

IMPACT OF INTERACTIVE DIGITAL KIOSKS UPON
SOCIAL BEHAVIOR IN URBAN PUBLIC SPACES

By

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Abstract

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The objective of this thesis is to study the impact of Interactive Digital Kiosks upon human social behavior in urban public spaces. William H. Whyte; an author of *The Social Life of Small Urban Spaces*, highlights several characteristics that promote the successful use of urban spaces: sitting space, nature, concessions, pathways, and triangulation (Whyte 1980). The way in which one of these five characteristics i.e. triangulation, influences human interaction is the focus of this thesis. Triangulation is the “process by which some external stimulus provides a linkage between people and prompts strangers to talk to each other as though they were not” (Whyte 1980 p.94). The aspects of human social behavior studied in this thesis are the demographics; duration of usage; browsing data preferences; self-congestion, meaning the amount and location of new interaction; and individualism. Using the West End in downtown Dallas as a case study, this thesis uses on-site observations and interviews with users and designers/manufacturers to analyze the role of the smart kiosks, how they play a crucial role in promoting users’ enjoyment of public spaces and user interaction.

For many years, the Internet of Things (IoT) has captured headlines, with various media outlets describing its potential to transform lives by enabling “smart”, sensor-enabled devices to communicate with each other, and with end users. By combining physical and digital infrastructure, city leaders can more efficiently use data to provide their constituents with an enhanced quality of life (Smart Cities Living Lab Case Study 2018). In contrast, relatively little research has been conducted on the relationship between specific Interactive Digital Kiosk functions and human social behaviors. In response to these gaps in the literature, this research investigates functions of Interactive Digital Kiosks to determine how these factors influence human social behavior. The West End which represents a microcosm of the urban environment and has connectivity to the downtown area is chosen as the case study, as Dallas is a major city that is a great testing ground with a diverse population (Smart Cities Living Lab Case Study 2018).

This research uses qualitative techniques (Deming and Swaffield 2011) (Taylor and Bogdan 1998) in the form of the secondary data, researcher’s passive on-site observations to analyze the impact of social interaction and in-depth interviews with the kiosk users and designers. Visual space design factors; kiosk installation locations; typology and relationship to the surrounding environment, are recorded in photographs. This research also utilizes in-depth interviews with visitors to the location and designers to obtain a rich understanding of the users’ experiences and perspectives. Also, the research uses behavioral mapping by preparing various ethnographic studies (Deming and Swaffield 2011).

Data analysis and findings from this research illustrate how various Interactive Digital Kiosks’ functions and location characteristics play an important role in people’s social behavior in West End, Dallas. Analyzed research themes are developed from both observation and interview data from the West End. The themes in this research identify which functions of Interactive Digital Kiosks can affect human social behavior and discuss how they are impacted. Themes are derived from the learning of the literature review. The findings utilize data from secondary sources, on-site observation and on-site

interviews with the kiosk users and DIA team members to understand the relationship between Market Street characteristics, the kiosk features and human social behavior in West End. The defined characteristics(measures) in Market Street include the restaurant patio and seating spaces, widened brick sidewalks and crosswalks, street parking, mixed-use surrounding, transit connectivity, bike stations, historical district etc. In addition, eight themes are developed from the data: variety, accessibility, privatization of public space, triangulation, user conflict, safety/security, symbolic value, user-friendly features. Based on the defined themes from behavioral mapping analysis and on-site interviews analysis at the Market Street in West End, researcher found that kiosk has potential to make a positive impact to encourage opportunities for social interaction but needs additional key features to make it more usable by people and address issues like digital divide. When designing and planning future urban spaces, these characteristics and features can be implemented to enhance the aspects of human social behavior studied in this thesis.

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Chapter 1: Introduction

1.1 Introduction

This chapter presents the motivation for this research and introduces the research questions for this thesis. This chapter also discusses definitions of terms, research methods, and significance of and limitations in this research. The goal of this research is to examine the impact of Interactive Digital Kiosks upon human social behavior in urban public spaces.

Cities are living systems- where technology, the built environment, and people interact at the micro level, in terms of urban spaces (Archive, 2017). Public spaces play an important role in defining the flavor of the city (Smart Parks 2016). As technology is constantly developing at a rapid pace, so are the applications and services that become utilized in everyone's daily life. As the use of digital networks becomes an essential part of everyday life, a new digital layer is added on to the existing urban landscape. This causes the urban environment to be experienced through multiple layers, with direct contact to the mediation of digital technologies. The redefinition of public space in terms of both physical and digital existence rises as an essential question. The continuous advancements of this information age and the revolution in mobile phones, wireless internet, Bluetooth, Global Positioning System (GPS) and all their associated applications have influenced the way people interact with each other and with their physical space, which raises questions about the impact of these technologies on the usage and act of communication within public space, and how can urban planners create a new kind of livable, attractive, safe and sustainable public space with a fluid hi-technology infrastructure (Abdel-Aziz et al. 2016).

1.2 Problem Statement

With the immersive invasion of the internet as well as smartphones' applications and digital social networking, people become more socially connected through virtual spaces instead of meeting in physical public spaces. The challenge for the planners and urban designers is to manage to blend these

technologies into the urban fabric so they do not disrupt the form and visual amenity of their setting. Successful public spaces should be safe, attractive, livable, healthy, and sustainable together with the flexibility to cope with the new needs appearing in each era (Abdel-Aziz et al. 2016). Therefore, to promote an understanding of how smart technologies influence people's social behavior in public spaces, researchers should evaluate the attitudes of the users of these technologies.

1.3 Purpose of the Research

The purpose of this study is to understand how the functions of Interactive Digital Kiosks and defined location characteristics contribute to people's social lives in public spaces, and how they can make cities more efficient places to live and work. In addition, this study on the Interactive Digital Kiosk in urban environments will provide further insights for future designers and developers interested in and working with the Interactive Digital Kiosks (IDK).

To this end, this thesis examines the IDK in West End, Dallas. The West End which represents a microcosm of the urban environment and has connectivity to the downtown area was chosen as the case study, as Dallas is a major city that should be a great testing ground with a diverse population (Smart Cities Living Lab Case Study 2018). The study area is centrally located in the downtown area and is intended to serve as a common meeting area for nearby residents, employees, and visitors.

This research has three aims. First, it will examine the functions of the IDK and identifies those with the potential to influence human social behavior. Second, it will investigate in what ways these functions of the IDK influence human social behavior.

1.4 Research Questions

1. How does the IDK influence human interaction in urban cities?
2. How will the IDK impact future urban design?
3. How will it enhance/attract other local business in the defined open space?

1.5 Definition of Terms

- Behavior mapping: Behavior mapping is a form of systematic unobtrusive observation research that tracks the behavior of individuals in relation to features of the physical environment (Cosco et al 2010).
- Human behavior: Human behavior is the range of actions and mannerisms exhibited by humans in conjunction with their environment, responding to various stimuli or inputs, whether internal or external, conscious or subconscious, overt or covert, and voluntary or involuntary (Loehlin et al. 1988).
- Human social behavior: Human social behavior is the behavior of how people influence and relate to one another (Myers 2007).
- IDK: An IDK is an installation with screens that are touch interactive or smartphone-interactive which allows content to be uploaded in a variety of formats including video, text, still photos, audio, etc., (Loukaitou-Sideris et al. 2018).
- Functions of IDK: IDK can provide access to transit information, awareness campaigns, local points of interest and public facilities (Smart Cities Living Lab Case Study 2018). Functions are customized to needs of users of the public space where kiosk is located.
- Qualitative research technique: Qualitative research techniques seek answers to broad questions and collect descriptive data from participants (Deming and Swaffield 2011).
- Self-congestion: Self-congestion is the amount and location of a new interaction between people (Whyte 1980 p.19).
- Triangulation: Triangulation means that “process by which some external stimulus provides a linkage between people and prompts strangers to talk to each other as though they were not” (Whyte 1980 p.94).

- Internet of things (IoT): Internet of things is a digital network of sensors and devices that interact with and share data among each other via the Internet (Loukaitou-Sideris et al. 2018)
- Analytical model approach: Analytical model approach gathers data from existing real-world situations and investigates relationships between variables (Deming and Swaffield 2011).
- Wayfinding: Wayfinding design provides directional guidance (signage, arrows, symbols, maps etc.) and the means to help people feel at ease in their surrounds (Gibson, 2009:12).
- Variable: A variable is a concept that allows for variations of its instances (Krippendorff 2004).
- Content Analysis: Content analysis is context sensitive and therefore allows the researcher to process as data texts that are significant, meaningful, informative, and even "presentational to others (Krippendorff 2004)".

1.6 Research Methods

This research used qualitative techniques (Deming and Swaffield 2011) (Taylor and Bogdan 1998) to assess the functions of the IDK that influence human social behavior in the urban environment. The functions of the IDK at West End and the ways these features influence human social behavior were identified through secondary data, on-site observations, and interviews with users and professionals who are familiar with the IDK. Secondary data was comprised of review of 'Smart Cities Living Lab Case Study Report' published by Dallas Innovation Alliance (DIA) and review of case study briefs. On-site observations provided insight the functions of the IDK and how these functions affect user perception. Visual space design factors: kiosk installation location; typology, and relationship to the surrounding, were recorded in photographs. Also, the researcher used behavioral mapping by preparing various ethnographic studies (Deming and Swaffield 2011). Published case study and dashboard reports by Dallas Innovation Alliance (DIA) were utilized as secondary information to help the researcher have a deeper understanding of the study location.

Interview data from users were analyzed using the Analytical Model approach (Deming and Swaffield 2011). Interview data was used to examine and define the users' opinions on the ways the functions of the IDK can influence human social behavior. Finally, the interview questions were open-ended so that the researcher could have in-depth discussions with each informant.

1.7 Significance and Limitations

This research offers potentially valuable contributions to the emerging field of outdoor smart furnishings and landscape architecture. The data collected in this research can inform future study in smart public space design in the DFW area. In addition, study findings can add to the existing knowledge base and contribute to understanding the impact of the IDK upon human social behavior, the results of this research can be a valuable asset to design professionals.

The study also has some limitations. Study area visitors chosen for on-site interviews may not have been sufficiently familiar with the kiosk to provide useful perceptions. In addition, age, gender, education background, and cultural differences will influence the perceptions of the informants in this study. The final limitation has to do with the time of the study. As the observations and interviews for this thesis were from February and March, the cold weather and resultant short observation and interview times may have limited the number of site visitors and/or inhibited them from participating in outdoor activities or engaging with other visitors. Due to the lack of any other kiosk installment in the DFW metropolitan area, the researcher had to rely on secondary data provided by professionals to prepare initial literature.

1.8 Study Location: West End in Dallas Overview

The West End Historic District of Dallas, Texas, is a historic district that includes a 67.5-acre (27.3 ha) area in northwest of downtown Dallas. It lies generally north of Commerce, east of I-35E, west of Lamar and south of Woodall Rodgers Freeway (Figure 1). The West End is south of Victory Park, west of the Arts, City Center, and Main Street districts, and north of the Government and Reunion districts.

Listed on the National Register of Historic Places, the area was originally a trading post. The existing old brick warehouses located there that have been refurbished into urban residences, restaurants, and shops. The site is located in the close proximity to the West End DART station and is at walking distance from Downtown Dallas, Dallas Convention Center, Victory Plaza, and the Perot Science Museum. The West End which represents a microcosm of the urban environment and has connectivity to the downtown area is chosen as the case study, as Dallas is a major city that is a great testing ground with a diverse population (Smart Cities Living Lab Case Study 2018). Additionally, site location is in Dallas which allows researcher to test the findings from literature and assumptions made during this study.

Study locations for the research is the N Market street in the West End District. On the N Market Street, Study Location 1 is situated between Pacific Ave and Ross Ave and Study Location 2 is situated between Ross Ave and Corbin street. The research focused on comparing both the sites which has similar street characteristics except site 1 includes of smart technology variable (Figure 2). Similar features allow the researcher to measure the qualitative aspect of the sites to further define the relationship between the characteristics of IDK and human social behavior.



Figure 1 West End Historic District
(Source: Google Maps)

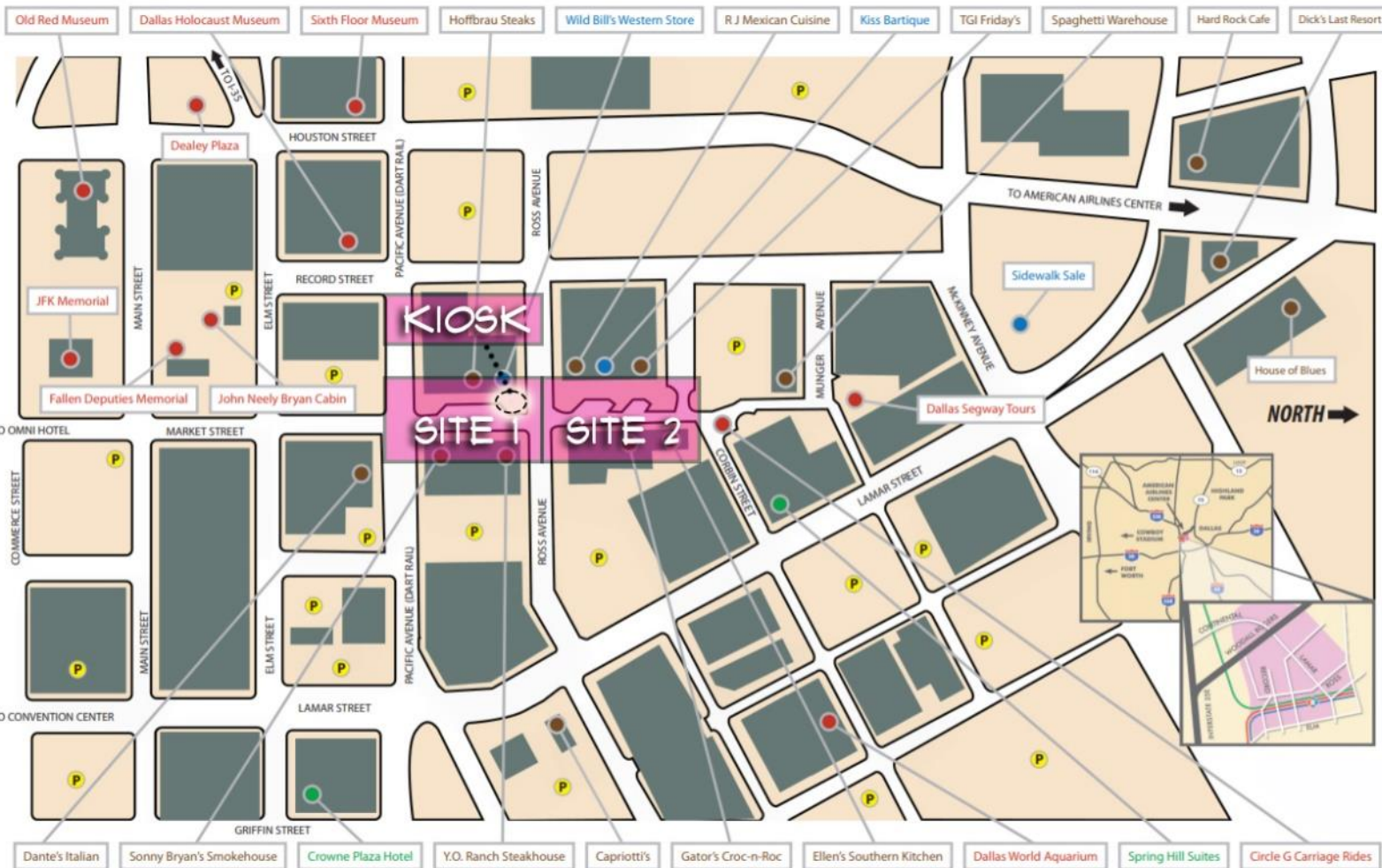


Figure 2 Site Context Map
(Source : VisitDallas)

1.9 Summary

The purpose of this research is to identify the IDK characteristics that can influence human social behavior at West End. The site selected for this study, the West End in downtown Dallas, was chosen for this study for two reasons. First, the study area is one of the leading tourist destinations for its rich history. Second, because the site is located in downtown Dallas, the researcher can visit the site for on-site observations and gain a deeper understanding.

