of involved standards, methods, definitions and elements.

RESEARCH DESIGN

As a principle approach towards livability, walkability aims to not only better the quality of life, but improve the natural environment. The North Central Texas Region is a significant contributor to environmental degradation, primarily through steadily rising vehicle emissions and above average VMT (EPA, 2014). The City of Plano, TX was chosen for its key location within the North Central Texas Region (see Figure 2). Located within a rapidly growing metropolitan area, Plano is an outer-tier suburb that continues to absorb a large portion of the growth within the region. Consequently Plano is experiencing significant transformation and increased congestion (City of Plano Planning Department, 2012). In an effort to curb the city’s greenhouse gas emissions, Plano has explored various walkability principles and adopted implementation strategies, to achieve them, through its 2005 Comprehensive Plan (City of Plano, 2005).

This study focuses on two development areas within the City of Plano: Legacy Town Center and Downtown Plano (see Figure 3) have been developed/redeveloped with the Comprehensive Plan’s visions and goals in mind. These developments were identified through the city’s Planning Department and were chosen because they provide the most interesting and significant outcomes for this research and are sites where walkability objectives and strategies would be most appropriate. The major research tasks included:
a review of the city’s pertinent data, documents, and maps; observational research through site visits; and interviews.

The first research task was to review the city’s most current 2005 Comprehensive Plan and identify what walkability principles are being pursued and what strategies are being used to implement them. Does the Comprehensive Plan identify challenges that the city has faced in previous implementation attempts? Existing walkability principles, as identified through the literature review, were compared to those identified by the City of Plano.

The second research task was to gather pertinent data about the city’s general development patterns and population trends. Land use and zoning maps were used to identify the various uses that have occurred in these two areas over time and whether these changes follow the visions and goals identified in the Comprehensive Plan. Further, U.S. Census and ACS population and economic characteristics data were used to quantify the rapid growth of the city, total land consumption, and household modes of transportation compared to state and national data.

The third research task involved observation of the selected communities. Observational research for this report involved visits to both the Shops at Legacy and Downtown Plano sites to observe walkability efforts. The goal of the site visits was to determine whether the walkability objectives identified in the 2005 Comprehensive Plan, “Urban Centers” Study, and other official documents were implemented in these sites. Observations focused on street activity, street capacity, and the comparison between objectives adopted and implemented by the city and defined by the Congress for New Urbanism (2010). A walking tour of the two selected developments was conducted
January 7th, 2015 with the City of Plano Planning Director, Christina Day. This included photographs of the developments and the walkability objectives as they were applied and integrated within the developments.

After observational research, ten interviews were conducted during the first week of January 2015 with seven local city planning professionals, one academic, and two developers. Interviews were conducted with the planning director and planning staff for the City of Plano, as well as with city planners in the bordering suburbs of Richardson, McKinney, and Frisco. Interviewing city planners of the neighboring suburbs provided useful insight, as these areas are experiencing similar transformations. Interviews were also conducted with two local developers, who participated in the developments identified as having implemented walkability objectives. Additional interviews were conducted with an academic professional within the field about the effectiveness of walkability in the suburbs. A detailed breakdown of the interviews is in Appendix A and the interview questions are in Appendix B.

The final task of the research process was combining and analyzing the collected data. The interviews were organized by categories of challenges and related walkability objectives and strategies. Photographs were used to identify where the objectives and strategies were successful versus where they failed to encourage walkability. All interview responses about challenges and potential solutions were organized by topic and analyzed to identify possible recommendations for planners in these regions.

The Institutional Review Board process was completed and approved in December of 2014.
BACKGROUND

Climate change is no longer a distant threat, it is a harsh reality, the effects and impacts of which have been well-documented and increasingly devastating in recent years (EPA, 2014). In 2010, EPA designated the North Central Texas Region (NCT) as a non-attainment area, meaning that the air quality of the region does not meet the standards as defined by the Clean Air Act. Vehicle emissions in this region are a major contributing factor. Thus, controlling and reducing emissions from mobile sources such as cars, trucks, motorcycles, and other vehicles is critical to the environmental success (North Central Texas Council of Governments, 2014).

The NCT Region is home to nearly six million people, a population which is expected to increase by over 70% over the next 30 years. As one of the largest metropolitan areas in this region, Dallas/Fort Worth continues to experience rapid growth and growth is a significant contributor to traffic congestion, greenhouse gas emissions, and air pollution through increased VMT (North Central Texas Council of Governments, 2007). In an effort to reduce vehicle congestion and emissions pollution, it is necessary to promote multimodal transportation options. Alternate transportation options must be not only be encouraged, but made available and accessible.

Over the past several decades, automobile-oriented development patterns have dominated the NCT Region. As a result, local municipalities are becoming increasingly aware of the impacts of sprawl and the limitations of the exiting transportation systems. According to the 2009 American Community Survey, 81% of commuting trips in DFW are made by driving, 10.3% of commuting trips are made by carpooling, and 4.8% are made by either public transit, walking, or other means (Regional Transportation Council, 2013).
A crucial role is played by land use and the built environment because the movement of people from origin to destination is significantly guided by what happens between the two (Regional Transportation Council, 2013). Other contributing factors are the lack of networks for bicycle and pedestrian facilities, consistent design guidelines, and importance placed on these modes of transportation.

According to the City of Plano’s Comprehensive Plan – Land Use Section (2012), as the DFW Metroplex continues to grow, estimates suggest that an additional three million people will reside in this region in the next decade. Previously considered as the outer-tier suburbs, gradually becoming first-tier suburbs, cities like Plano, are absorbing this population growth. This introduces strains and limitations on existing infrastructure. Adjustments must be made to minimize health and environmental impacts from increased congestion.

**CITY OF PLANO**

Located 30 minutes from Downtown Dallas, within the southern portion of Collin County, the City of Plano covers just over 71 square miles and has a density of approximately 3,100 people per square mile. Originating as a small farming community of about 2,000 residents, the city grew into a bedroom community through the 1970s and 1980s. Since 2000, Plano has had a population growth of 18.4%, resulting in approximately 270,000 total residents in 2014 (Sperling, 2014).

Like most suburbs, the city consists of predominantly low-density, automobile-oriented development. Figure 4 depicts the population distribution within the boundaries of the City in 2010. From this image, it is clear that this is a predominantly low-density
suburb. However, in recent years, due to the overall rapid growth of the DFW metropolitan area, Plano has been transitioning into a mature and mostly developed city. Currently, the majority of the land has been developed, with only about 8% undeveloped land (City of Plano Planning Department, 2012).