This research has been organized into five chapters. The first chapter is the Introduction. It identifies the research objectives and describes the research methods. Chapter Two, the Literature

Review, focuses on the connection between urban environment, smart furnishing, human behavior; and reviews current research on IDK. Chapter Three, Research Methods, includes the research design and the significance and limitations of this research. Chapter Four, Analysis and Findings, provides results from on-site observations, behavioral mapping, and interviews. Finally, Chapter Five, the Conclusion, is a discussion of the findings and suggestions for future research.

Chapter 2: Literature review

2.1 Introduction

This chapter presents a review of the literature and research on the relationship between urban spaces and social behavior. This chapter also covers the social value of urban open space and how this research is important for landscape architecture. In addition, there is a brief review of smart furnishing typology and a detailed definition of the term 'IDK'. The review also focuses on several case studies from the United States to derive the characteristics of the selected kiosks. Finally, this chapter introduces background knowledge of the study location in the West End, including size, location, and surroundings.

2.2 Urban public spaces as research venues

The public spaces of a city, such as its streets, footpaths, waterfronts, parks, plazas, town squares, and laneways give form to the ebb and flow of human exchange and interaction (Carr et al. 1992). Public spaces are significant because they are able to bridge the gap between individual to the rest of the world. Public spaces provide avenues for movement, places for communication, and common grounds for enjoyment and relaxation. The capacity of public spaces to teach and offer learning is also a significant perspective, especially when those spaces play an important role in the history of the city and the social life of its citizens (Aghostin-Sangar 2007). At the same time, the users of these spaces are also capable of influencing the spaces' form and feel, by introducing social characteristics and elements such as culture, gender, sexuality, ethnicity, and age. These components, together with the physical and encompassing (or non-physical) features of the public space, are fit for profoundly affecting the manner in which that individuals act, experience and interact in public spaces (Madanipour 2003).

The literature reveals that creating public open space has been used as a tool to improve the urban environment, to enhance urban images and to improve the quality of life of urban residents (Gehl and Gemzøe, *Public Spaces, Public Life*. 1996). The significance of public spaces has been widely recognized, mainly from the perspective of improving quality of life through a comfortable environment

and abundant public life; enhancing the urban image through urban vitality and affecting economic development through investment which is attracted by making a good image (Aghostin-Sangar 2007). Despite the changing nature of modern neighborhoods and communities, public spaces are still essential parts of life because they provide opportunities for various individuals—young, old, etc., retired from work, unemployed, students and government official workers, etc. to experience a variety of human encounters (Hanafi et al, 2013).

Public spaces can afford opportunities for casual encounters in the course of daily life that can tie individuals together and give their lives significance and power. A century ago, outdoor activities in public spaces were exclusively necessary, forty years ago, the primary focus was shopping, while recently recreational activities, cultural events, parades, and exhibitions are hosted in public spaces (Figure 3). These spaces do not only serve daily needs but also can be placed to gather for special occasions, as well as, binding together the major city functions and activity trends (Hanafi et al, 2013).

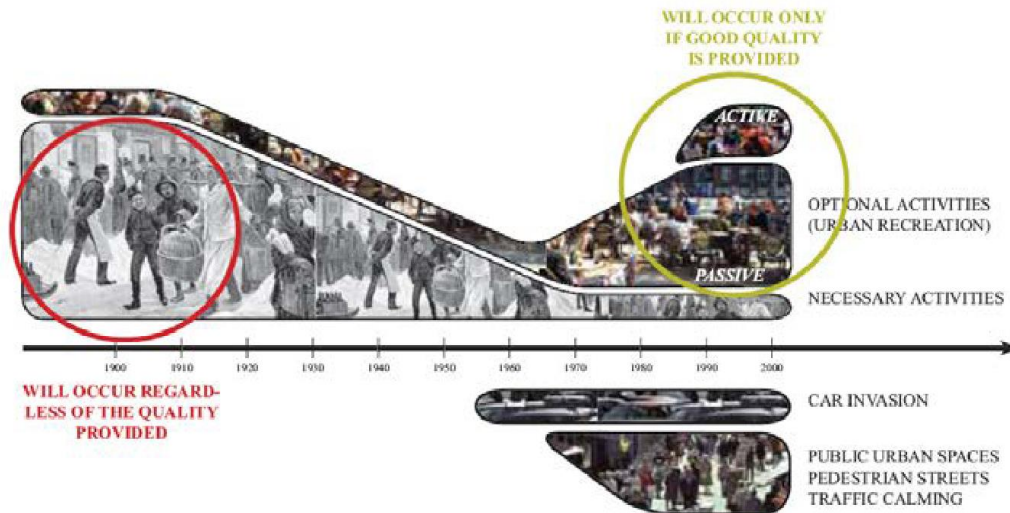


Figure 3 Development of Public Life from 1880 to 2005
(Source: Hanafi et al, 2013)

2.3 Social behavior in public space

According to Gehl and Gemzøe (1996, 2001), the activities within the main city spaces are specifically divided into three main categories of outdoor activities in the public spaces in a city, each of

which places very different demands on the physical environment. These three activities are classified as necessary activities, optional activities and social activities. The city's most prominent public spaces are often emblematic of the city itself and reflect whether its citizens relate well to the city and to each other (Li 2003, 9–14). According to Gehl (2010), no matter what technical innovations are taking place, human beings have not changed. They still need casual contact with other human beings that used to be built into daily life. Public spaces can afford opportunities for casual encounters in the course of daily life that can bind people together and give their lives meaning and power. The development of urban open space has been a tool to enhance the urban environment, improve the identity of the place, and to improve the quality of life of the urban space users. Social activity can take place on any occasion when there are people present. People's perception of their environment influences their social interaction within that environment (Hanafi et al, 2013).

Hanafi (2013) states that “site design creates opportunities to gain human response, which encompasses physical and intellectual welfare, environmental quality, and overall quality of life”. Users of urban public space can also influence the form and sense of these spaces, by way of introducing social traits and factors which includes culture, gender, sexuality, ethnicity, and age. Those factors, collectively and in combination with the physical and ambient functions of the public space, can have a profound impact on human behavior, experience and interaction in public spaces (Hanafi et al, 2013). Site design that keeps user needs in focus can draw people to outdoor space and can be driving force to bring other people to create a venue for social interaction (Whyte, 1980).

Theoretical studies (Hanafi et al, 2013) have been specifically focused on the virtual relationships among factors affecting human social behavior as a dimension of urban design and the elements affecting the guidelines of public urban space design from the human social behavior point of view. However, the size, scale, functions and spatial elements of public spaces influence user behavior,

primarily influencing people’s choices. External factors which include the economy, social background, and culture can also be dominating factors for the design decisions (Figure 4).

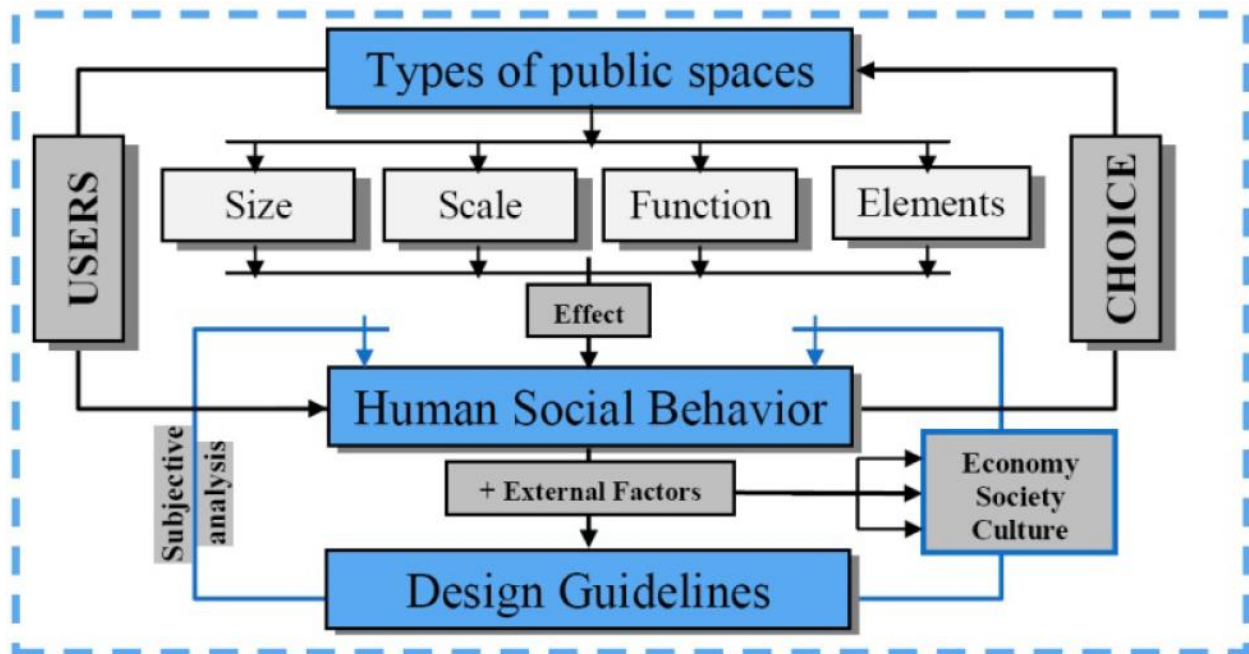


Figure 4 Relationship between social behavior and public spaces
(Source: Hanafi et al, 2013)

2.4 Literature on Urban Spaces and Human Social Behavior

2.4.1 William H. Whyte (1980)

In the book, Social Life of Small Urban Spaces, Whyte (1980) analyzes his research taken from “The Street Life Project.” This book includes studies about people’s social activities in urban public spaces. According to Whyte, a deep and broad understanding of the way people use spaces is necessary to create a successful urban space (Whyte 1980). In Whyte’s opinion, designers can learn much about people’s social needs by passive observation of and discussions with users of public spaces. Therefore, he observed and recorded the daytime public life of open spaces using time-lapse photography to chart his findings (Whyte 1980). Whyte points out six characteristics that are important to create a successful urban park/plaza in his book.

The first characteristic is comfort spaces. According to Whyte’s (1980) findings, most people in public spaces tend to stay in a corner of the space, for example, near the steps or walls on the edges

instead of the large open spaces in the center. People usually walk through the large open spaces and they tend to stop and talk in a more defined space (Whyte 1980).

The second characteristic is the sitting spaces. According to Whyte (1980 p.28), “people tend to sit most where there are places to sit.” The seating arrangements can be of various forms, such as steps, ledges, fountains, planters, chairs, or walls. Sitting on a long step or wall, according to Whyte (1980), is a comfortable way to talk and people watch. In addition, moveable seating can let people choose where they want to sit and avoid eye contact with strangers (Whyte 1980).

The third characteristic of successful urban spaces is water features. Water features are a design element that people like to watch, touch, and feel. Water feature can also create a sound of nature that drowns the noise of the city life (Whyte 1980). In Whyte’s research, he recorded many instances of people using water features in different kinds of urban spaces to cool off.

The fourth important characteristic is the food concessions. According to Whyte (1980), food concessions are a vital way to attract people and create meeting points for people. Whyte (1980) noticed that people start greeting one another while sitting and eating together and that people gather around concessions and stay there for long periods of time.

The fifth characteristic is activities, such as art and music exhibits or routine performers, in urban parks (Whyte 1980). These activities attract people to urban parks and create a unique atmosphere for social contact.

The sixth characteristic of successful urban parks identified by Whyte (1980) is the relationship of the park to the street. According to Whyte (1980), a successful urban park is easily accessible from the street and can attract people on the street into the park. Furthermore, when a park sits beside a street, pedestrians on the street and people in the park can watch each other. According to Whyte (1980 p.19) “What attracts people most, it would appear, are other people.”

2.4.2 Jan Gehl (1987 and 2010)

Jan Gehl's book, Life Between Buildings, was published in English in 1987. This book focuses on the relationship between the performance of urban spaces and the factors that influence their use (Gehl 1987). Gehl (1987) uses the human dimension to measure the success of urban space by quantifying the number of people and social contact, and by noting their preferred locations for sitting and standing. In Gehl's opinion, successful spaces are designed based on the real behavior and preferences of the users of that space, not on their intended behaviors or perceived preferences.

In the last chapter of his book, Gehl (1987) focuses on human activities and design elements that can encourage people to spend more time in urban spaces. He presents a series of factors that can affect the flow of walking people in urban spaces: the height of buildings around the space, accessibility, visibility, the location and number of entrances, crowd density, and modes of transportation in and around the space (Gehl 1987). He also discusses where people usually choose to sit and stand and the types of social activities, they participate in. According to Gehl, the edges are people's first choice for sitting and standing. Indeed, it is not until all of the edges and borders are fully occupied that people tend to move inwards (Gehl 1987). This is called the edge effect, and it exists because users of public spaces enjoy facing the stream of people and people watching. As a result, the edges of public space are the best place for a good view of the surrounding activities.

Gehl published another book called Cities for People in 2010. This book is a more detailed version of Life Between Buildings. In this book, Gehl (2010) uses site observations as tools to study the characteristics that can make public spaces come alive. In addition, he introduces new descriptors useful to discuss successful cities: lively, sustainable, safe, and healthy. According to Gehl (2010), cities that are lively and sustainable foster social contact. For example, a lively city with many different groups of users is more welcoming to social contact. Gehl (2010 p.65) quotes a common Scandinavian saying: "People come where people are." This means that in urban spaces, people are usually attracted by and to other

people's activities. He also presents the positive relationship between sustainability in a social sense and urban spaces. As Gehl discusses in his book, social sustainability is a large and broad topic, and it focuses on giving people from different social levels equal opportunities to access common city spaces. Cities with social sustainability also provide people equal access to meeting other people in public urban spaces (Gehl 2010).

2.4.3 Clare C. Marcus and Carolyn Francis (1997)

Published in 1997, People Places includes a great deal of resources on the subject of urban open space. In their book, Marcus and Francis (1997) discuss different types of urban spaces such as urban plazas, neighborhood parks, campus outdoor spaces, child care outdoor spaces, and many others. According to Marcus and Francis, social contact is as important to park visitors as nature contact. People usually decide whether to go to a park based on who else goes with them rather than the recreation facilities and/or nature space in the park (Marcus and Francis 1997). Therefore, ways to provide opportunities for social contact is an important consideration in the design of an urban space.

One of the issues explored in their work is seating. The different styles, directions, and surface materials of the seating can have either a positive or negative effect on social contact. For example, seats arranged at right angles and at a proper distance can encourage social contact between people while seats arranged too close together or too far apart will discourage social contact (Marcus and Francis 1997). Furthermore, movable seats allow people to have some control over their own comfort and create a social environment by themselves to their liking. Marcus and Francis also suggest that pathways should be designed to connect attractive spaces and encourage group walks. These pathways should be wide enough to avoid bothering people who sit nearby. According to Marcus and Francis (1997), designing special spaces for regular groups of park visitors is also important for encouraging social contact. For example, a group of tables or seats arranged in a concave pattern can promote contact and create a sense of community.

2.4.4 Synopsis of Literature

Elements of urban space:

- Plazas
- Sitting Space
- Sun
- Wind
- Trees
- Water
- Food
- Street
- Concourses and Mega Structures
- **Triangulation**
- Users and Activities
- Boundaries and Transitions
- **Information and Signs**
- Maintenance and Amenities

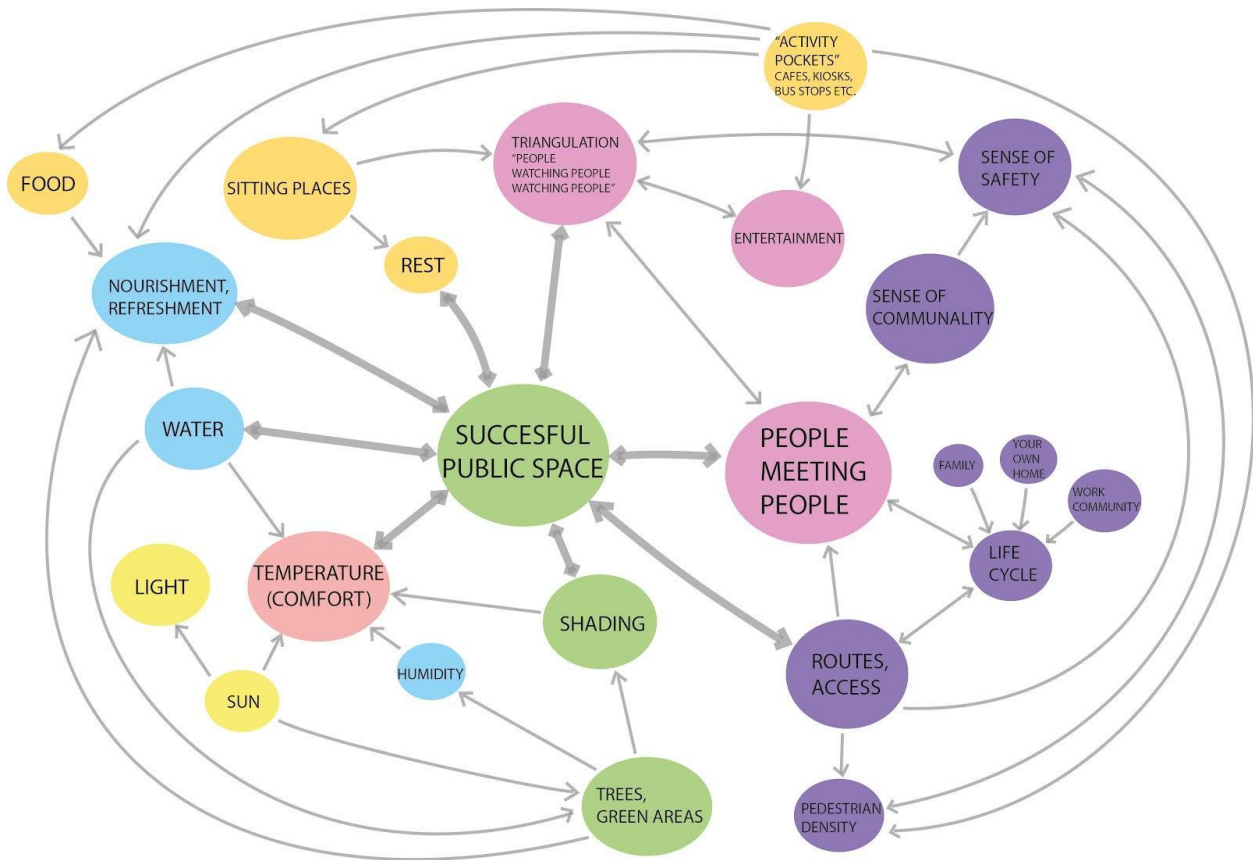


Figure 5 Parameters Affecting Human Behavior in Urban Setting
(Source: Nisar 2017)

This research focuses on ‘triangulation’ as an element of urban space to study social interaction. According to Whyte (1980) activities like art installations, street sculpture, street performance, skating rinks, dance floors, etc. promote social interaction in public spaces. This study compares the themes derived from on-site observations and in-depth interviews at the study location by considering the IDK as the characteristic of the site location that can make an impact on social interaction.

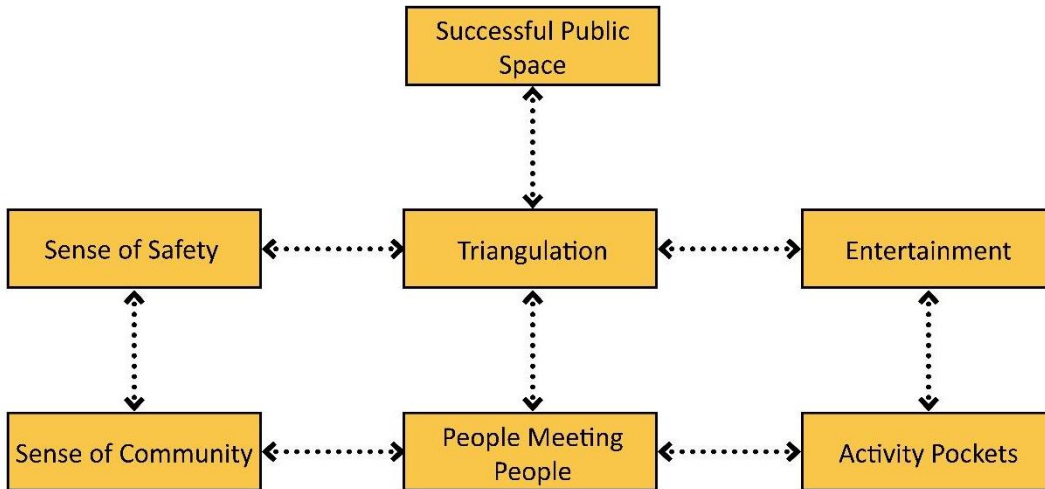


Figure 6 Triangulation
(Source: Whyte, 1980)

2.5 Introduction and Typology of Smart Furnishing

Human behavior, experiences and social interactions in public spaces are believed to be the result of the processes of the mind that are influenced by the different features of these spaces (Hanafi et al, 2013). Site design integrates the elements of site furnishing that are used for designated purposes and creates identity and sense of place. This understanding enhances the creative possibilities for designers to shape outdoor spaces. Site furnishings create the settings for resting, sitting, eating, and social encounters with others (Gupta et al,2015).

New technologies can be incorporated in parks to make them more habitable, pleasant, and easier to maintain and monitor. Smart furniture is an intelligent multi-functional furnishing which provides various technological amenities like solar-powered charging, Wi-Fi, collect data for foot traffic and overall space usage patterns, etc. (You, 2013). The Luskin Center’s SMART Parks Toolkit (2018) explores seven smart technologies that can help park managers rethink and redesign urban furniture and amenities in parks, enhance the visitor experience and make maintenance and operations easier and more effective. Smart Technologies include smart benches; solar shade structures; solar-powered trash compactors; restroom occupancy sensors; smart water fountains; digital signs; and automatic

bicycle and pedestrian counters. When furnishings are selected based on analysis of the site’s current and desired pattern of use, design can serve its purpose effectively. Also, the character, nature, and placement of the site furnishing may set standards and expectations of quality for the development of adjacent areas (Gupta et al,2015).

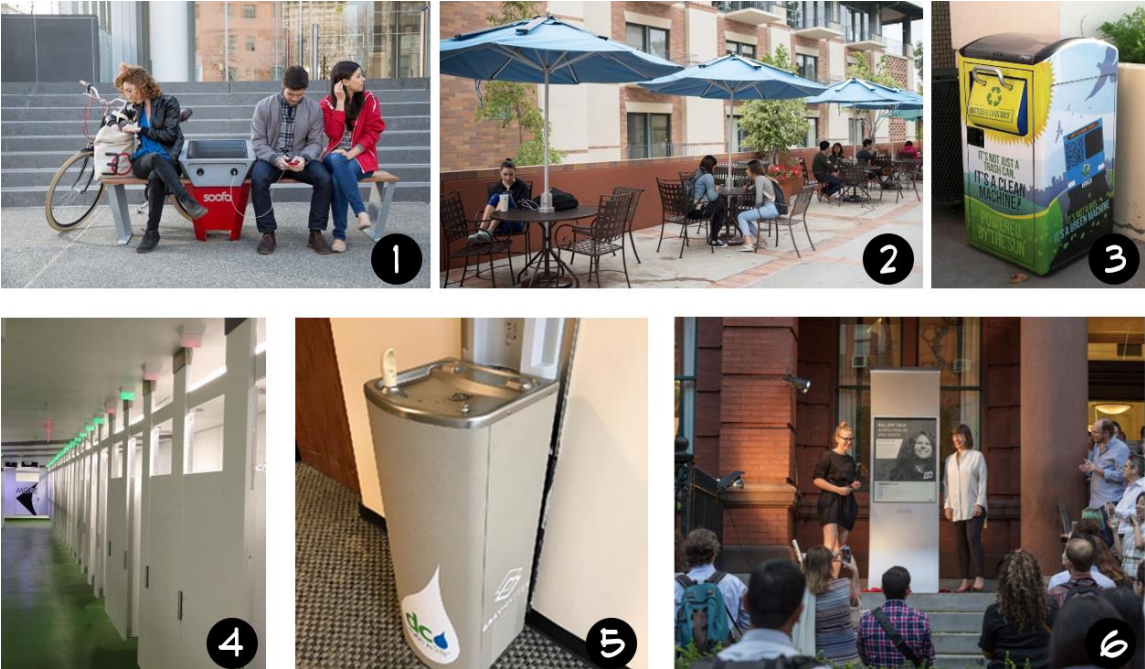


Figure 7 Typology of Smart Furnishing
(1) smart benches; (2) solar shade structures; (3) solar-powered trash compactors; (4) restroom occupancy sensors; (5) smart water fountains; (6) digital signs

(Source: The Luskin Center, 2018)

2.6 IDK

Traditional map kiosks use static symbols, signs, and maps to showcase information to a traveler or pedestrian. A traveler using a traditional map kiosk sees an overview of their surroundings and is given an indication of where they are in terms of where the map kiosk is located (Gibson, 2009). If a traveler wants to get to the desired destination using a traditional map kiosk, they would have to determine the best possible a route themselves and would not be able to ask any questions if uncertain of their surroundings. This is difficult, however; because many travelers have trouble understanding foreign languages and map systems.

The digital “kiosk” has been around longer than interactive “digital signage,” because interactive kiosks appeared in airports and other transport hubs, and in retail settings, before the larger digital signage screens were interactive. Digital signage allows content to be uploaded in a variety of formats including video, text, still photos, audio, etc.

Key Features

1. 24/7 free Internet access with up to gigabit speeds
2. Integrated lighting
3. Digital displays to provide insight-driven and intelligently programmed advertising & public service announcements
4. Android tablet with touch screen display, directional speaker & microphone
5. Tactile keypad & Braille lettering, dedicated 911 button, USB charger, headphone jack
6. Iconic and durable aluminum construction designed and built in NYC
7. Sleek design and decreased footprint to restore sidewalk space and improve visual continuity



Figure 8 IDK
(Source: Intersection 2019)

2.7 Defining the need of IDK in public space

Furniture, which is Wi-Fi enabled, can increase users' internet connectivity which can result into the reduction of the "digital divide", which refers to the gap between demographics and regions that have access to information and communication technology (Ciaramella, 2018). Systems such as signs, symbols, and maps have not only pioneered wayfinding but also have allowed designers to pick up fundamental characteristics of these systems and mold them into more efficient wayfinding technologies in the new digital era. The digital era showcases a transition in the way content is delivered. Although various tools in digital media have changed the way content is shown, the content itself is still stable. However, new modes of delivery such as social media have also changed the modes of communicating (Grant & Meadows, 1996). The digital era not only has changed the ways in which we communicate information to one another, but also the way information is communicated through new forms of technology. We are living and navigating through hybrid environments that connect the physical and digital world. (Jones, 2010). We live in a world where all our surroundings are now being inhabited and connected to digital technologies. Therefore, it is no surprise that wayfinding navigation systems have transitioned significantly to new and enhanced digital technologies (Ghattoura 2016). In today's world, any individual traveling to an unknown or known destination uses GPS to find the best and most convenient route. It is interesting to consider that the GPS is less than two decades old. However, by May 2012, half of the all-American adults- 46% to be exact-owned a GPS-enabled smartphone. Almost three-quarters of them (74%) access location-based information on phones, such as directions to restaurant and social locations (Farman, 2013).

New technologies such as interactive kiosks have also changed the way in which people find their desired destination in popular outdoor and indoor spaces: commercial or residential. In many instances, these interactive kiosks not only provide improved Wayfinding but also, additional customized features to improve the overall experience for a traveling individual.

The digital era showcases a transition in the way content is delivered. Although various tools in digital media have changed the way content is shown, the content itself is still stable. However, new modes of delivery such as social media have also changed the modes of communicating (Grant & Meadows, 1996). The digital era not only has changed the ways in which we communicate information to one another but also, the way information is communicated through new forms of technologies. We are living and navigating through hybrid environments that connect the physical and digital world. (Jones, 2010).

2.8 Summary

This chapter described the evolution of urban spaces and discusses the characteristics of urban spaces from different time periods. It also discusses social behavior in public spaces. The literature review provides the foundation for the research design on urban spaces and human social behavior through the works of Whyte (1980), Gehl (1987 and 2010), and Marcus and Francis (1990). This chapter further discusses the typology of smart furnishing, introducing the term 'Interactive Digital Kiosk' and defining the need for such kiosks in the urban environment. Secondary documents are also collected to describe the background knowledge of the kiosk at West End. The following chapter details the method of the research and discusses how the data will be collected and analyzed.

This chapter has elaborated the impact of urban public space characteristics on human social behavior. These include physical elements like the size, scale, functions and spatial elements of the public space. The social and economic aspects comprise of improving quality of life; enhancing the urban image; affecting the economic development. The urban spaces improve quality of life by providing avenues for movement; a place for communication; and offering a common ground for enjoyment and relaxation. Additionally, the urban spaces enhance the urban image through urban vitality; and impelling economic development through investment. Apart from the urban spaces creating an impact on social behavior, the users can also influence the form and sense of the urban spaces by introducing the social

traits and factors. Eventually, the urban public spaces evolved to be a place to congregate for special occasions and activity trends besides the daily needs of the users. The literature studied in the chapter focuses on several elements of the urban space that influences the social activities. These elements include, plazas, sitting space, sun, wind, trees, water, food, street, concourses and mega structures, triangulation, users and activities, boundaries and transitions, information and signs and maintenance and amenities.

This study focuses on how public urban space characteristics influence the usage of IDK. Study further identify some characteristics(measures) for the study location to demonstrate the relationship between public space, IDK and human social behavior.

Chapter 3: Methodology

3.1 Introduction

This chapter focuses on research methods. The study uses qualitative techniques to study the association between certain design characteristics of the IDK and human social behavior. Chapter 3 discusses the research design, the collection of data, and the analysis of data. This chapter concludes with the limitations of the research.

3.2 Research Design

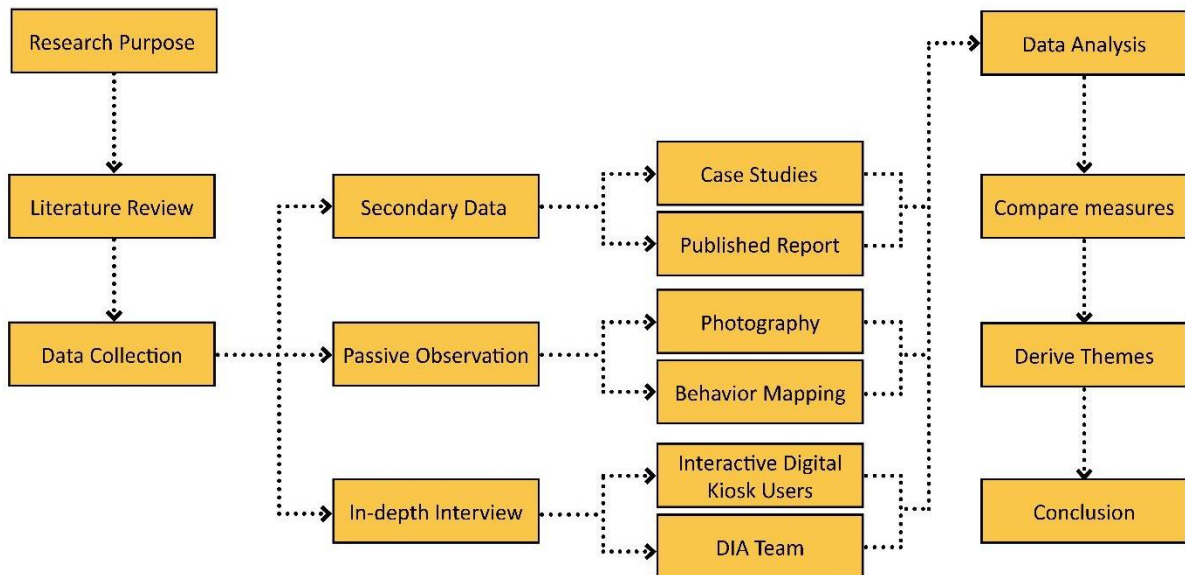


Figure 9 Research Design and Data Analysis Process

The research procedure for this thesis was as follows:

- Examine secondary documents published by Dallas Innovation Alliance (DIA) to gather background knowledge of the IDK at West End, including its key features, location, surroundings, users, and data collected by the kiosk.