The Transition and Revitalization Commission of Plano (2008) released a report titled “Future Dimensions: Envisioning Plano’s Future” in response to the shifting demographic and population changes as well as regional and national issues. The report noted that the city’s physical growth directly reflects its economic, social, and environmental growth. Therefore the goal is to return to the physical and design considerations as the basis for future comprehensive planning. The Commission envisioned a more urban, diverse, dense, and transit-oriented approach towards creating neighborhood-based community spaces, encouraging redevelopment, and utilizing existing infrastructure. As the city absorbs population and matures into an inner suburb, increased traffic congestion and strain on the natural and built environment are inevitable. Recommendations included adding pockets of higher-density, mixed-use developments to provide a fabric on which to build more transportation options, create destinations, and insure sustainable conditions.

The concept of density nodes or, as the city refers to them, urban centers, utilizes New Urbanism principles and the idea of returning to traditional forms of development. In this context, urban centers are high-density nodes of mixed-use residential and commercial development that provide employment and entertainment within a pedestrian-oriented neighborhood environment. Urban centers create special, attractive, and inclusionary community gathering spaces, more compact and economically wise
neighborhoods, as well as contribute to sustainable development and the quality of life of the city’s residents (City of Plano Planning Department, 2012). The two existing urban centers, Shops at Legacy and Downtown Plano, have been rapidly expanding with initiatives to encourage more pedestrian–friendly environments. As a result, an “Urban Centers” Study (2012) was developed by the City of Plano Planning Department in which officials and professionals collaborated to identify potential sites for higher density mixed–use urban centers.

Both the “Urban Centers” Study and the City’s 2005 Comprehensive Plan call for revisions in traditional ideas of housing and neighborhood areas, redevelopment, and density. These reports warn of consequences from and challenges with the existing development patterns and suggest shifting focus to previously overlooked tracts of land for infill development. Future development patterns should be carefully considered and revised to incorporate higher density and pedestrian–friendly environments.

Figure 3, shows the locations of two areas of the city that will be investigated in this study: Shops at Legacy and Downtown Plano. These sites were selected because they are the only existing urban centers identified by the city. These sites were developed with the City’s Comprehensive Plan goals and visions in mind. The following subsections individually define and examine these three study areas.

**SHOPS AT LEGACY**

Shops at Legacy, pictured in Figure 5 and Figure 6, is a large mixed–use town center development, involving residential, commercial, and office uses. It is located on
Legacy Drive, adjacent to the Dallas North Tollway, amidst a wide variety of corporate headquarter campuses in the northwestern part of the city. This 150-acre infill development was designed by DPZ, RTKL Architects, and Post Properties in 1998. The site houses two hotels, a convention center, 500,000 sq. ft. of shops and entertainment along the central main street, and 2,400 units of multi-family housing (Duany Plater-Zyberk & Company, LLC., n.d.).

The goal of this development was to provide workers in the various surrounding corporate headquarters with the opportunity to shop, dine, and live in close proximity to their workplace. Designed as a lively, pedestrian-friendly environment, the site offers a 3-acre lake park at the center of the development with plenty of public green open space and recreational space (Duany Plater-Zyberk & Company, LLC., n.d.). Parking is provided along the street and in parking garages incorporated into the residential and commercial structures. Walkable streetscape design with tree-lined sidewalks, street furniture, and outdoor dining provide a comfortable and safe environment for pedestrians.

**Downtown Plano**

Downtown Plano, pictured in Figure 7 and Figure 8, was once a nearly-forgotten and desolate area where buildings stood abandoned, and streets empty. The opening of the Dallas Area Rapid Transit light rail station in 2002 resurrected the downtown historic district and transformed it into an active urban center with retail, entertainment, and residential uses. Located along 15th Street, near Highway 75 and the President George
Bush Turnpike, this area has an abundance of opportunities for redevelopment and infill projects for new residential, business, and retail uses. Primarily surrounded by single-family houses and institutional and industrial uses, it also offers employment opportunities within three miles of downtown in the Research Technology District and Telecom Corridor (City of Plano, 2013).

Downtown Plano is famous for the signature brick sidewalks and street trees that provide not only an improved pedestrian experience but connect the area visually. On-street parking calms traffic and provides a safe buffer for pedestrian comfort. Opportunities exist to extend the urban center concept as the downtown area expands westward towards U.S. 75 and along J and K Avenues. However, pedestrian routes within neighborhoods are obstructed, many areas lack sidewalks, and new construction and revisions may pose challenges for the existing historic character of the streets (City of Plano, 2013).

FINDINGS

Evaluation of individual sites revealed disconnections and issues between the defined features and characteristics of the built environment that should influence walkability and walkability as defined in this region. There are gaps in consistency of key features of the built environment associated with walking at the neighborhood level and the objectives provided in the city’s documents; these include land use mix, street connectivity, and quality of aesthetics.
The “Urban Centers” Study (2012) identifies specific characteristics that must be met in order for the development to be considered an urban center. The study calls for an appropriate mix of complementary uses that are integrated at the block or building level and have a clearly defined edge and center. Buildings must be of a human-scale and should enhance the streetscape and define public space. Corridors and connections to the contextual surroundings define the boundaries and character of the neighborhood. Streets should be designed as a functional pattern of networks and provide sufficient and readily available parking without interfering with the pedestrian realm. The study also encourages provision of a variety of transportation modes with connections to the rest of the city and region. Placement of civic and institutional buildings should be incorporated within the development framework in order to reinforce their symbolic and cultural importance (City of Plano Planning Department, 2012). These characteristics closely mirror the general principles of New Urbanism (Leccese & McCormick, 2000). Key design elements are: street and block layout, street design, building placement, building design and scale, on/off-street parking, common areas, public space, sidewalks, paved surfaces, landscaping and location. Both the “Urban Centers” Study and the City’s 2005 Comprehensive Plan encourage careful consideration and revision of existing development patterns in order to incorporate higher density and pedestrian-friendly environments.

The “Zoning Districts and Uses” (2012) report identifies the creation of an Urban Mixed-Used (UMU) zoning districts and selection of two parcels of land, at the southern edge of the city, for potential development. The UMU districts are designed as compact pedestrian-oriented urban mixed-use centers which promote social interaction, community
identity, and efficient use of land and resources. “The UMU district should support and encourage a variety of transportation options, including transit, bicycles, and walking… [and] is applicable primarily to large undeveloped properties where higher density residential and commercial uses are appropriate” (City of Plano Planning Department, 2012, p. 180). As the code was primarily modeled after the two existing urban sites, Shops at Legacy and Downtown Plano, and uses the ideas of the “Urban Centers” Study, the requirements identified within the UMU code will be applied in the observational findings.

As defined in the “Zoning Districts and Uses” Report (2012), each UMU district must include at least three use-categories, restricting only residential, retail, or office/institutional to the primary use category. Primary uses require a minimum of 50% and a maximum of 70% of the gross floor area. Table 1 and Table 2 reveal a detailed breakdown of the requirements for single family attached, and commercial and multifamily uses.