- The secondary data is also comprised of a systematic review of case study briefs. This include review of two case study projects: 1) Link NYC and 2) City Post Kiosks to gather information about its key features and locations where these kiosks are installed.
- Conduct on-site passive observations to record usage of the kiosk and the impact of site characteristics (defined measures) through digital photos and the use of ethnographic study (Deming and Swaffield 2011) to map behavior on the Market Street at West End.
- Conduct in-depth interviews with the kiosk users and DIA team to benefit the research through open-ended questionnaire which makes the data collection flexible and dynamic. Taylor and Bogdan (1998) also refer to the in-depth interviewing method to be non-directive and unstructured. The researcher uses this method for data collection because it allows the researcher to understand concepts from the key informants' point of view.
- Interpret and code the collected data of behavior mapping and in-depth interviews. Develop themes using learnings from the literature. Study used the grounded theory method (Taylor and Bogdan, 1998) and content analysis (Krippendorff, 2004) as primary research techniques to Interpret and compare the variable and measures from observations and in-depth interviews for both the locations.

3.3 Data Collection Methods

Data collected for this study is comprised of reviewing the secondary data, passive observation and on-site interviews. The study utilizes in-depth interviews (Taylor and Bogdan, 1998), a systematic review of case study briefs and behavioral mapping (Cosco et al 2010) as methods for data collection.

3.3.1 Secondary Data

3.3.1.1 Case Study- Kansas City, MO: KCityPost Smart City Digital Kiosks

Kansas City's KCStat open data dashboard began in 2011 and offers citizens and city staff dynamic digital visualizations that include parking, traffic flow, pedestrian hotspots and the location of the streetcars. This data is provided by city staff, and its availability and timely release is governed by a

2014 city council resolution, which directs city departments to make data open and available to the public whenever feasible, with respect to a variety of privacy and confidentiality needs. Additionally, the city's open data practices are governed by a committee of city staff and citizens; committee members see what data the city collects, and then collaboratively set priorities around which data to review, clean, and publicly release (Smart Cities Living Lab Case Study 2018). There are twenty-five 55" screen display Smart Kiosks placed along the Streetcar line in Downtown Kansas City and other strategic places for citizen engagement. The kiosks host a multitude of content and applications that connect citizens to the city. The Kiosks are open to developers and advertisers to leverage for local discovery and useful apps (Kansas City Living Lab 2015).

CityPost Smart City Digital Kiosks features (Bowling, 2018)(Figure 16):

- Wi-Fi hotspots
- Real-time information collected via Smart City sensors
- City Services
- Local points of interest/local events, public transportation information
- Weather
- Parking availability
- Restaurants
- 911 calling, headphone jack
- Local community information
- Digital display in the loop (Published on daily basis)
- Bike sharing program
- Kiosks features can be accessed through a phone app
- Video and sound capabilities
- 2-way video communication for 911

- ADA Compliant
- Selfie station
- Information available in 9 languages



Figure 10 KCityPost Smart City Digital Kiosks
(Source: Smart City Post Kiosks with KC Streetcar, 2018)

3.3.1.2 Case Study- New York, NY: LinkNYC

During the summer of 2016, New York City (in partnership with companies including Qualcomm and Google) transformed 7500 of the city’s pay phones into a “Swiss Army knife” of digital technology support, all free of charge. Each LinkNYC kiosk (called Links) originally provided four key functions: a USB charger, a WiFi hotspot, means to make a phone call (provided by Vonage), and a web browser. All of these features were open to passersby and free to use. Links themselves are sleek and trim, bearing a little structural resemblance to the pay phones they replaced. Instead of rarely used, easily ignored pay

phones, Links epitomized contemporary visions of smart cities as seamlessly integrating Internet access and digital connectivity (Graham, 2014; Kitchin and Dodge, 2011; Mattern, 2017).

LinkNYC features (LinkNYC)(Nextcity.org)(Figure 16):

- Wi-Fi hotspots
- USB Charging, headphones jack
- 911 calling
- City services, maps, and directions
- Free phone call
- Public announcements
- Two 55" HD Display
- ADA Compliant
- Paid advertisements
- Event listings
- Weather updates
- Transit Alerts



Figure 11 LinkNYC
(Source: Intersection, 2019)

Data collected from review of two case studies comprised: comparison of kiosks' features, comparison, learning about diversity of features based on case study location and deriving common features from the case studies. These learnings helped the researcher as precedent projects to learn about the model kiosk and the set of features, the kiosk should have. It also helped shape the interview questions to set examples for respondents, prepare questions about proposed features and proposed locations.

3.3.2 Passive Observation

Behavior mapping is an objective method of observing the behavior and associated built environment components and attributes. It provides researchers with an innovative method of assessing behavior linked to detailed physical characteristics of outdoor areas. Behavior mapping provides environment–behavior researchers with an efficient method for gathering, processing, analyzing, and representing data (Cosco et al 2010). Ethnographic study (Deming and Swaffield 2011) helped the researcher understand the factors influencing usage of the kiosk and impact of defined measures of

West End in two ways. First, visual design characteristics(measures) of West End are recorded in digital photographs (Gehl 2013), including:

- Restaurant patio and seating spaces
- Widened brick sidewalks and crosswalks
- Street parking
- Mixed-use surrounding
- Transit connectivity
- Bike stations
- Downtown connectivity
- Relationship to the street
- No provision of public seating
- Historical district
- One-way streets
- Paving
- Street light
- Trees
- Music

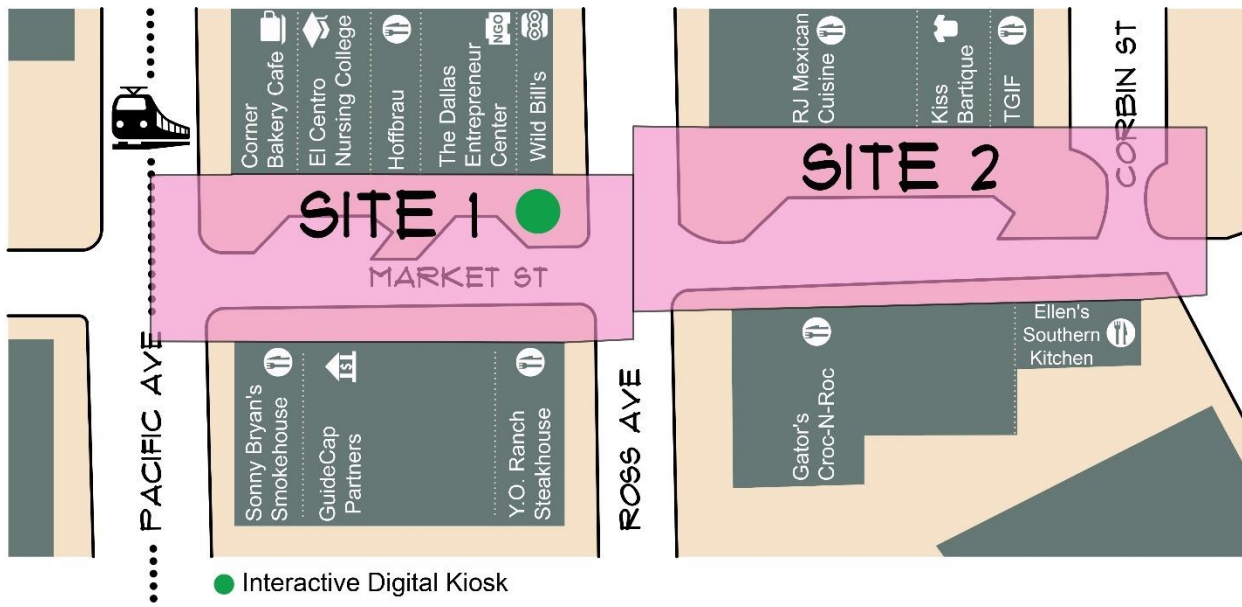


Figure 12 West End Site Plan

Second, behavior mapping was also used in this research to record what people do and how the presence of the IDK influences their social interaction in the West End. Behavior mapping allowed the researcher to directly observe phenomena in both study areas, with Site 1 location having smart technology and Site 2 without kiosk presence (Figure 12). Both site locations have similar characteristics(measures) which helps the researcher to measure the behavioral activity in identical environment. Having IDK as the only variable helps the researcher to observe the difference in behavioral pattern in Site 1 and Site 2. Also, this method allows the researcher to evaluate relationships between kiosk characteristics and human social behavior (Cosco et al. 2010).

3.3.3 On-site Interviews

An open-ended interview is a way of gathering the information that cannot be collected from observation of people (Taylor and Bogdan 1984). The researcher asks questions of an informant, who then answers those questions. Some questions in these interviews can be used to gather basic data on informants such as age and background. However, most questions focused on informants' feelings, experiences, thoughts, and preferences. The in-depth interview method uses open-ended questions

which makes the data collection flexible and dynamic. Taylor and Bogdan (1998) also refer to the in-depth interviewing method to be non-directive and unstructured. The researcher uses this method as a medium for data collection because it allows the researcher to understand concepts from the key informants' point of view. Since the study is directed towards understanding the perspectives of the informants, such as their opinions and critical understanding of features of smart kiosks and impact of the kiosks on social interaction, in-depth interviewing enables them to express freely -in their own terms - as the questions are open-ended (Krippendorff, 2004).

3.3.3.1 The Informants

Informants for this research were selected from study location users, kiosk users and the DIA team who launched the 'Smart Cities Living Lab' at West End. The users were selected from a purposive sampling within both the study locations to allow the research to obtain accurate results from diverse population about their experiences and feelings. A purposive sampling technique (Figure 13) was undertaken in this research as part of the process of selection of interviewees. Castillo (2009) mentions that the population for research is generally a large collection of individuals who are familiar with the main focus of the study. Purposive sampling technique was utilized to obtain information from a very specific group of people who possess the trait of interest (Krippendorff, 2004). Hence, a master list of participants, the research population, were enumerated by the researcher. Kiosk users at Site 1 location and other users at Site 2 location were chosen based on their rich experiences about the kiosk within the defined space.

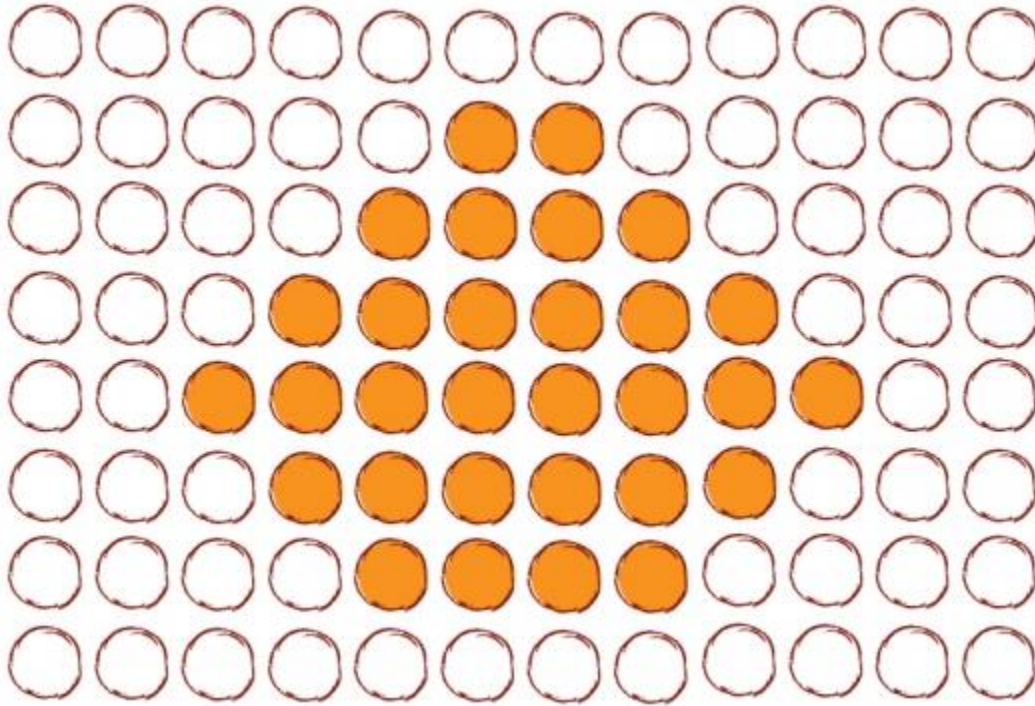


Figure 13 Purposive Sampling Technique
(Source : Explorable 2018)

In addition, an electronic recorder was used during the interview with the informants' permission; in this way, all of the conversations were digitally recorded. These digital audio files were used to make detailed notes by the researcher. To protect their anonymity, the informants' names and other identifying information are edited out of the interview notes. After the interview, the tape was transcribed, which means typed exactly as recorded, word-for-word. The audio files were destroyed after the completion of the research.

3.3.3.2 Interview Procedures

Interviews were digitally recorded at the time of interview. Consent from the interviewee was obtained before beginning the in-depth interview. Later, the interviews were transcribed, translated and the recordings of the interviews were destroyed. The identity of the interviewees is protected and identifying information is not revealed to keep the anonymity of participants. An approval from the Institutional Review Board (IRB) was required for this data collection method, which was acquired on

March 16, 2019, prior to recruitment of interviewees (See Appendix A). A brief introduction of the researcher and the study was given to the interviewee followed by the interview questions.

3.3.3.3 Interview Questions

Interview questions for the kiosk's users/space users are listed below. These questions examine how space measures and the presence of the IDK affect users' social behavior and analyze users' perception of kiosk characteristics. All of the questions were asked in a conversational style with follow-up questions based on their responses.

- Are you a visitor/local/resident/business owner?
- What was your purpose for coming here?
- How did you find this kiosk?
- How often do you use the kiosk?
- What are you looking for when using the kiosk?
- Do you usually meet new people while exploring through the kiosk?
- What are your favorite features of the kiosk at West End? Why?
- What was your perception about the kiosk before using it? How was your experience after using it?
- Can you suggest any other locations for the kiosk around the city? Why?
- Does the kiosk increase your perception of safety?
- What is your opinion on the kiosk being a conversation starter?
- By giving equal access to everyone, does the kiosk create a feeling of acceptance?
- Can you suggest any improvements to the kiosk?
- Is there anything else you'd like to tell me about your experience with the kiosk?

The following are interview questions for the DIA team. These questions examine the DIA team's perceptions of how IDK characteristics are intended to affect human social behavior.

- Who are your intended users for the IDK?
- How did you define the need of the kiosk in the public spaces?
- Did you consider any aspects of human social behavior when designing the kiosks' functions and placing it in the urban fabric?
- What are the criteria that help you decide the location for placing the kiosk?
- Are there any functions designed into the kiosk to impact human social behavior?
- Anything else you'd like to add to the functions/design of the kiosk to improve social interaction?
- After the installation of the kiosk, have any additional amenities been added to the areas adjacent to or near the kiosk?
- Is the kiosk designed to attract a diversity of users? Do you see this happening?
- Which design functions of the kiosk bring diverse users to the urban space?
- How does the kiosk promote a socially friendly environment?
- How does the typology of the open space impact the location of the smart kiosk?
- What were some precedent projects that were a reference during designing this kiosk?

3.4 Data Analysis Methods

This section discusses the data analysis methods used in this research. This research significantly benefits from the grounded theory approach (Taylor and Bogdan 1984). Taylor and Bogdan (1998 p.137) state "The grounded theory approach is a method for discovering theories, concepts, hypotheses, and propositions directly from data rather than from a priori assumptions, other research, or existing theoretical frameworks."

This research categorized the interview data using keywords and then divided the data into sub-categories to further classify the data (Krippendorff 2004). Titles were created to describe the primary themes from the interview data and passive observation data (figure 15). After this, the data from the passive observations are compared with the interview data based on defined variable and measures in order to define the themes. The researcher explores the relationships between these data and integrates them into a coherent theory (Taylor and Bogdan 1998). Figure 14 describes the analysis methods followed in Chapter 4.

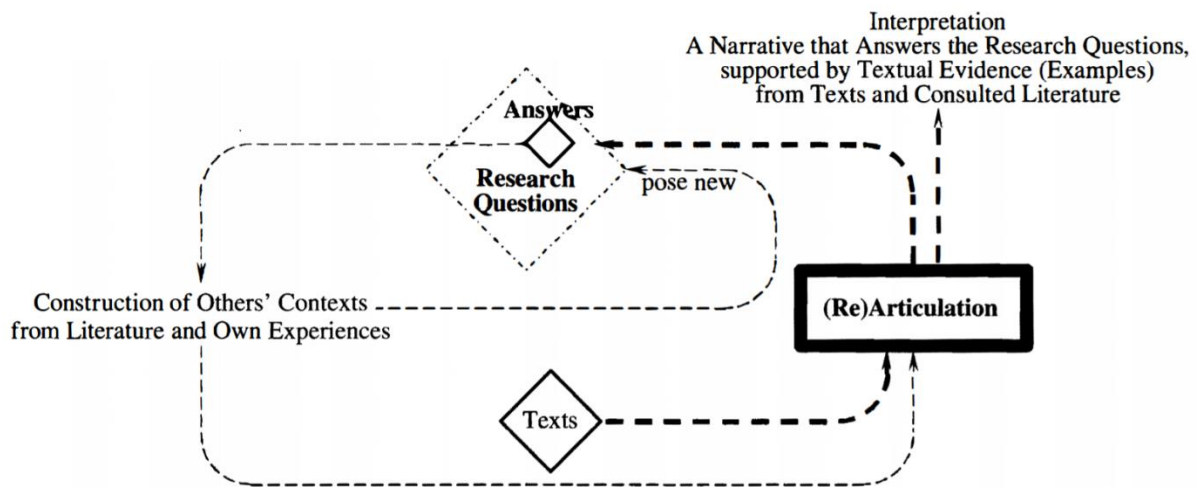


Figure 14 Qualitative Content Analysis
(Source: Krippendorff 2004)

The recorded interviews were later transcribed (figure 15), to obtain the data for analysis. Analyses of the obtained data used the grounded-theory approach as mentioned by Taylor and Bogdan (1998). The researcher seeks to discover theories, concepts, hypotheses, and propositions from the collected data and not from other research, theories, or prior assumptions. (Taylor and Bogdan, 1998, p137). In order to get the concepts and themes, the researcher must read the interview transcriptions multiple times. Recordings of the interviews assisted the researcher to keenly follow the responses and add more depth to the research. The researcher documented each aspect of the interview starting from the tone

of the respondent to the opinion of the respondent on the discussion topic. A conscious effort was made to not interrupt the conversation with opinions and bias from the researcher. It is very important for the study to obtain the perspectives of the informants as error-free and clear of biases as possible so, the findings can be grounded more firmly.

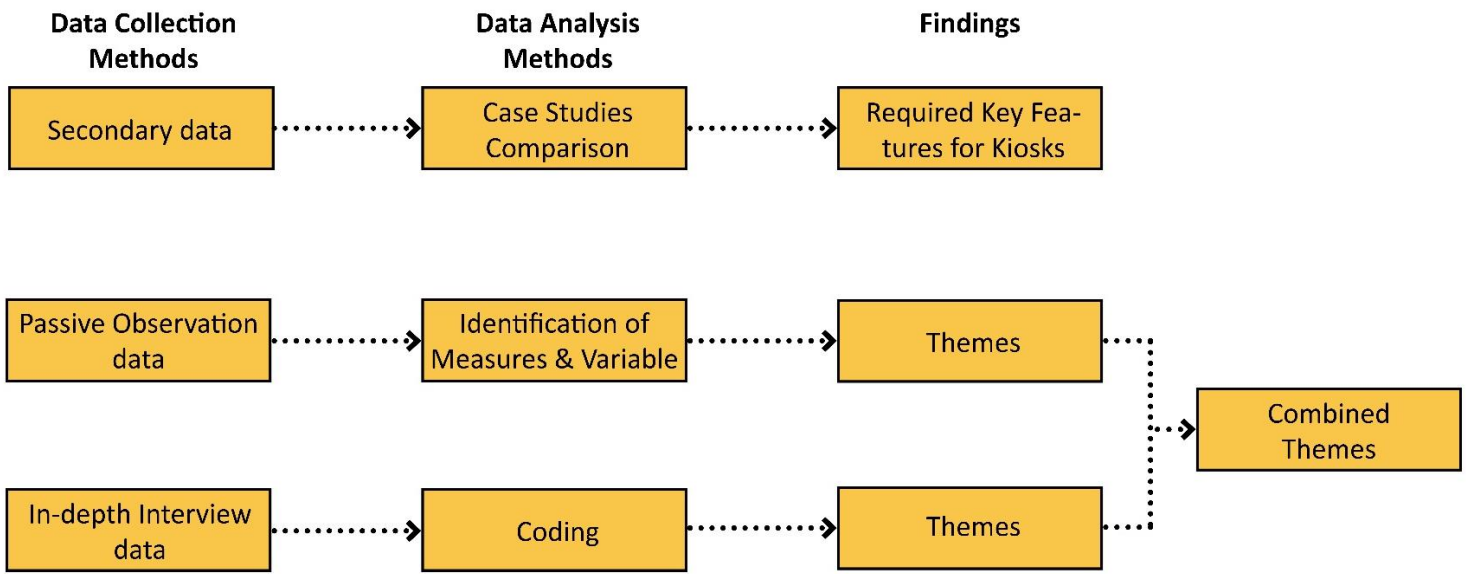


Figure 15 Data Analysis Design

Additionally, the content analysis technique is also adopted in the research. Krippendorff (2004) mentions the content analysis technique as “an empirically grounded method, exploratory in the process and inferential in intent.” The researcher completed a content analysis of data obtained through a systematic review of the case study briefs. The themes obtained from the literature review are utilized to support and compare the findings from the interviews. The researcher examines the similarities (to support) and differences (to compare) between the themes and patterns obtained from interviews and literature review. The researcher also looks for viewpoints of the kiosk users and DIA team based on the data obtained from interviews. The categories and themes gathered through both techniques were utilized in the findings and the conclusions to respond to the research questions of the study.

3.5 Limitations

The methodological significance of the research is the ability to comprehensively derive the findings from multiple data sources. The combination of the grounded theory method and content analysis technique support greater validity of the findings as they relate to the research questions posed. Since the research population is defined and purposive sampling is undertaken for interviews, descriptive statistical results can also be obtained.

In this research, passive observations and interviews provide the greatest depth of understanding a diverse spectrum of settings and people (Taylor and Bogdan 1998). However, interviews have limitations primarily based on the difference between informants' words and actions. According to Taylor and Bogdan (1998), informants have fixed attitudes and respond in fixed ways in given situations. Another limitation is the potential lack of interview responses in this research. As noted by Taylor and Bogdan (1998), a deep and broad range of participants is necessary to develop a comprehensive analysis. Finally, the public urban space characteristics studied in this thesis that affect human social behavior are derived from this researcher's examination of the literature; however, this list of characteristics may not be complete.

3.6 Summary

This research used quantitative methods to study the relationship between the IDK features, defined measures and human social behavior. The research procedures utilized in-depth interviews and passive observations. This approach applies to the West End in Dallas, Texas. Chapter 4 discusses the analysis and findings from the research methods applied in this chapter.

Chapter 4: Analysis & Findings

4.1 Introduction

This chapter provides analysis and findings from secondary data, behavioral mapping, on-site observation with kiosks' users at the West End and online interviews with the DIA team members. In this research (Figure 15), researchers have reasons to draw distinctions within a body of text and apply the same content analysis to each part (Krippendorff, 2004). The collected data through behavioral mapping and the secondary data helps to understand the IDK features at West End in Dallas. The data from on-site observation was used to analyze how defined variable and measures affect user activities and kiosk usage frequency. The on-site interview analysis identifies the relationship between kiosk features and human social behavior. Finally, themes are identified and developed. These themes focus on the characteristics of kiosks that can affect human social behavior.

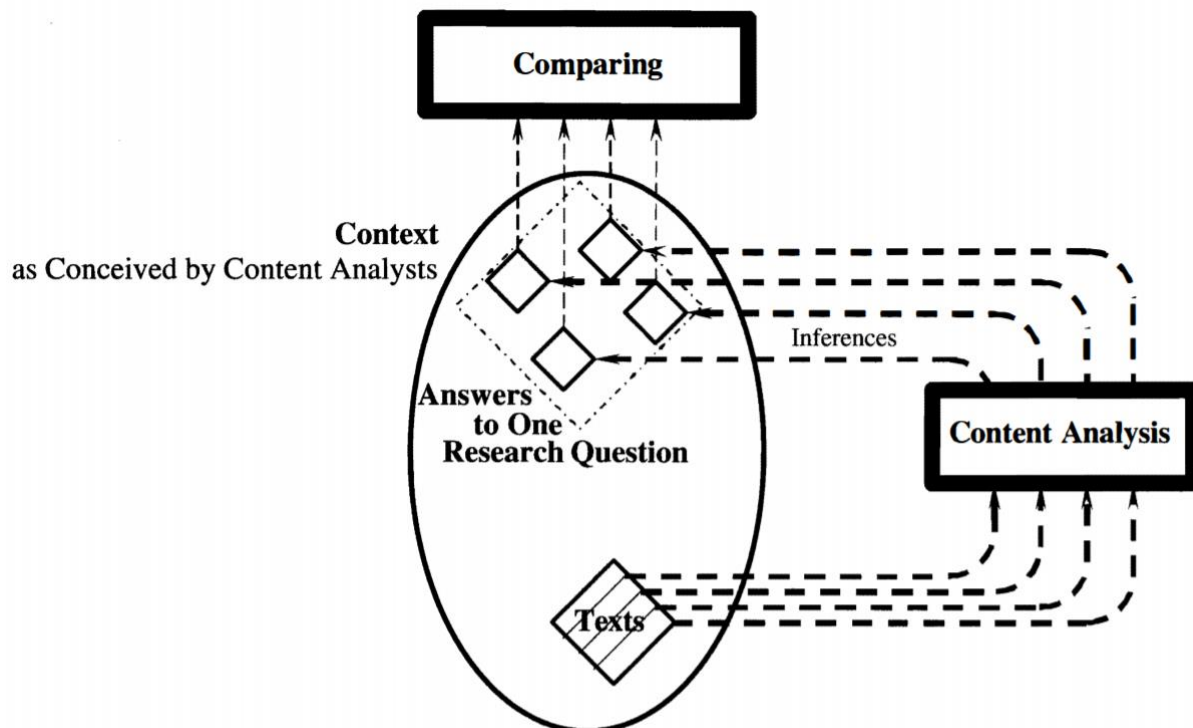


Figure 16 Comparing Similar Phenomena Inferred from Different Texts
(Source: Krippendorff 2004)

4.2 Findings from Secondary Data

Secondary data analysis seeks to determine the IDK features at West End in Dallas. This study utilizes case study comparison and published graphical data analysis to understand the DIA team members' vision. Case study projects were chosen from different locations (New York, Kansas) to learn about diversity of features based on location requirements. Figure 16 shows comparison of all the features of LinkNYC, City Post Smart Kiosks and West End Kiosk. The researcher analyzed similarity between set of kiosk features from three diverse locations to understand the required features that a kiosk should have. In order to provide learning on the features a kiosk should have, the researcher analyzed the following common features from all three locations.

- 1) Wi-Fi Hotspot
- 2) City Services
- 3) ADA Compliance
- 4) Local events
- 5) Real-time transit maps
- 6) Weather
- 7) Wayfinding
- 8) Point of interest
- 9) Display in multiple languages













































| LinkNYC Kiosk | KCity Post Kiosk | West End Kiosk |
|---|--|---|
| Wi-Fi Hotspot  | Wi-Fi Hotspot  | Wi-Fi Hotspot  |
| USB Charging  | | USB Charging  |
| 911 Calling  | 911 Calling  | |
| City Services  | City Services  | City Services  |
| Wayfinding  | Wayfinding  | Wayfinding  |
| Free Phone Call  | | |
| Advertisement  | Advertisement  | |
| ADA Compliant  | ADA Compliant  | ADA Compliant  |
| Weather  | Weather  | Weather  |
| Audio Jack  | Audio Jack  | |
| | Selfie Station  | Selfie Station  |
| | Restaurants  | Restaurants  |
| 1 language  | 9 languages  | 2 languages  |
| 1300 locations  | 25 locations  | 1 Location  |
| Events  | Events  | Events  |
| Point of Interest  | Point of Interest  | Point of Interest  |
| | Parking Availability  | |
| | Bike Sharing Program  | |
| | Kiosk sync with phone app  | |
| | Sound capabilities  | |

Figure 17 Case Study Comparison

The Smart Cities Living Lab Case Study Report (2018) of the IDK at West End is comprised of observations through three consecutive months in 2018. According to the published report by Dallas Innovation Alliance (DIA) team, a total of 1130 users interacted with the kiosk within three months. Out of this three-month period, July was the most visited month and Saturday is generally busiest day with very diverse users (Figure 17). The chart also shows the comparison of features utilization in this period

and based on the data “selfie feature” was used by 1046 people. Out of all the users, 61.82% users utilized more than three features in the kiosk.

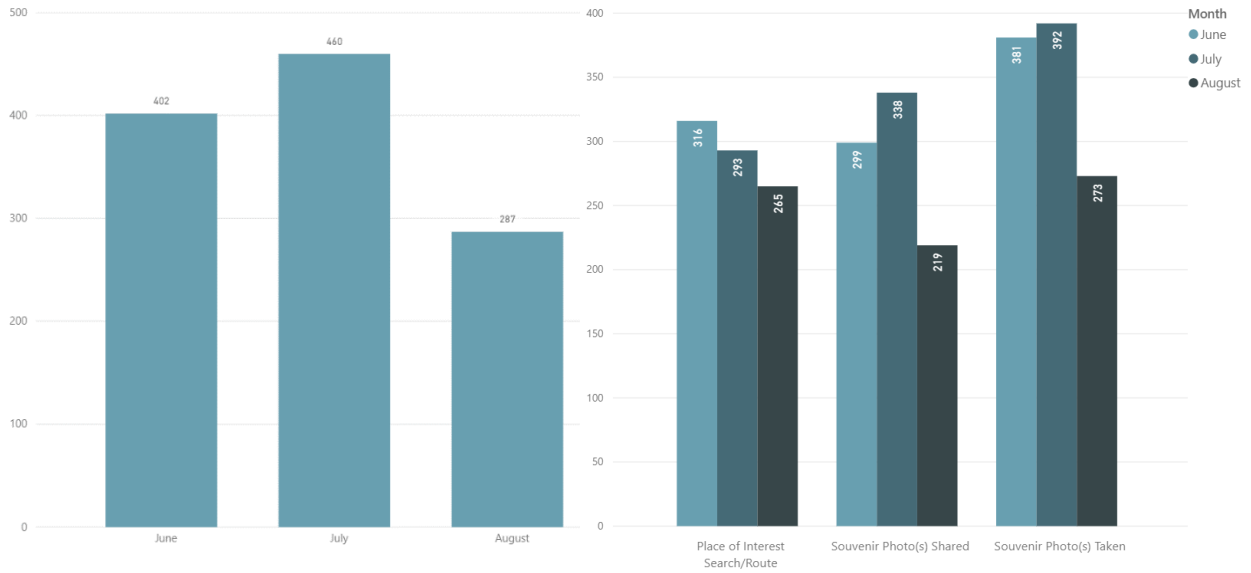


Figure 18 Overall usage by month; Comparison of key features usage by month (Source: DIA Team)