The UMU district calls for streets with 11–12 foot travel lanes, a maximum block size of three acres, a maximum block length of 600 feet, a variety of street types and block sizes to create a grid network and prohibit cul-de-sacs and curvilinear streets. Main streets require buildings of a minimum of two stories, 600–1,200 foot section of high concentrated activity, with stores limited to 100 feet of frontage, and prohibit any parking structures or surface parking lots to directly touch the main street. Street trees are required every 40 linear feet of major and minor street frontage, within five feet of the back of the street curb. Sidewalks are required on both sides of all streets and while landscaping, outdoor dining, and street furniture are permitted and encouraged within the
sidewalk, there should always remain a clear path minimum of 7 feet in width on minor streets and 12 feet in width on major streets (City of Plano Planning Department, 2012).

The UMU districts are required to provide open space at a minimum of 5% and maximum of 10% of the gross acreage of the development, touching a street on at least two sides. The maximum allowed parking for nonresidential uses is limited to one space per 250 sq ft of gross leasable area, this includes on–street parking which is required on all major and minor streets, and one space per one bedroom unit, one and a half space per two bedroom unit, and two parking spaces per three bedroom unit. A surface parking lot may not contain more than 25% of the parking requirement for the entire development. All surface parking lots with 50 or more spaces are required to accommodate future development and must be located on the outside edge of the development (City of Plano Planning Department, 2012).

SITE VISITS

Overall the site visits revealed compliance with the principles adopted in the city’s documents and guidelines. However, compared to the walkability principles identified by the Council for New Urbanism (CNU) (2010), there were discrepancies. The main ones were lack of connectivity between the walkable and the surrounding neighborhoods and continued separation of uses. While both Shops at Legacy and Downtown Plano reveal successful implementation of walkability objectives, there are missing connections between the surrounding neighborhoods. Examples would be the missing sidewalks along the developments directly across the street from the Shops at Legacy (Figure 9) and
abrupt discontinuation of the sidewalk treatment and aesthetics in Downtown Plano (Figure 10).

During both site visits, the lack of ground floor activity made some of the areas feel less welcoming or engaging. However, the provision and quality of paths in the Shops of Legacy site was more superior to Downtown Plano, while the smaller scale of Downtown Plano retail created a more engaging and comfortable pedestrian environment. It should be noted that very few pedestrians were encountered during both site visits, at various times of the day, which is confirmed by the lack of pedestrian activity throughout the images.

**SHOPS AT LEGACY.** This site was a greenfield development originally intended to serve the employees of surrounding corporate campuses. The site is divided into north and south sections, with Legacy Drive running down the center (Figure 11). Legacy Drive is a major thoroughfare with a speed limit of 45 mph. The site is bordered to the west by a major highway, the Dallas North Tollway, which is considered the main transportation connection for the site. There are two bus stops along Legacy Drive in both directions for the DART Crosstown 452 Bus to Parker Road Station, which is the regional light rail station which connects Plano to Downtown Dallas. The bus schedule shows buses running approximately every 30 minutes during morning and evening rush hour and every hour during off-peak hours (DART, 2014).

While this site has a complimentary mix of uses and a walkable built environment, as specified by the city’s Plan, commercial and residential uses are separated and the ground floors predominantly consist of retail and entertainment along the main streets.
There are missed opportunities for creating a more pedestrian atmosphere, and the site lacks connections with the surrounding area. CNU specifies that ground floors should be reserved for nonresidential uses in order to create activity in the pedestrian realm while mixing in residential or commercial uses on the floors above. The only ground floor retail is found along Bishop Road, the main street in South section (Figure 12) and along Lone Star Drive (Figure 13), a second main street in the North section. The buildings along these main streets are two stories and the uses are primarily commercial. The rest of the development consists of office towers (Figure 14), a hotel (Figure 15) and residential urban living apartments (Figure 16 and Figure 17) all without ground floor retail.

The built environment follows the city’s guidelines including setbacks, sidewalk widths, block lengths, tree placements, grid network, and parking requirements. The site contains on-street parking along every street and all parking structures are either hidden within the development or on the outer edges (Figure 18). However, there are parking structures (Figure 19), although hidden, along the main streets of the site that decrease the safety of pedestrians as cars pull in and out of the hidden garage. Following the CNU and city document guidelines, most of the streets of this site create an enclosed outdoor room, utilizing trees, landscaping, and building features (Figure 20), while some of the minor streets lack the necessary features to create an interesting pedestrian realm (Figure 21).

Another missed opportunity is presented in the north section around the fountain and open space. While the fountain partially provides a focal point as well as amazing views from the surrounding buildings, it also serves as a separation of uses between the retail and office towers. This feature does not take full advantage for the pedestrian realm
in that no street furniture is provided and no ground floor activity activates the space. The restaurants on the retail side of the fountain offer very limited outside seating and views of the fountain and the lack of ground floor activity on the office towers side creates an empty air of isolation. The fountain seems isolated creating a disconnection between the public and private realms.

While this site does primarily consist of higher density multifamily residential units integrated with single-family attached residential units, there are limitations to the available data at block and lot level. In order to look at the density for this site, census tract data was obtained through the American Community Survey 2010–2013 five year estimates. Figure 22 depicts the Shops of Legacy site outlined in black, as it is located within both Census Tract 316.57 and Census Tract 316.58. Census Tract 316.57 is approximately 970 acres and contains the 90 acre North Section of the Shops at Legacy site. Census Tract 316.58 is approximately 1090 acres and contains the 83 acre South Section of the Shops at Legacy site.

Table 3 displays the total population and density per census tract for each of the indicated years. Aside from the Shops at Legacy site, the two census tracts primarily contain commercial land uses, consisting of large corporate headquarter campuses. Therefore, it is assumed that the site accounts for the vast majority of the total population and density. Taking into consideration the approximate size of the Shops at Legacy site is 173 acres, by comparison to the rest of the city’s density of 3,611 people per square mile (or 640 acres), excluding Downtown Plano, it achieves the intended higher density.
The success of the Shops at Legacy has provided growing interest in developments with similar objectives. Current plans for Legacy West, a 200 acre site surrounding the JCPenny corporate headquarters, just west of the Shops at Legacy, proposed an urban mixed-use development (Figure 23). New designs proposed high-rise buildings, dense urban living apartments, complimentary mix of retail, and offices lining along the main street (Brown, 2014).

**DOWNTOWN PLANO.** The site was a redevelopment project of the historic Downtown Plano district. This site is also a Transit Oriented Location (TOD) because of the direct access to DART light rail. The Downtown district is served by the red and orange lines, the orange connecting Plano with Downtown Dallas and the DFW Airport, and the red connecting Plano to Downtown Dallas and Oak Cliff, a southern district of Dallas.