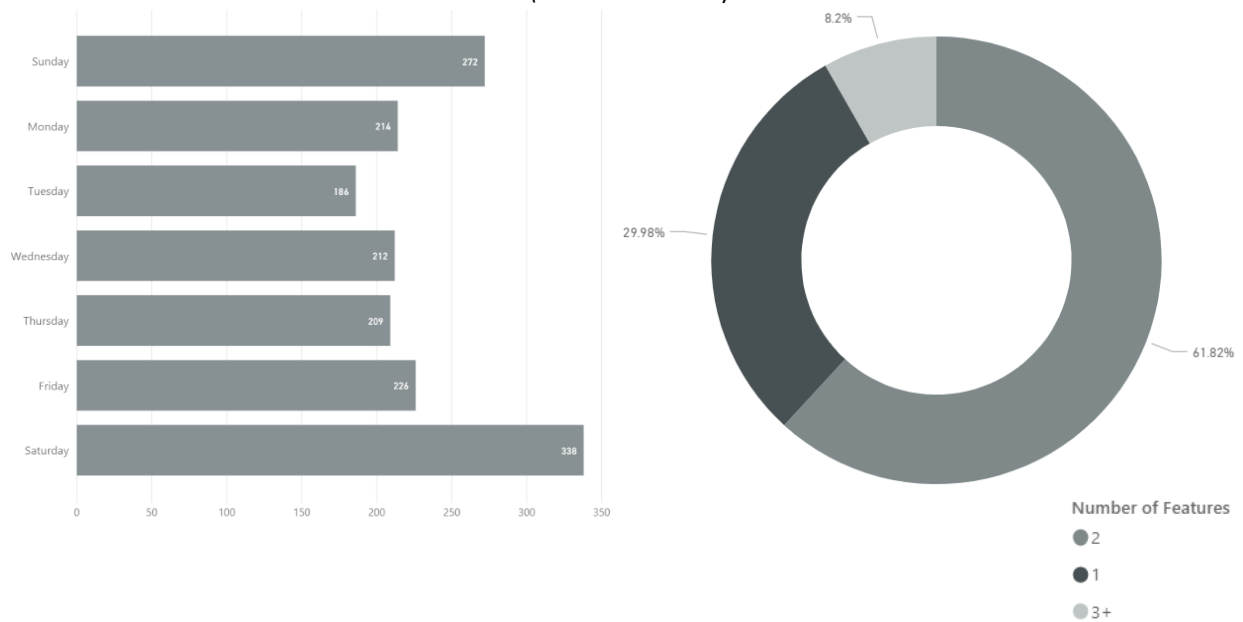


Figure 19 Overall usage by days; Usage of key features (Source: DIA Team)

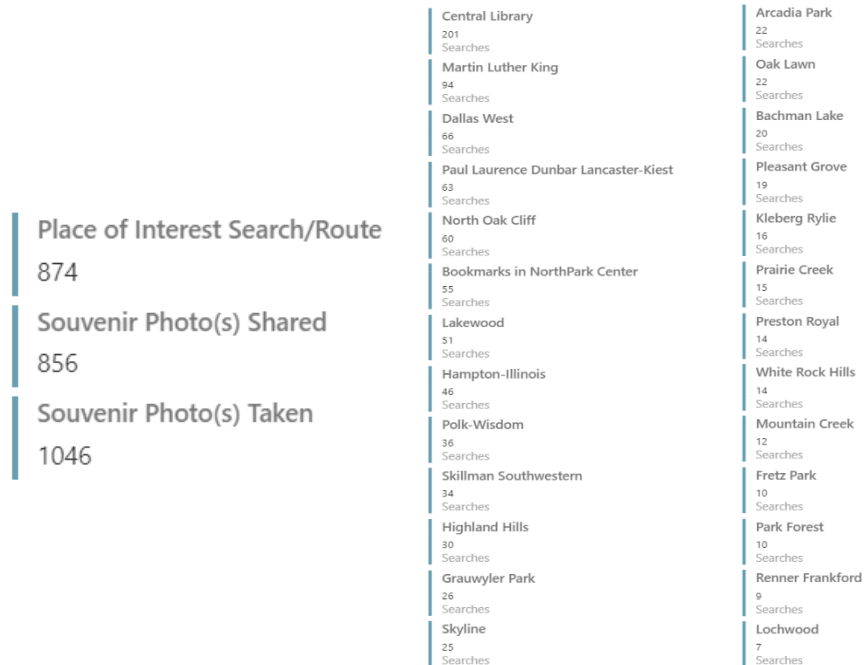


Figure 20 Top key features usage during observation period; Most searched locations in Dallas (Souce: DIA Team)

4.3 Findings from On-site Observation/ Behavioral Mapping

On-site observation provides direct access to the design characteristics and the social phenomena of the site. The observation process also helps the researcher of this thesis to gain a deeper understanding of the defined measures (figure 18) on the Market Street in the West End and explore how these measures influence human social behavior. In addition, the observation process helps to clarify why some spaces on the street are used while others are not. The first step in this process is observing the defined measures of Market Street and people’s behavior in or around these elements.

Street Furniture and spatial elements, identified as measures include (Figure 18):

| |
|---|
| 1. Restaurant patio and seating spaces |
| 2. Widened brick sidewalks and crosswalks |
| 3. Street parking |
| 4. Mixed-use surrounding |
| 5. Transit connectivity |
| 6. Bike stations |
| 7. Downtown connectivity |
| 8. Relationship to the street |
| 9. No provision of public seating |
| 10. Historical district |
| 11. One-way streets |
| 12. Paving |
| 13. Street light |
| 14. Trees |
| 15. Music |

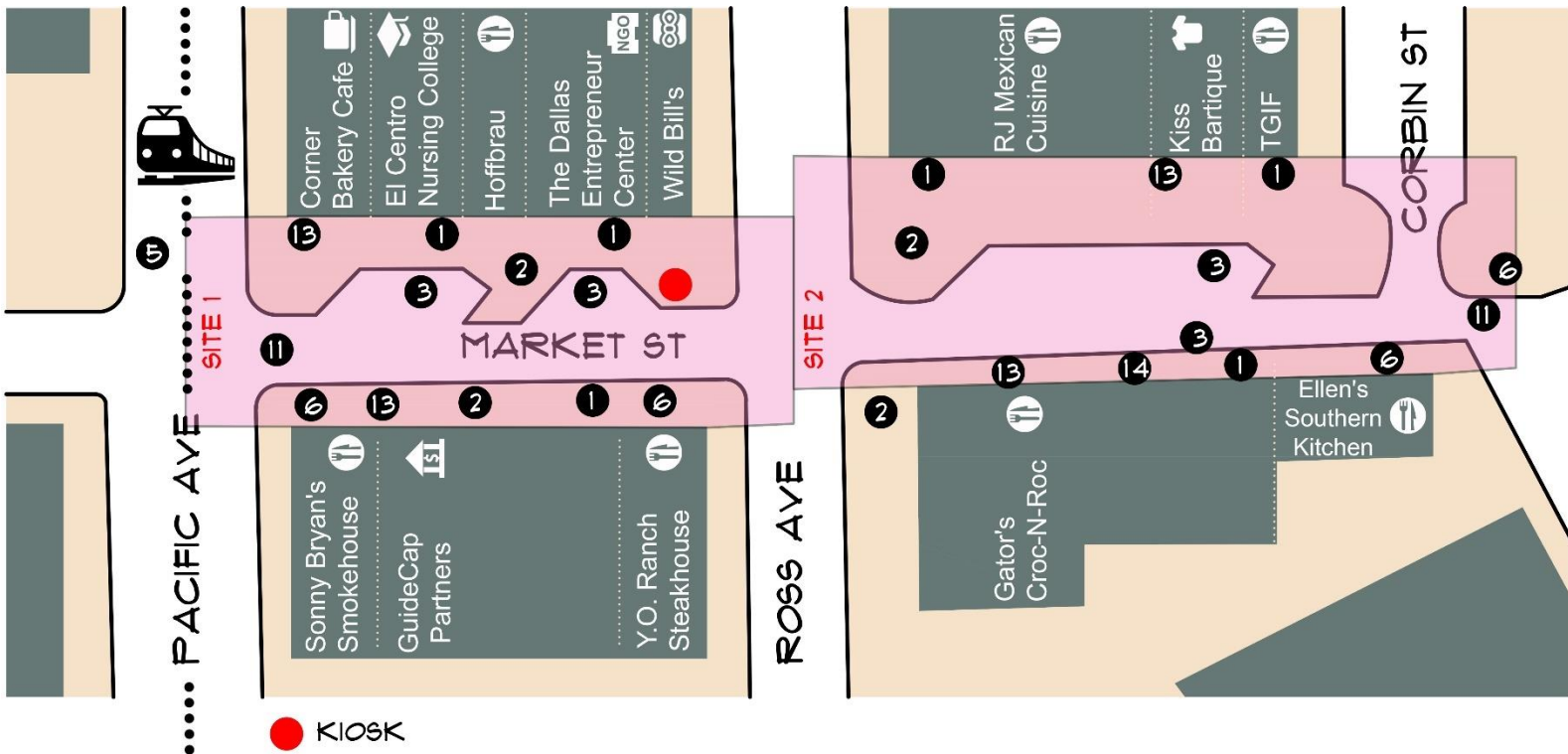


Figure 21 Location of defined variables and measures

Market Street located in the heart of the West End Historic District of Downtown Dallas, is characteristically defined by brick buildings; widened brick sidewalks and crosswalks; mixed-use setting of lower-level with restaurants and small businesses, and upper level are offices and institution; restaurant patio seating; pedestrian and bike friendly sidewalks; series of street lights; shaded sidewalks; one-way streets with parking provision; great connectivity to the public transportation system; and destination place for diverse users (Figure 19,20).

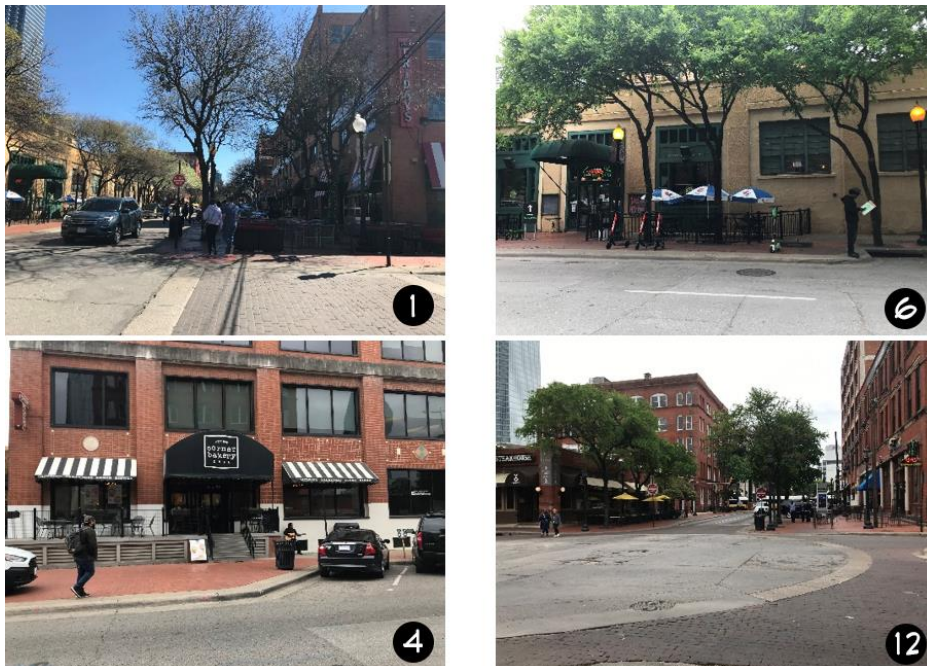


Figure 22 Measures: (1) Seating, (12) Paving, (4) Mixed-Use Surrounding, (6) Bike Stations (figure 21)

These measures allow the researcher to observe behavioral activities in Site 1 and Site 2. Both the sites being part of the West End Historical District have common measures with the IDK being the only variable. This process allows the researcher to observe 1) the influence of the defined measures in both the study locations and 2) behavioral activities in site 1 due to the IDK. Site observation helps the researcher to understand how the kiosk can impact the social interaction in areas with the similar street characteristics.

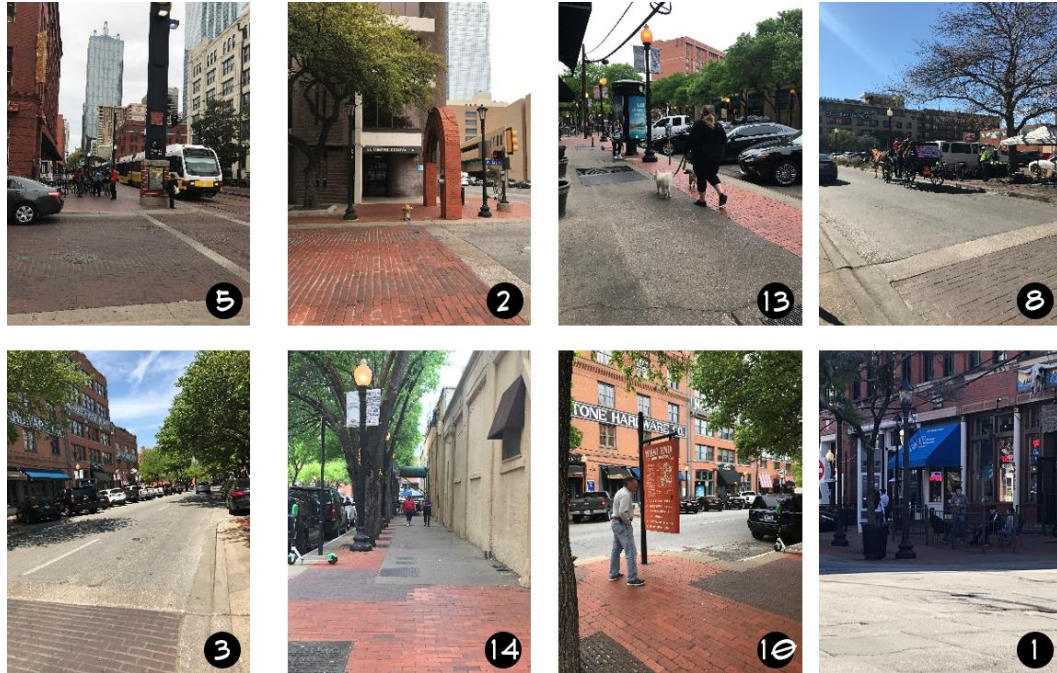


Figure 23 Measures: (5) Transit connectivity, (2) sidewalks, (3) street parking, trees, (13) street lights, (1) kiosk and (8) triangulation (figure 21)

In this research, the social phenomena on Market Street is also recorded by behavior mapping and researcher's field notes (Whyte 1980). These methods help to define who are the users, activities, and which areas in the street are most frequently used. In addition, this process helps identify the street characteristics in the West End that people are most attracted to, and how these characteristics affect human social behavior.