While the entire Historic Downtown Plano is bound by East 18th Street to the north and East 14th Street to the south, and M Avenue to the east and F Avenue to the west, a great majority of new construction and redevelopment has taken place around East 15th Street. For reference the site is divided into north and south sections, with 15th Street running down the center (Figure 24). East 15th Street used to be the main street for the city and is currently a major thoroughfare with a speed limit of 30 mph. The site is bordered to the west by H Avenue and I Avenues and is a couple of blocks from a major highway, North Central Expressway. In addition to the DART light rail station, this site is served by the DART East Plano Flex Service Route 870, which is a van that loops around the eastern part of the city. The Flex Service Route schedule shows vans running
approximately every 15 minutes during morning and evening rush hour, and every 30 minutes during off peak hours (DART, 2014). Observation revealed that this site follows the guidelines set by the city’s Comprehensive Plan as well as the CNU. The majority of the development along various types of streets provides a complimentary mix of retail and entertainment uses along ground floor and higher density residential uses on the levels above. This site also incorporates office and institutional buildings and uses.

The northern section consists of a public park, the light rail station, two mixed-use urban living and ground floor retail buildings, redeveloped retail buildings along the East 15th Street (Figure 25), and institutional buildings bordering the eastern edge. There is a garage structure incorporated into one of the building designs (Figure 26) and all streets provide for on-street parking (Figure 27). The sidewalks and East 15th Street roadway are laid out in red brick patterns creating a historic feel and a pleasant aesthetic. All the buildings have been pushed close to the street and the sidewalks incorporate street furniture and landscaping, which results in a comfortable pedestrian scale and pleasant atmosphere (Figure 28). The southern section consists of four mixed-use urban living and ground floor retail buildings, one of which was recently completed (Figure 29), redeveloped retail buildings along East 15th Street, and stand-alone restaurants and other retail (Figure 30). All the streets and roadway surfaces follow a similar red brick design, allow on-street parking, and a pedestrian atmosphere. The south section also includes a parking garage incorporated between two mixed-use buildings and a hidden but public open gathering space (Figure 31). Both sections provide pedestrian crosswalks and create a safer atmosphere while crossing the street by creating sidewalk bulb-outs (Figure 32).
CHALLENGES

Fast-growing cities can be categorized in two ways, reactive and proactive. When the City of Plano was rapidly growing and expanding, the Planning Department was overwhelmed by the number of development projects. As a result, most of the time was consumed by primarily reviewing the plans and making sure they complied with the standards (Lettelier, 2015). Plano was simply reacting to the development and growing demands of the various stakeholders, at times with conflicting interests. Because of the growth surge, a lot of development happened before it could be maintained and contained while the codes in place were minimal at best (Beck, 2015). This in turn shaped the development pattern of the city and presently continues to influence development patterns (Lettelier, 2015). Mature cities face multiple challenges in introducing and implementing new progressive ideas. This section is divided into five primary challenges faced by the City of Plano: Cultural Background, Governance, Opposition, Economics and Regional Cooperation.

CULTURAL BACKGROUND

One of the primary themes revealed through interviews and discussions with professionals and developers addresses why this region, and the City of Plano in particular, has taken such a long time to embrace walkability and more pedestrian-friendly communities. Primarily challenges range from density issues to historical development patterns. The director of City Planning in Plano, Christina Day (2015), explained that density is usually driven by the unavailability of inexpensive land and since there has always
been and still remains cheap land in the city increasing density has not been a priority. Historically walkable built environments generally have nicely-scaled grid networks but Plano was developed when the automobile dominated, therefore the city’s development patterns prioritized the automobile and were not designed with pedestrian environments in mind (Schwartz, 2015). “That really is the primary challenge, historically automobile-oriented development patterns dominate this region and have influenced the region culturally to favor the vehicle over any other mode of transportation” (Beck, 2015). City Planner Lori Schwartz (2015) stated that “realistically, the existing grid system is very different from those of denser urban cities where a block is 300 feet long, where as our blocks are 1,000 feet and longer.” Older cities are more likely to be walkable because they were built before the prioritization of vehicles. However, geography and municipality borders also dictate walkability and densities in different cities (Woliver, 2015). Combined with this region’s abundance of available inexpensive land, cities developed and expanded horizontally (Woliver, 2015).

When cities in this region first began to grow there was a different trend, a different theory in the planning community. Plano was based on the neighborhood unit and walkability was thought of as being contained within that unit. This concept did not necessarily consider access by foot outside the neighborhood unit (Schwartz, 2015). As the vehicle became more and more prioritized, while the neighborhood unit idea remained, block sizes began to increase. Not only that, at the time fuel was very cheap and people were able to commute and travel further without much restraint (McDonald, 2015). Therefore today, walkability is limited as there are no safe connections between the units and crossing a six lane road with speeds of 40 mph is a barrier for pedestrians (Schwartz,
2015). But walkability within the neighborhood unit still exists and people exercise, walk their dogs, bike, and kids are able to walk or bike to school. “The suburban ideal still exists and walkability exists in this context but not in the sense where you live your life, go to work, and buy groceries never having to drive” (Schwartz, 2015). As Senior Planner Steve Sims (2015) stated this region “will always be designing walkability with the automobile in mind.”

Planning Director Christina Day (2015) stated that the city’s development patterns were established not only around the automobile but also by only requiring sidewalks in adjacent developments where land is developed, but not necessarily along vacant lots. Unlike in densely developed urban areas, Plano still has vacant land integrated within the developed framework, therefore places exist that do not have sidewalks. The challenge then becomes prioritizing whether to create sidewalks on undeveloped lots, because that will increase costs for future development, depending on the design of driveways and entrances (Day, 2015). It boils down to continued, if not increasing, demand around the automobile and justifying and balancing the extra expenses of building new or adding onto existing infrastructure. Ultimately, considering the existing development patterns “people here need automobiles in order to live and work, so that is where financial priorities lie” (Day, 2015).

**GOVERNANCE**

According to some developers the biggest challenge in creating successful walkable communities is the municipality itself. Cities may have the right ideas and create
grand visions, but sometimes these visions are not supported by the codes and zoning restrictions (Woliver, 2015). While the plans are driven by the Planning Department, the codes and standards are most likely driven by the Engineering or Buildings Departments. These kinds of inconsistencies lead to implementation challenges and misconceptions.

The existing development patterns and prioritization of the automobile means that “traffic engineers rule the world in this region” (Woliver, 2015). Post WWII, the ideas that were applied when building highways and coordinating traffic flows carried over to neighborhood streets, with a great deal of emphasis placed on longer and wider streets with bigger turning radii (Lettelier, 2015). Even when progressive initiatives are in place, the city’s traffic engineers primarily utilize engineering data and focus on the health, safety, and well-being aspects within this context. According to traffic data, street trees are an endangerment to drivers (Lettelier, 2015). Therefore, when it comes to consideration of developments proposing more street trees, it is difficult for the City Council to support them (Woliver, 2015).