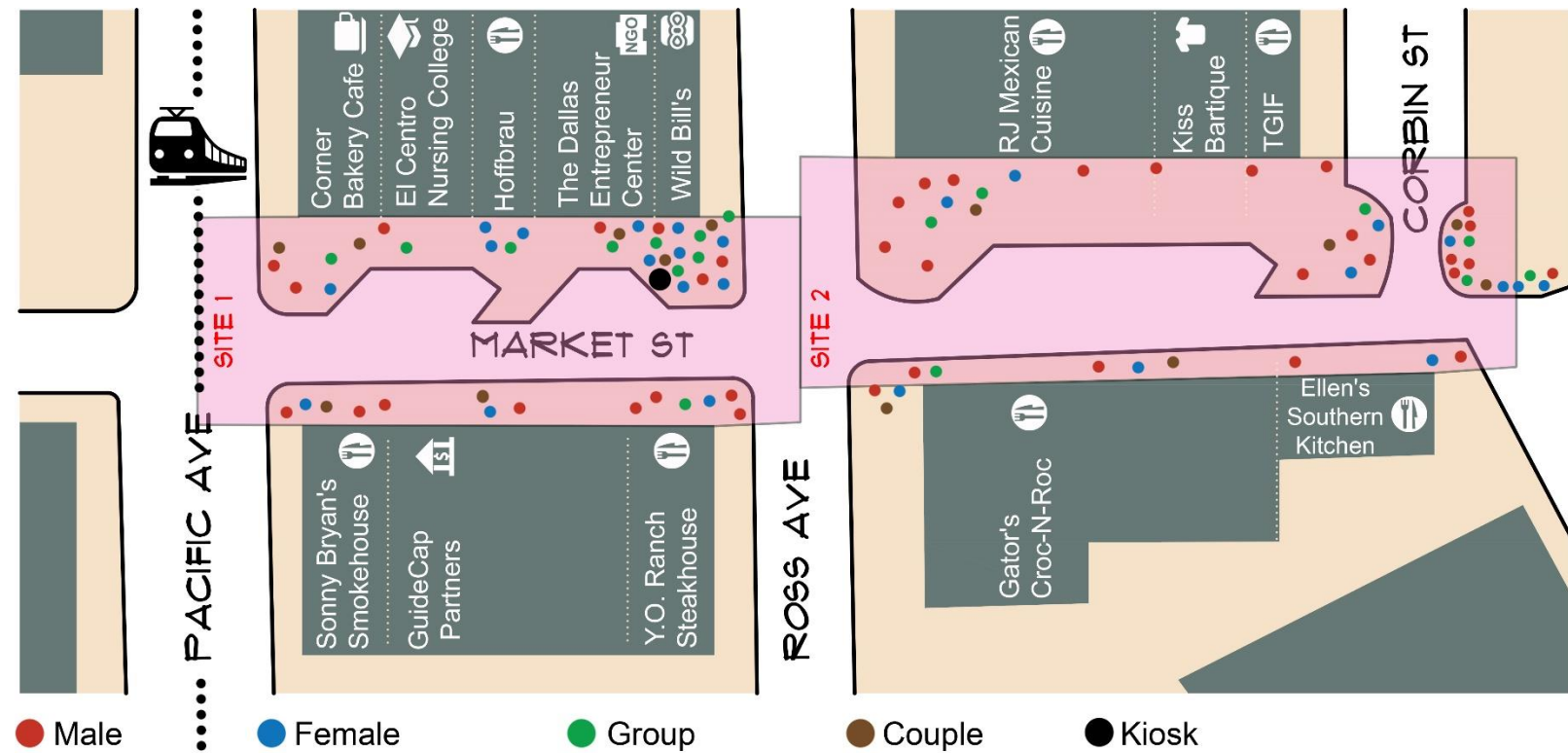


Figure 24 Behavioral Map

The first behavior mapping analysis was conducted on St. Patrick's Day weekend (March 16, 2019) with cloudy weather and 69-degree Fahrenheit temperature. Saturday was selected as the specific study day since people were expected to go outside and a diversity of users can be witnessed. The social phenomena observations were recorded at Market Street on a cloudy Saturday afternoon from 15:30 to 17:30. During the observation time, 176 people visited and were engaged into different locations along Market Street. From observation, 40% of the visitors were adult male, 47% of them were adult female, and the remaining 13% were children (ethnogram1, figure 24). The proportion of adult female and children at the location totaled 60%, implying a sense of safety and comfort at Market Street during the observation hours. The major attractions on Market Street were the high-end restaurants and bars, the historical district, and Wild Bill's souvenir shop. The users of this area were tourists, business owners, local residents and visitors. Since it was a St. Patrick's Day weekend, there were

visitors from around the world and local residents to celebrate the day at bars and restaurants and visit the souvenir shop.

| Open Space Ethnogram | | | | Site: Market Street | |
|----------------------------|--------|--------|-------------------------------|------------------------------|--|
| | | | | Date: 03/17/2019 15:30-17:30 | |
| Users | Number | Gender | Age Category | | Activity |
| | | | (0-5) | (5-12)(12-17)(18-25)(25-35) | |
| | | | (35-55) | (55-65)(65-above) | |
| Alone | 12 | Mix | 25-35, 35-55 | | Walking, Smoking, Riding bike, Observing |
| | | | | | Talking over phone, Reading the map, Paying parking meter |
| | | | | | Homeless people, Checking phone, Bike Cop |
| In | 32 | Couple | 18-25, 25-35 | | Walking, Eating, In conversation, Riding bike |
| Groups of 2 | | | | | Observing, Taking photos, Drinking festivities |
| | | | | | Riding horse carriage, With strollers, Reading the map |
| | | | | | Checking phone, Interacting with the kiosk |
| In | 18 | Mix | 18-25, 35-55, 55-65, Below 10 | | Walking, In conversation, Eating, Observing, Reading the map |
| Groups of 2 or more | | | | | Taking photos, Congregation, Riding horse carriage |
| | | | | | Drinking festivities, Interacting with the kiosk |
| Other (with pets) | 10 | Woman | 35-55 | | Walking |

Figure 25 Ethnographic Study- Fevity Weeknd

Field notes- During the observation window, all the restaurant patios were decorated with green balloons and were playing music which created very inviting atmosphere in the area. There were horse carriage rides and electric bikes which helped visitors to move around the area (Figure 20). With the provision of wide sidewalks and pedestrian friendly streets, people were standing in couples, groups and with bikes to enjoy conversation and the outdoors. Among the Market Street restaurants, only Gator’s offers the rooftop patio so that attracted large number of visitors on the street. During the observation period, there was a spray paint artist creating live canvas art on the corner of Corbin Street, which created an opportunity for triangulation (Figure 21). There was a huge crowd taking pictures in front of the Wild Bill’s souvenir shop and visiting the shop (Figure 20). People were walking in and out of the restaurants, as well as enjoying the weather by sitting on the outdoor patios. There were bike cops continuously patrolling the streets at the district and frequent congregations of people on the street created a sense of safety that provided a relaxing and welcoming urban space. There were a couple with strollers and family groups with children passing by the street, or reading the West End map on the

street, or playing on the street furnishing or debating over which place to eat, which provided a sense of equity to the space. There were a few panhandles loitering near the DART station as well as the corners of the street but that did not bother the users. People appeared to generally stop at the intersection waiting to cross the street, were generally looking at the phone, talking or attempting to find their way. People appeared to generally stop under the shaded tree area, or near the patio fencing area, or shop entrances, or street corners, or bike stations to have conversations and observe the surroundings. Most people seemed to not notice the IDK installed right in front of the Wild Bill's souvenir shop. While visiting the shop or passing through the sidewalk, people seemed to get surprised when seeing the kiosk and spent not more than 15 minutes going through its features (Figure 22).



Figure 26 Triangulation- Spray Paint Artist



Figure 27 Triangulation- Souvenir Shop, IDK

The second behavior mapping analysis was conducted on a weekday (April 3, 2019), with cloudy weather and a 53-degree Fahrenheit temperature. The weekday was selected as the specific study day to compare the user dynamics on weekends and weekdays. Social phenomena observations were recorded at Market Street on a cloudy Wednesday afternoon from 11:00 to 14:00. During the observation time, 110 people visited and were engaged with the different characteristics of Market Street. From observation, 43% of the visitors were adult male, 50% of them were adult female, and the remaining 7% were children (ethnogram 2, figure 27). The proportion of adult females and children at the location totaled 57%, implying a sense of safety and comfort at Market Street during the observation hours. The major attractions on the Market Street were the high-end restaurants and bars, the historical district, and Wild Bill's souvenir shop. The users of this area were tourists, business owners, employees, local residents and visitors. Since the observation time was during mealtime on a weekday, there were some tourists, employees, workers, students and local residents to grab the food from restaurants and visit the souvenir shop.

| Open Space Ethnogram | | | | Site: Market Street |
|-----------------------------------|--------|--------|---|--|
| | | | | Date: 04/03/2019 11:00-14:00 |
| Users | Number | Gender | Age Category | Activity |
| | | | (0-5) (5-12)(12-17)(18-25)(25-35) (35-55)(55-65)(65-above) | |
| Alone | 8 | Mix | 25-35, 35-55 | Walking, Smoking, Riding bike, Observing, Reading the map Talking over phone, Cleaning, Paying the parking meter Checking phone, Picking up food, Bike cop |
| In Groups of 2 | 24 | Couple | 18-25, 25-35 | Walking, Eating, In conversation, Riding bike, Observing Taking photos, Homeless people, With strollers, Smoking Reading the map, Smoking, Interacting with the kiosk Checking phone, Picking up food |
| In Groups of 2 or more | 10 | Mix | 18-25, 35-55, 55-65, Below 10 | Walking, In conversation, Eating, Observing, Reading the map Taking photos, Congregation, Interacting with the kiosk |
| Other (with pets) | 4 | Woman | 35-55 | Walking |

Figure 28 Ethnographic Study- Weekday mealtime

Field notes- During the observation window, the researcher started observing the study location at 11:00 but the street was very quiet. There were only a few tourists visiting the area and employees from the restaurants were cleaning and preparing the patio seating for the mealtime. Around 11:30, the restaurants started playing music and the area became little lively and inviting, more people started showing up on the street. Around noon, the area was filled with employees from nearby offices, students from the El Centro Nursing College, workers from a nearby construction site, tourists and visitors. There were electric bikes to help visitors to move around the area (Figure 20). With the provision of wide sidewalks and pedestrian friendly streets, people were standing in couples, groups and with bikes to enjoy conversation and the outdoors. Sidewalk edges, shop entrances and vacant spaces on the study location were the desired spots for smoking. During the observation period, destination for tourists and visitors was Wild Bill’s souvenir shop. People were taking photos in front of the shop and constantly coming in and out, which created a place for triangulation (Figure 22). People were walking in and out of the restaurants as well as seemed to be enjoying the weather by siting in the outdoor patios. There were bike cops continuously patrolling the streets of the district, and frequent congregations of people on the street created a sense of safety that provided a relaxing and welcoming urban space. There were a couple with strollers and family groups with children passing by the street or reading the

West End map on the street, or playing at the street furnishing, or debating over which place to eat, which provided a sense of equity to the space. There were few pan handlers loitering near the DART station as well as the corners of the street but that didn't bother the users. People stopped at the intersection waiting to cross the street were generally looking at the phone or talking or finding their way. There were also few people looking for parking spots or paying the meter for street parking. People generally stopped under the shaded tree area or nearby the patio fencing area or shop entrances or street corners or bike stations to have conversation, check their phone, take pictures, read the West End map and observe the surroundings. Most of the people seemed to be not noticing the IDK installed right in front of the Wild Bill's souvenir shop. While visiting the shop or passing through the sidewalk, people seemed to be surprised by the kiosk and spent not more than 15 minutes experiencing the kiosk features (Figure 22).

Finally, it was observed that groups of people, people with kids, and couples spent more time on the street than individuals and/or pet owners. The former stayed on average for more than 30 minutes while the latter stayed for approximately 15 minutes in the study location. As stated by DIA team, the intended users for the kiosk are general public- tourists, employees, business owners, local residents and visitors but only tourists were the primary group of users identified during the observation period. The kiosk usage seems to be higher during Saturday and relatively lower on Wednesday. More crowds were observed during mealtime.

The themes on IDK features and social interaction derived from behavioral mapping are outlined below. These themes were derived using learnings from the literature review.

- Variety of users
- Ability (ADA accessible)
- Privatization of public space
- Connectivity/ Access points

- Triangulation

4.4 Interview Participants' Profile

The detailed profile of the twelve participants is depicted in the chart (See Figure 26) and is described as follows: (1) 4 visitors; (2) 2 business owners; (3) 2 employee; (4) 1 student; (5) 1 bike cop; (6) 2 DIA team members were involved in the in-depth interview procedure. The researcher interviewed twelve participants to understand their perception of IDK features and influence of the kiosk on their perception of using the space.

■ Business Owner ■ Employees ■ Visitors ■ Student ■ Bike cop ■ DIA Team Members

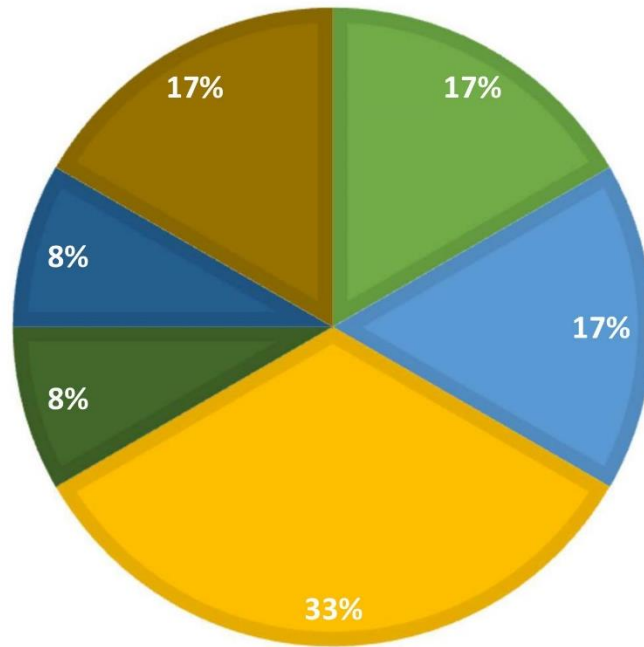


Figure 28 Interview Respondents

4.5 Findings from Interviews

The interviews help the researcher gather information that cannot be observed, such as informants' thoughts, feelings, and experiences at Market Street in West End. The interview data help the researcher to identify the most popular and effective elements on Market Street and analyze the informants' thoughts and feelings about the IDK.

The researcher used the grounded theory method to identify categories from the interview data collected (Taylor and Bogdan, 1998). Following this method, themes emerged from reading and re-reading the interview transcripts until no more themes emerged. Taylor and Bogdan (1998) mentioned that to determine the number of instances in qualitative research and to support a conclusion or interpretation, there are no specific guidelines that are required to be fulfilled especially for the amount of data obtained.

The themes emerging from the analysis of the interview transcripts are outlined under this section; however, there are some overlaps with the themes already identified as part of the literature review. If interviewees mentioned a specific indicator which can be included under themes identified from the literature review, then the theme has an overlap in findings from interviews and literature review. This is explained in more detail later in the chapter under combined themes. The themes on the IDK features and social interaction obtained from interviews are outlined below.

- User conflict
- Safety/security
- Maintenance
- The pedestrian links
- The transit foyer
- The symbolic value
- User-friendly features

4.6 Combined themes

This section elaborates the defined themes from behavioral mapping analysis and on-site interview analysis at Market Street in West End. The combined themes from analysis methods are variety, ability (ADA accessible), privatization of public space, connectivity/ access points, triangulation, user conflict, safety/security, maintenance, the pedestrian links, the symbolic value, user-friendly features.

1) Variety

During the behavioral mapping, the researcher observed that small businesses, restaurants and historical venues of the West End attracts many diverse users like tourists, employees, local residents, business owners, students, workers and visitors (Appendix C (1)). The user group is comprised of individuals, couples, group of people, people with kids, and pet owners (Figure 24).

2) Accessibility

Market Street located in the heart of the West End Historic District of Downtown Dallas provides destinations to the visitors, local residents, employees and tourists (Appendix C (2)). With the close proximity to DART station, the study location provides great connectivity to the other parts of Dallas. Market Street is an urban space that is easy to locate and enter into. People can easily find that there is something to do or something happening in the area, which can entice people to enter the district.

During the behavioral mapping, the researcher observed that the wide brick sidewalks and pedestrian friendly streets provide equal access to general public, people with bikes, disabled individual, elderly and people with strollers. This is intended to define a sense of equity to all the intended users. Additionally, the researcher observed that the defined measures of Market Street like paving, trees, street lights, wide sidewalks, mixed-use surrounding, transit connectivity and bike stations promote pedestrian friendly streets (Figure 24). These elements transform the pedestrian experience to be more enjoyable, welcoming, human scale, engaging and encouraging.

3) Privatization of public space

During the behavioral mapping, the researcher observed that all the restaurants on Market Street offer fenced patio seating which signals that the seating belongs to the particular restaurant (Figure 22(1)). Apart from being situated in the heart of Downtown Dallas with heavy pedestrian traffic, Market Street does not offer any public seating. While talking with some of the business owners, the

researcher was told that panhandlers cause harm to the restaurant business therefore restaurant owners avoid providing public seating around their restaurants.