A city’s ordinances, codes and plans also create barriers, limitations, and extra costs for developers. Some of the existing zoning is in place from the 1970s and 1980s, limiting densities and uses, thus development on these lots does not make financial sense for developers (Shacklett, 2015). So it really is up to the developer’s desire to develop a certain lot and go through the rezoning approval process. However, standards are in place because there are developers only concerned with the end result and profit versus design and experience. “Progressive developers on the other hand try to think outside the box and develop to improve quality of design and quality of life for future tenants, but these
ideas are hard to conform to the existing codes” (Woliver, 2015). While cities have good intentions, standardization waters down good progressive design of new developments.

One of the major issues in preventing successful walkability within developments seem to be parking requirements. While the city supports and encourages walkability, new developments still result in expansive surface parking lots. Although there has been an increase in parking garage structures, parking is mainly determined by city standards (Woliver, 2015). “Cities in this region still require a massive amount of parking and that always takes away from the design” (Innmon, 2015). The challenge becomes economic. While parking structures can be incorporated into the developments to allow for better walkability throughout the site, they are not encouraged, and the higher costs may ultimately result in development of the surface parking lots (Woliver, 2015). Cities hire consultants that provide formulas for the estimated parking requirements, which include extra seasonal parking, resulting in primarily empty parking lots throughout the rest of the year. The challenge becomes prioritizing the focus on design and aesthetics while trying to meet parking requirements (Woliver, 2015). Economics also come into play when developers would rather preserve the acreage for the actual development and landscaping which results in much more profitable overall development which is significantly reduced by the parking requirements.

While shared parking is allowed on a few sites, it is primarily limited to retail and office uses because “people still want to know that they will be guaranteed a parking spot” (Innmon, 2015). The challenge with parking overall is that the mixed-use developments involve developing different pieces of a large parcel by different owners and developers. Sometimes each stakeholder is only concerned with accommodating their needs and
tenants. Often the office building developer and owner just want enough parking for their employees and disregard the parking needs of the adjacent retail use (Innmon, 2015).

Municipalities also have the power to guide the location of development, prioritizing the need for access by vehicle. “When people are coming into the city, you want the least amount of impact on the traffic within the city” (Lettelier, 2015). The key idea for placement of these type of developments is to concentrate traffic on roads that are already designed for high volume, but also taking into consideration future transit opportunities. Therefore, in Plano, the existing and the proposed walkable mixed-use communities are primarily located along major highways. Opposition from homeowners also plays a role in locating higher density mixed-uses on the edges of the city.

**OPPOSITION**

Creating walkable compact communities means increasing densities and connecting new and existing developments. A big challenge the city faces is dealing with opposition from residents and homeowners due to misguided perceptions of increased density and traffic congestion associated with these types of developments. One of the first steps in connecting the various uses is to create accessibility between the currently separated residential and retail uses (Lettelier, 2015). Opposition comes primarily from homeowners with concerns of cut-through traffic.

Opposition causes problems for the developer as well as the city. If a developer is interested in developing a site that requires rezoning, they have to go through an extensive and costly rezoning process. After this process, the developer could still run into
opposition from the surrounding neighborhood residents and businesses. Owners fear that the increased density will lead to increased number of school-age children, thus impacting the quality of the school district and land values (Shacklett, 2015). Sometimes the challenge is understanding the individual neighborhoods. For example, a redevelopment for condos near a neighborhood with single family homes was turned down (Day, 2015). The condos were deemed an inappropriate use within this context and instead the site was redeveloped for office and retail uses. These outcomes also significantly depend on the developer’s outreach to the existing residents and the developer’s track record (Day, 2015). However, the term “apartments” is in itself considered a derogatory term in this region. Apartments mean higher densities, more school children, more traffic, and less attention to property maintenance (Day, 2015). This is especially true of larger apartments with multiple bedrooms. Large apartments are usually attributed to more children per household which leads to overcrowding in schools. Another issue is that residents of communities consisting primarily of single-family homes perceive apartment residents as less of their community (Schwartz, 2015). On the other hand, residents also fear unwanted traffic from the new development’s retail uses, as well as possible unwanted foot traffic through the neighborhood. “Ultimately, everyone wants to protect their own investment” (Shacklett, 2015).

ECONOMICS

Rethinking infrastructure is essential in creating more compact, mixed-use development patterns. For walkable development to occur, developers and municipalities
have to plan, allocate funds, and finance the costly and complicated infrastructure required for compact growth in a suburban setting (Urban Land Institute, 2012). This includes redevelopment of street grids, sidewalks, streetscapes, utilities and, where applicable, transit investment and parking structures. Modifying and upgrading the often out-of-date infrastructure that would make redevelopment feasible, attractive and, most importantly, economically successful, can be challenging and expensive (Urban Land Institute, 2012). Despite the costly infrastructure challenges, existing commercial corridors create great opportunities for redevelopment. In addition to housing a variety of retail and commercial uses that support the surrounding neighborhoods, these commercial corridors already have preexisting transit service.

From a developer’s point-of-view, there are significant limitations to capacity and increased development costs to be considered with redevelopment and repurposing. Compromises have to be made especially when the existing structures were not designed to accommodate newer technologies (Innmon, 2015). The challenge is the return on investment. Developers are taking huge financial risks in implementing innovative ideas because there may not be enough demand to justify the costs. “It all comes down to economics. It is safer to stick with existing full-proof ideas that are guaranteed” (Innmon, 2015).

Another challenge results from the market side of the development. In this region, the growing demand and the lack in supply of compact walkable communities means these types of developments drive up the rents. Increased rents in turn limit the type of uses within the development, thus limiting the walkability factor. For example, a necessary service like a small grocery store would not be able to compete and justify the rent,
resulting in residents having to drive to the nearest Wal-Mart for groceries (Innmon, 2015). The challenge then becomes finding the balance to justify the smaller uses that would make the development walkable.

In order to achieve walkability at the scale defined in the CNU would require demolishing the whole city and starting all over (Day, 2015). Realistically, solutions have to fit into the existing development pattern. Applying the originally intended walkability ideas is more about intensifying density going in existing developments (Beck, 2015). The challenge becomes attempting to retrofit neighborhoods without a clearly-defined grid network. The city has to prioritize redevelopment strategies because logically retrofitting the whole suburb is not economically justifiable and simply lacks the demand (Beck, 2015). Artificially creating urban centers like Shops at Legacy, a greenfield development, gives the city an economic advantage by choice of locale and accessibility to major regional connections. The city has to take into consideration that ultimately all the infrastructure maintenance will be its responsibility, and while maintenance costs increase, the land values could decrease if the development is unsuccessful (Lettelier, 2015).

Banks also play an important role in the implementation process. They are ultimately the ones that fund the projects and can refuse to support projects solely on projected profits and returns (Beck, 2015). This type of development is market-driven and while cities may encourage ground floor retail and commercial uses with residential above, the end result may only yield residential. From an economics standpoint, when developing greenfields, even increased residential densities may not support or justify retail or commercial ground floor uses, placing limitation for future development (Shacklett, 2015).
REGIONAL COOPERATION

Compact walkable mixed-use development in a suburban setting often requires extensive cross-jurisdictional infrastructure planning (Urban Land Institute, 2012). This is especially important in a city like Plano which is bounded by nine other cities. The surrounding cities are large and have their own politics and agendas that need to be considered in order to keep the city functioning efficiently. From a transportation perspective, regional communication exists because the Council of Governments coordinates regional efforts. However, limits exist in regional cooperation because “there are politics that will always be in the way and competition for tax dollars” (Day, 2015). Established and past relationships, spanning over administrations, between various jurisdictions play a major role. Neighboring cities have the potential to buy pieces of land in other jurisdictions to better serve their own needs, while in the process creating barriers within that particular jurisdiction.

The Council of Governments provides a certain network and open discussions on growth patterns and expectations for future and existing development. Regional cooperation among agencies also exists on schools and school districts. However, the question remains whether cities are necessarily planning for these interjurisdictional connections, and taking into consideration improvement, infrastructure, and shared services. “Efforts are being made to explore these opportunities wherever possible, regardless of existing political situations” (Schwartz, 2015).
WALKABILITY EFFORTS

“Efforts made by cities in this region primarily respond to demand” (Beck, 2015). Cities started by expanding existing and introducing new trail systems, both bike and hike, and then started connecting the trails and making them more accessible. However, it is difficult to change perceptions on increasing densities (Beck, 2015). The excitement surrounding Shops of Legacy and Downtown Plano, especially Downtown Plano because it is a transit-oriented development, creates growing interest in walkable developments. Despite the auto-oriented nature of the NCT region, other developments like the Mockingbird Station, also along the DART network, and Southlake Town Square, where people can drive to and then walk around, are generating increased demand (Day, 2015). On top of this, the balance of job availability and land values in the region makes the return on investment difficult to ignore. As population continues to increase and the city’s remaining vacant lots diminish, increasing density and rethinking development patterns are becoming major priorities. Currently, the City of Plano is involved in several efforts to realize these goals and encourage walkability. The city’s Director of Planning (Day, 2015), however, cautions that as the city’s efforts towards creating more walkable communities are underway “a big part of understanding the existing community is understanding that while it is important to accommodate new growth, new people and to ensure that everyone is comfortable, it includes this suburban lifestyle and as planners we underestimate that.”
TRANSPORTATION ALTERNATIVES

Plano’s Department of City Planning has been working with the City Council through visioning meetings to develop a process for new developments. Currently, they are exploring options and other ways of providing transportation through increased bus and light rail service and Bus Rapid Transit (Schwartz, 2015). Complete streets have also been discussed. In order to gain wider acceptance, it is necessary to prove that traffic functions would not be affected (Day, 2015). The existing and proposed locations for the compact mixed-use developments result in urban centers primarily along the edges of the city. These centers lie on transit lines as well as along major highways. Taking this into consideration, walkability may need to be isolated to specific areas (Schwartz, 2015).

Scale is an important factor to consider when discussing walkability. If people are willing to walk approximately ½ mile, the next step is addressing the connections for adjacent areas. In a city like Plano where a street block could be 1000 feet or more, this idea becomes a challenge. While options are being explored for connectivity along major corridors and the possibilities of creating transit oriented development nodes, “you will never be able to look at the entire city in terms of walkability at that scale” (Schwartz, 2015). Plano has joined the 8–80 Cities Initiative, where roadways are examined by measuring whether an eight or an 80 year old would be able to cross safely. “The question then becomes how to safely get people across, and one solution is trails and underpasses” (Schwartz, 2015).
TRAIL NETWORKS

The city’s population is in need of more exercise opportunities and trail systems have become the number one amenity in neighborhood developments (Wolver, 2015). However, while there is increased interest in walking, “the demand mainly lies in recreational walking due to the safety issues in crossing the major thoroughfares” (Schwartz, 2015). Trails can provide the much-needed physical activity to the suburban lifestyle and could potentially resolve the connectivity challenges and barriers imposed by auto-oriented development patterns. “Trail systems have been an increased effort recently and a full time trail planner has been added to the staff” (Day, 2015). One of the goals in revising the city’s Comprehensive Plan focuses on exploring different ways to create ‘safe connections and accessibility through trail systems, where those connections can be made, and how to improve access from existing trails. Because climate is such an important factor, the city has also made efforts to make sure some of the trails are protected from the elements. Currently trails connect several different neighborhoods, libraries, and recreational centers. “Perhaps we can look to our trails to ultimately connect retail and gathering spaces throughout the city” (Schwartz, 2015).

Efforts are also made on regional-scale cooperation through the connection of Plano’s Bluebonnet Trail to the City of Allen’s Six City Trail (McDonald, 2015). This connection is part of the Six Cities Trail Plan which is a project between the cities of McKinney, Frisco, Plano, Allen, Garland, and Richardson. This is Plano’s first inter-city connection which eventually aims to create a fluid trail network between all six cities (NBC, 2012). Other discussions of trail systems have resulted in creating safe bicycle routes that would connect the rest of the city to East Plano, across a major highway, Central
Expressway. This trail is planned to connect to the Parker Road Station along the DART light rail in order to ease access to transit.

OTHERS

Since the creation and adoption of the Urban Mixed–Used zoning districts, two sites have already been approved for development. The sites are located along the city’s southern border, President George Bush Highway, one at Coit Road and second at Alma Road (Figure 23). These will be greenfield developments in the middle of established residential, retail, and business districts. Not only are the sites accessible by multiple modes of transportation, their location along Plano Road, which is home to various corporate offices such as Dell Services, FedEx Office, Alcatel Lucent, Republic Title, provides an existing job market as well as retail customer base. Locating these sites in close proximity to existing residential and business districts provides opportunities for connections between the existing and future developments.

The product of the 1980s–1990s neighborhood unit development pattern of Plano is major intersections with four corners of commercial development. Of the four corners, usually only one is successful while the others might be struggling or even failing. Plano is currently revisiting the neighborhood units’ four-corner retail developments and exploring mixed–use development at a smaller scale. The Planning Department is working on incorporating the STAR Communities’ Community Urban Center category, designed to promote appropriate redevelopment, preservation, and adaptive building reuse in older commercial areas. Following these guidelines could potentially transform the corners into walkable developments with varieties of mixed–uses that complement the adjacent
neighborhoods (Schwartz, 2015). To ensure successful implementation it is important to figure out the right placement of these centers and how to connect them to the surrounding neighborhoods.

In recognizing the existing outdated development pattern combined with land availability limitations, the City of Plano introduced an Economic Development Incentive Fund (EDIF) geared towards redevelopment of current properties. This incentive program recognizes the need for improvement and redevelopment to meet progressive demands, including those related to walkability objectives, such as sidewalk and public infrastructure improvements (Plano, 2014).

An example of some of the efforts on the part of developers is at first designing the site without any roadways, prioritizing pedestrian circulation, connectivity, and comfort, and then introducing only the necessary roadways (Woliver, 2015). This type of design is based on a hierarchy of trails and sidewalks and a culture of trees and streets that provide an urbanized feel and more opportunity for walkability. However, the only reason this type of development was possible, was because the land “did not fall within any specific jurisdiction and did not face any red tape” (Woliver, 2015).

CONCLUSIONS AND RECOMMENDATIONS

While walkability has gained popularity in recent years, it is deeply rooted by traditional development patterns such as the Neighborhood Unit. Both concepts respond to urban disorganization as well as congestion. Even though the idea of the Neighborhood Unit still exists, the increase in automobile dependence has significantly increased the
scale at which the concept has been applied. Walkability objectives are interpreted differently across various regions, depending on the cultural background, and the scale at which they are applied significantly differs by region. Different cities face different challenges and have different agendas and priorities, therefore, there is no universal formula for implementation of walkability objectives. Most importantly, planners must not consider walkability as a stand-alone goal but rather as one of the underwriting factors in comprehensive livability of a neighborhood.

For Plano, one the biggest challenges in creating successful walkable communities is, and will continue to be, the city’s urban form, as it was founded and rapidly grew at the time when the automobile ruled transportation. However, this is not the only challenge planners and developers face. Multiple economic challenges are associated with the existing auto-oriented infrastructure that affects both planners and developers in their efforts to effectively redevelop communities. Successful walkable development and redevelopment require expansive cooperation and open communication across multiple channels. Presently, challenges exist due to the lack in regional cooperation between municipalities, the lack of communication between various city departments, and communication between residents and developers.

Although the concept of walkability revolves around the traditional grid and compact design, for many suburban cities ‘traditional’ signifies auto-oriented. The observations and interviews presented reveal that the City of Plano will most likely never be able to achieve walkability on a citywide level, nor would that be desired by most residents. However, the support of compact, mixed-use, higher density development in designated Urban Centers creates walkability nodes throughout key areas of the city. While
observations of two of these sites revealed that implementation of walkability objectives follows the guidelines set forth by the Charter of New Urbanism as well as the visions set by the city, both sites exhibit inconsistencies. The inconsistencies primarily included path connectivity and context, quality of the pedestrian realm, and continued vehicle prioritization. The following recommendations are based on the inconsistencies observed in the Downtown Plano site.

PATHS

Path context and connectivity play a key role in the pedestrian experience. While the site introduces sidewalks along most of the streets, provision alone may not be enough. Figure 33 demonstrates potential locations for existing sidewalk improvements: three locations for improvements around existing bus stops, identified with lighter circles, and three locations for sidewalk bulb-outs, identified with darker circles.

The highlighted sidewalks identify areas where paths are obstructed by utility boxes, where paths are too narrow, and areas where paths are absent. To resolve these issues, the city’s Transportation and Planning Departments should follow the sidewalk width and context requirements set by the Urban Mixed-Use zoning regulations. The highlighted sidewalks should also be remedied to introduce more landscaping and buffers to protect pedestrians from traffic as well as provide protection from the weather elements.

The identified bus stops, especially considering their proximity within the Downtown area, should contain more than the stop sign. The Transportation Department should introduce proper shading in order to protect commuters from the elements and adequate seating options. An ideal example is the existing bus stop at 16th Street which provides
seating and a glass enclosure to protect commuters from rain, wind, and excessive sun exposure. The three darker areas identify locations where path connectivity should be enhanced by introducing bulb-outs or other treatments to ensure the safety of pedestrians while crossing. These areas could also be enhanced by creating sidewalk continuity, keeping consistent level and surface across the roadway. This technique will also force vehicle traffic to slow and approach with caution, creating a safer pedestrian environment.

**PEDESTRIAN REALM**

Figure 34 identifies all the areas dedicated to automobile parking. Some of the smaller streets exist specifically to serve as access to parking. These areas are unsafe for the pedestrian and cut off access within the pedestrian realm. Figure 35 identifies the key areas where the city should restrict automobile use and reserve use primarily for the pedestrian. These areas can serve as extensions to the existing pedestrian plazas as well as extensions for existing commercial uses to encourage outdoor dining and other activities.

One of these plazas, south of 15th Street, would be an extension of an existing pedestrian plaza with street furniture, a fountain, and existing retail uses. The existing north bound DART stop is located just north of 15th street and sits adjacent to residential units. The Transportation Department should consider moving the north bound DART stop, south of 15th Street, to the extended pedestrian plaza. This could activate the space and the adjacent retail uses, creating a destination to encourage more visitors to Downtown Plano.
Ground floor retail and activity are important elements in creating an interesting pedestrian realm. Figure 36 identifies locations where the Planning Department should regulate ground floor uses. Uses in these areas should be reserved and encouraged for the type of retail activity that has the most potential to activate the pedestrian realm. These areas should provide outside seating and activity, large active store-fronts, and uses that will draw interest and foot-traffic throughout the day. The Planning Department should develop strategies that will support continued engagement with residents, customers, and businesses alike. This could be achieved through street festivals, concerts in the park, farmers markets, and other social events that would draw visitors and interest to the area. Continued investment in walkability and organizational tools like business improvement districts and community improvement districts have the potential to coordinate and promote methods. These recommendations are just a few of the retrofits that might improve not only walkability but also livability throughout Downtown Plano.

Unfortunately, data availability and time constraints presented significant limitations throughout this research. Future research on walkability implementation in the City of Plano should include extensive evaluation of the implemented walkability objectives on a site-by-site basis. Commuter and resident surveys can also help in identifying which objectives are the most effective for each specific area.

The City of Plano has made significant progress in terms of providing and promoting walkability through various investments and policies. This research, along with previous literature, reveals that redeveloping sprawled suburban cities into compact walkable communities faces numerous challenges, some of which may never be resolved. However, the city’s acceptance and zoning for mixed-use urban centers has created a
growing interest in the concept and continued strides in the right direction. Walkability has many different definitions, especially when it comes to dealing with walkability on a Texas scale. The challenge comes in prioritizing, choosing, and recreating the right elements in order for walkability to work in this region.
Works Cited

Beck, B. P. (2015, January 8). Dean, School of Urban and Public Affairs - University of Texas, Arlington. (O. Chernomorets, Interviewer)


Lettelier, J. (2015, Januray 5). Director of City Planning at Firsco. (O. Chernomoret, Interviewer)


Woliver, T. (2015, January 8). Director of Planning and Development at Hillwood Communities. (O. Chernomorets, Interviewer)
Figure 1: Clarence Perry’s Neighborhood Unit

Figure 2: City of Plano within Collin County, of the North Central Texas Region
Figure 3: Areas of Interest within the City of Plano (City of Plano GIS Division, 2012)

Figure 4: City of Plano Population Distribution by 2010 Census Tracts (City of Plano GIS Division, 2012)
Figure 5: Shops at Legacy Locator (Google Maps, 2014)

Figure 6: Shops at Legacy Bird’s Eye View (Google Maps, 2014)
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Figure 8: Downtown Plano Bird’s Eye View (Google Maps, 2014)
<table>
<thead>
<tr>
<th>Table 1: UMU District Requirements – Single Family Attached</th>
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<tr>
<td><strong>UMU District Requirements – Single Family Attached</strong></td>
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<tr>
<td><strong>Density</strong></td>
<td>Maximum: 40 dwelling units per acre</td>
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<td></td>
<td>Minimum: 25 dwelling units per acre</td>
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<tr>
<td><strong>Height</strong></td>
<td>Maximum: 3 stories</td>
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<td>Minimum: 2 stories</td>
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<tr>
<td><strong>Lot Coverage</strong></td>
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<td><strong>FAR</strong></td>
<td>No Requirements</td>
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<td><strong>Front Yard Setback</strong></td>
<td>75% of the building façade within 25 feet of the street curb</td>
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<tr>
<th>Table 2: UMU District Requirements – Commercial and Multifamily</th>
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<td><strong>Residential Density</strong></td>
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<td></td>
<td>Minimum: 1:1</td>
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<tr>
<td><strong>Front Yard Setback</strong></td>
<td>75% of the building façade within 25 feet of the street curb</td>
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Figure 9 Missing Sidewalks

Figure 10 Edge of Walkability
Figure 11: Shops at Legacy Bird’s Eye View (Google Maps, 2014)

Figure 12: Retail along Bishop Road, South section
Figure 13: Lone Star Drive

Figure 14: Office Towers on Lone Star Dr, North Section
Figure 15: Marriott Hotel, South Section

Figure 16: Residential, North Section

Figure 17: Residential, South Section
Figure 18: Hidden parking structure along Lone Star Dr, North Section

Figure 19: Hidden parking structure along Bishop Rd, South Section

Figure 20: Enclosed outdoor room, South Section
Figure 21: Minor residential street, North Section
Figure 22: Shops of Legacy outlined within Census Tracts 316.57 and 316.58

Table 3: Total Population and Density

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<td>Total Pop</td>
<td>Density</td>
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<td>316.57</td>
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*Density: per square mile
Figure 23 Legacy West Development (Brown, 2014)

Figure 24 East 15th Street
Figure 25 Hidden Garage Structure

Figure 26 On-Street Parking

Figure 27 Pedestrian Scale
Figure 28 Recently Completed Mixed-Use Building

Figure 29 Restaurants and Retail
Figure 30 Public Open Space

Figure 31 Pedestrian Crosswalk
Figure 32 Existing UMU Zoning Districts
Figure 33: Downtown Plano Sidewalks Diagram

- Areas for sidewalk improvements
- Areas for bus stop improvements
- Areas for pedestrian crossing improvements
Figure 34: Downtown Parking Lots Diagram

Existing parking lots
Areas for pedestrian improvements
Areas for ground floor improvements
## APPENDIX A

### Interviews

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<thead>
<tr>
<th>Date</th>
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<th>Title</th>
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<tr>
<td>January 5th, 2015</td>
<td>Jeff Innmon</td>
<td>VP of Design and Construction for KDC Real Estate Development and Investments</td>
</tr>
<tr>
<td>January 5th, 2015</td>
<td>John Lettellie AICP</td>
<td>Director of Planning for the City of Frisco</td>
</tr>
<tr>
<td>January 6th, 2015</td>
<td>Chris Shacklett AICP</td>
<td>Senior Planner for the City of Richardson</td>
</tr>
<tr>
<td>January 6th, 2015</td>
<td>Jennifer Arnold</td>
<td>Planning Manager for the City of McKinney</td>
</tr>
<tr>
<td>January 7th, 2015</td>
<td>Christina Day</td>
<td>Planning Director for the City of Plano</td>
</tr>
<tr>
<td>January 7th, 2015</td>
<td>Dough McDonald</td>
<td>Senior Planner for the City of Plano</td>
</tr>
<tr>
<td>January 7th, 2015</td>
<td>Steve Sims</td>
<td>Senior Planner for the City of Plano</td>
</tr>
<tr>
<td>January 7th, 2015</td>
<td>Lori Schwartz</td>
<td>Planner for the City of Plano</td>
</tr>
<tr>
<td>January 8th, 2015</td>
<td>Barbara Beck PhD FAICP</td>
<td>Dean of the School of Urban and Public Affairs, at the University of Texas Arlington</td>
</tr>
<tr>
<td>January 8th, 2015</td>
<td>Tom Woliver</td>
<td>Director of Planning and Development at Hillwood Communities</td>
</tr>
</tbody>
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APPENDIX B

Interviews conducted with city planners in Plano included the following questions:

1. How do you define walkability for this region?

2. What efforts has the city made to create walkable communities? Why did you begin these efforts? When? What were your goals? Has there been success?

3. What tools do you need to produce walkable communities in Plano?

4. The “Urban Centers” Study identifies several key locations for potential walkable development, why were these sites selected and have any of them been developed? What happened? Do you believe there was success? Why or why not? How do you measure success?

5. What kind of potential social, environmental, civic or economic benefits do successful walkable communities offer?

6. How influential are the city’s comprehensive plan and existing zoning regulations in development of walkable communities? The “Urban Centers” Study and Mixed-Used Development Element of the Comprehensive Plan call for connectivity of walkable communities, such as urban centers, with surrounding developments/communities, but the Transportation Element advises against sidewalks along major thoroughfares, how has this inconsistency effected development?

8. What challenges does the city face in the design and development of walkable communities? How can these challenges be overcome?

Interviews conducted with city planners in municipalities surrounding Plano included the following questions:

1. How do you define walkability for this region? How do you measure success?
2. What efforts has the city made to create walkable communities? Why did you begin these efforts? When? What were your goals? Has there been success?
3. What tools are needed to produce walkable communities here?
4. What has been done to date? Why did you select these sites? Do you believe there was success? Why or why not?
5. What kind of potential social, environmental, civic or economic benefits do successful walkable communities offer?
6. What challenges does the city face in the design and development of walkable communities/developments? How can these challenges be overcome?
7. Can suburbs of the North Central Texas Region achieve complete walkability? Why? Why not?

Interviews conducted with developers and academics included the following questions:

1. How do you define walkability for this region? How do you measure success?
2. What goes into the process of designing a walkable community/development? What tools are needed to produce successful walkable communities?
3. Are there any successful walkable communities/developments within the DFW Metroplex?

4. Where has implementation of walkable objectives been most successful? Why were these sites more successful than others? What affects successful implementation?

5. What potential social, environmental, civic or economic benefits do successful walkable communities offer?

6. How influential are the city’s comprehensive plan and existing zoning regulations in developing a walkable development?

7. Can suburbs of the North Central Texas Region achieve complete walkability? Why? Why not?

8. What are the challenges in the design and development of walkable communities in this region? How can these challenges be overcome?