4) Triangulation

During behavioral mapping, the researcher observed that both the site locations offer elements to impact social interaction. The IDK installed in front of the Wild Bill's souvenir shop and the shop itself, located in Site 1, attracts a diversity of users to the location (Figure 27). Site 2 hosts a variety of street events and occasional activities to attract variety of users, which causes the scope of social interaction (Figure 26). Market Street provides both the opportunities and topics for people to start discussions with others. These spaces not only have an aesthetic appeal but also increase the user dynamics in the area. These spaces draw people onto the street and give them chances to meet and know others who live nearby and enable them to relax with companionship.

5) User conflict

A majority of participants in the study cited user conflict as a behavioral element that affects human social behavior (Appendix C (3)). From interviews, many employees and business owners who were familiar with the area stated that the kiosk provider team removed the charging feature from the kiosk at Market Street since it was being utilized by the homeless but not the intended users. This caused inconvenience to the business owners and other users.

6) Safety/security

Many participants in the study cite user conflict as a critical element that affects the human social behavior. From the interviews, many participants cite that constant patrolling of the bike cops, congregation of people and small businesses provided a sense of safety and security in the area (Appendix C (7)). Market Street Garden is a patrolled urban space with diverse uses and an active environment. These activities minimize opportunities for crime and help the users to feel less vulnerable. The security of this space is one of the important elements that attracts people and creates

a comfortable and friendly environment for all users, especially for women, children, and the elderly. In addition, this sense of safety helps people to feel relaxed and increases interaction among people.

Maintenance is another key point in Market Street and is highlighted by the participants. From the interviews, many of the participants cite that constant removal of the trash from the street and sidewalks as well as aggressive removal of the panhandlers from the Market Street provides sense of safety and is inviting to users.

7) The symbolic value

During the on-site interview process, the participants were asked about their experience of using the kiosk, additional feedback and their take on promoting the use of the kiosk (Appendix C (9)). Most of the participants suggested the modification in the kiosk design at Market Street. The participants cited that the more noticeable the kiosk is more users will be attracted to it. The suggestions from the participants were as follows:

- Adding more color to the kiosk to be noticed by the people
- Adding a label that defines the purpose of the kiosk on it, promotes directing people towards the kiosk
- Adding a sensor features that communicates or invites people passing by
- Adding an aesthetic feature that defines the historical district

8) User-friendly features

During the on-site interview process, the participants were asked about their experience of using the kiosk, additional feedback and their take on promoting the use of the kiosk (Appendix C (9)). Most of the participants suggested the modification of the kiosk design at Market Street. The participants cited that the more user-friendly features the kiosk has the more it attracts more users. The suggestions from the participants were as following:

- Adding street names on the maps

- Adding the user-friendly site map of the kiosk features so that users can access the required data with comparatively less clicks. Time consuming data access tends to promote the attitude to find alternatives to finding the data
- Adding features and graphics like cell phone that users tend be comfortable with
- Adding 'zoom in' and 'zoom out' features to promote user interaction with the maps

4.7 Summary

The findings utilize data from secondary sources, on-site observation and on-site interviews with the kiosk users and DIA team members to understand the relationship between Market Street characteristics, the kiosk features and human social behavior in West End. The defined measures in Market Street include the restaurant patio and seating spaces, widened brick sidewalks and crosswalks, street parking, mixed-use surrounding, transit connectivity, bike stations, downtown connectivity, relationship to the street, no provision of public seating, historical district, one-way streets, paving, street light, trees and music. In addition, eight themes are developed from the data: variety, accessibility, privatization of public space, triangulation, user conflict, safety/security, symbolic value, user-friendly features. It is important to note that these measures, variables and themes are not independent from each other. They work together to create a socially friendly environment in an urban area. In these spaces, people can enjoy family time, meet friends, greet their neighbors, and feel safe and comfortable interacting with strangers. In addition, these spaces can help people attach to their community and create feelings of acceptance. Chapter 5 presents the conclusions of the research, implications for landscape architecture, and recommendations for further study.

Chapter 5: Conclusion & Discussion

5.1 Introduction

This chapter summarizes the research findings and introduces their meaning for the landscape architecture profession. First, this discussion responds to the three research questions in the first chapter and shows how the analysis and findings engage these questions:

1. How does the IDK influence human interaction?
2. How will the IDK impact future urban design?
3. How will it enhance/attract other local business in the defined open space?

Second, this discussion presents the relevance of this research to landscape architecture. Finally, this chapter introduces ideas that arose during the research process and concludes with future research opportunities that can be pursued on the basis of these findings.

5.2 Conclusions

In Chapter 1, the researcher outlines three research questions that guide the scope of this research. The following section summarizes the findings based on the secondary data, on-site observations and on-site interviews and shows how the final research analysis fits the research questions.

- 1) Research Question 1: How does the IDK influence human interaction in urban cities?

The first research question concerns the ways in which the features of the IDK influence human social behavior. There are six key points defined by themes. None of these themes exist independently from one another in West End. They work together to create a comfortable and friendly urban environment for people to interact with others. The guiding design themes identified in this study are:

- **Variety:** Small businesses, restaurants and historical values of the West End attracts many diverse users such as tourists, employees, local residents, business owners, students, workers and visitors.
- **Accessibility:** On Market Street, wide brick sidewalks and pedestrian friendly streets provide equal access to general public, people with bike, disabled individual, elderly and people with strollers. With the close proximity to the DART station and Downtown Dallas, the study location provides great connectivity to the other parts of Dallas. Defined measures of the Market Streets like paving, trees, street lights, wide sidewalks, mixed-use surrounding, transit connectivity and bike stations promote pedestrian friendly streets. These elements transform the pedestrian experience to more enjoyable, welcoming, human scale, engaging and encouraging.
- **Safety/security:** Constant patrolling of the bike cops, congregation of people and small businesses provides sense of safety and security in the area. Market Street Garden is a patrolled urban space with diverse uses and active environment. These approaches minimize opportunities for crime and help the users to feel less vulnerable. Constant removal of the trash from the street and sidewalks as well as aggressive removal of panhandlers from the Market Street provides sense of safety and inviting to the users.
- **Triangulation:** Market Street provides both the opportunities and topics for people to start discussions with others. These spaces not only have an aesthetic appeal but also increase the user dynamics in the area. These spaces draw people onto the street and give them chances to meet and know others who live nearby and enable them to relax with companionship.

Based on the defined themes from behavioral mapping analysis and on-site interviews, analysis at the Market Street in West End, the IDK has potential to make a positive impact to encourage opportunities for social interaction but due to missing themes like 'symbolic values' and 'user

friendly features', the kiosk at the West End failed to make a demonstrable impact on social interaction.

2) Research Question 2: How will IDKs impact future urban design?

With the expanding users of smartphones, the technology is persuasive. The way smartphones have transformed the way humans interact with the world around them.

Connecting people:

- IDKs display information and advertisement for the general crowd.
- Lot of information on fingertip, real-time alerts/information.
- The display maps make public transportation easier to navigate and make information accessible to citizens.
- Generating revenue through third party advertising.
- Constantly updating services to better serve the communities.
- Promote tourist attractions by posting updated information.
- Educating users through public health and safety advertisement, local events.

Safety:

- Constant surveillance technology(sensors) and 911 calling feature promote safety and security.

3) Research Question 3: How will it enhance/attract other local business in the defined open space?

- Secondary users/ local businesses to support the kiosk.
- Connect with commerce.
- Current scenario- local businesses like restaurants and shops bring people to the area to support the kiosk.
- Users bring other people to the area which can help generate revenue for the local businesses.
- Central connectivity or sync to the indoor digital screen to provide ease to the users.

- Reach the particular demographics that the location is serving without sending more merchandise to that location.
- Provide users with more non-physical merchandise, such as music, video games and movies.

5.3 Relevance to Landscape Architecture

Landscape architecture is a field that combines arts and sciences and has an influence on architecture and urban planning. This field includes but is not limited to the design and planning of urban parks/plazas. Urban street furnishings are significant to creating and maintaining livable urban areas, and the interactions in these places encourage citizen investment in the city. As William Whyte (1980) points out in his book six characteristics that are important to create a successful urban parks/plaza are: space, sitting space, food, water, street and triangulation. Therefore, it is important for landscape architects and urban planners to identify what types of urban space elements are necessary to create a social and friendly public urban space and understand how these elements work. In the long term, the findings and analyses from this research, especially the identified themes, can be used in future design projects. Landscape Architecture is about how people live in an environment.

5.4 Future Research Opportunities

As the technology becomes more advanced over time, cities are leaning more towards ‘smart city’ concepts to stay connected with the visitors, local residents, law enforcement, and first responders. With the facility of sensors, designers/manufacturers can monitor user activities to collect data for future decisions to build and what citizens and visitors truly need. The following recommendations for further study will enhance future research related to IDKs and human social behavior:

- 1) Methodology:
 - Increase the number of participants for the interviews.
 - Conduct interviews with Landscape Architecture practices around the study location.

- Conduct passive observations and on-site interviews after all the phases of the 'Smart Cities Living Lab' (2018) at West End project is completed.

- Examine the themes in other urban space with similar measures and variables.

2) Technological influence

- Smart Kiosks to be interactive with the phone for ease of data exchange.
- Employing easy-pay technology offers cities an opportunity to create additional income that can be used to fund their touchscreen kiosks without having to allocate additional resources.
- Offering face recognition sensors to keep the privacy of the individual.
- Connecting electric cars to the smart kiosks to promote eco-friendly environment.
- Kiosks can work as a central port to interact with the local business and users can access the shop inventory to order food or can utilize other facilities.
- Digital ways to interact with businesses.
- Order items from the kiosk.

5.5 Summary

In conclusion, the purpose of this research is to identify the IDK characteristics that can influence human social behavior at West End in Dallas. This research has been organized into five chapters: Introduction, Literature Review, Research Methods, Analysis and Findings and Conclusion. The research describes the evolution of urban spaces and discusses social behavior in public spaces. Additionally, discusses the typology of smart furnishing, introducing the term 'Interactive Digital Kiosk' and defining the need for such kiosks in the urban environment. Secondary documents are also collected from DIA team to describe the background knowledge of the kiosk at West End in Dallas. The literature studied focuses on several elements of the urban space that influences the social activities. These elements include, plazas, sitting space, sun, wind, trees, water, food, street, concourses and mega structures, **triangulation**, users and activities, boundaries and transitions, information and signs and

maintenance and amenities. This research used quantitative methods to study the relationship between the IDK features(variable), defined measures (site characteristics) and human social behavior. The research procedures utilized in-depth interviews and passive observations. The findings utilize data from secondary sources, on-site observation and on-site interviews with the kiosk users and DIA team members to understand the relationship between Market Street characteristics, the kiosk features and human social behavior in West End. The defined measures in Market Street include the restaurant patio and seating spaces, widened brick sidewalks and crosswalks, street parking, mixed-use surrounding, transit connectivity, bike stations, downtown connectivity, relationship to the street, no provision of public seating, historical district, one-way streets, paving, street light, trees and music. In addition, eight themes are developed from the data: variety, accessibility, privatization of public space, triangulation, user conflict, safety/security, symbolic value, user-friendly features.

The study location seems to create symbiotic relationship between local businesses and the kiosk. Similarly, defined measures in West End seem to attract large number of visitors and create an opportunity of triangulation. Findings from the case study projects provided learnings about some essential features of kiosks in urban spaces and data collection methods including passive observation and on-site interviews provided learnings about users' experience; passive observations provided understanding about factors influencing usage of the kiosk and impact of defined measures of West End. In closing, researcher found that the Interactive Digital Kiosk at West End in Dallas, has potential to make a positive impact to encourage opportunities for social interaction but needs additional key features and symbolic value to make it more usable by people and address issues like digital divide. When designing and planning future urban spaces, these characteristics and features can be implemented to enhance the aspects of human social behavior studied in this thesis.

Appendix A

IRB Approval Letter



March 18, 2019

Ravija Munshi
Dr. Diane Jones Allen
School of Architecture
The University of Texas at Arlington
Box 19108

Protocol Number: 2019-0205

Protocol Title: *Impact of Interactive Digital Kiosk upon social behavior in public spaces of Dallas, Texas*

APPROVAL OF MINIMAL RISK HUMAN SUBJECTS RESEARCH WITHOUT FEDERAL FUNDING

The University of Texas Arlington Institutional Review Board (UTA IRB) or designee has reviewed your protocol and made the determination that this research study involving human subjects is approved in accordance with UT Arlington's [Standard Operating Procedures \(SOPs\)](#) for minimal risk research. You are therefore authorized to begin the research as of **March 16, 2019**.

Note that this project is not covered by UTA's Federalwide Assurance (FWA) and the researcher has indicated it will not receive federal funding. You must inform Regulatory Services immediately if the project may or will receive federal funding in the future, as this will require that the protocol be re-reviewed in accordance with the federal regulations for the protection of human subjects.

As Principal Investigator of this IRB approved study, the following items are your responsibility throughout the life of the study:

UNANTICIPATED ADVERSE EVENTS

Please be advised that as the Principal Investigator, you are required to report local adverse (unanticipated) events to The UT Arlington Office of Research Administration; Regulatory Services within 24 hours of the occurrence or upon acknowledgement of the occurrence.

INFORMED CONSENT DOCUMENT

The IRB approved version of the informed consent document (ICD) must be used when prospectively enrolling volunteer participants into the study. Unless otherwise determined by the IRB, all signed consent forms must be securely maintained on the UT Arlington campus for the duration of the study plus a minimum of three years after the completion of all study procedures (including data analysis). The complete study record is subject to inspection and/or audit during this time period by entities including but not limited to the UT Arlington IRB, Regulatory Services staff, OHRP, FDA, and by study sponsors (as applicable).

MODIFICATIONS TO THE APPROVED PROTOCOL

All proposed changes must be submitted via the electronic submission system and approved prior to implementation, except when necessary to eliminate apparent immediate hazards to the subject. Modifications include but are not limited to: Changes in protocol personnel, changes in proposed study procedures, and/or updates to data collection instruments. Failure to obtain prior approval for modifications is considered an issue of non-compliance and will be subject to review and deliberation by the IRB which could result in the suspension/termination of the protocol.

ANNUAL CHECK-IN EMAIL / STUDY CLOSURE

Although annual continuing review is not required for this study, you will receive an email around the anniversary date of your initial approval date to remind you of these responsibilities. Please notify Regulatory Services once your study is completed to begin the required 3-year research record retention period.

HUMAN SUBJECTS TRAINING

All investigators and personnel identified in the protocol must have documented Human Subjects Protection (HSP) training on file prior to study approval. HSP completion certificates are valid for 3 years from completion date; the PI is responsible for ensuring that study personnel maintain all appropriate training(s) for the duration of the study.

CONTACT FOR QUESTIONS

The UT Arlington Office of Research Administration; Regulatory Services appreciates your continuing commitment to the protection of human research subjects. Should you have questions or require further assistance, please contact Regulatory Services at regulatoryservices@uta.edu or 817-272-3723.

Appendix B

Informed Consent Document



The University of Texas at Arlington (UTA)

Informed Consent for Studies with Adults

TITLE OF RESEARCH PROJECT

Impact of Interactive Digital Kiosk upon social behavior in public spaces of Dallas, Texas

RESEARCH TEAM

Principal Investigator- Ravija Munshi, Landscape Architecture Program,
ravijaviral.munshi@mavs.uta.edu

Faculty Advisor- Dr. Diane Jones Allen, Landscape Architecture Program, diane.allen@uta.edu,
817-272-2801

IMPORTANT INFORMATION ABOUT THIS RESEARCH PROJECT

The research team above is conducting a research to study about the impact of Interactive Digital Kiosk upon human social behavior in West End, Dallas. The aspects of human social behavior studied in this thesis are the Demographic study; duration of usage; browsing data classifications; factors affecting usage; self-congestion, meaning the amount and location of new interaction; and individualism. Using West End in downtown Dallas as a case study, the thesis uses on-site observations and interviews with users and designers/manufacturers to analyze the role of the kiosk, how it plays crucial role in promoting users' enjoyment of public spaces and user interaction.

You might want to participate in this study if you want to contribute your perspective to a user interaction study involving smart kiosk in urban space. However, you might not want to participate in this study if you are uncomfortable sharing your personal experiences with a group.

This study has been reviewed and approved by an Institutional Review Board (IRB). An IRB is an ethics committee that reviews research with the goal of protecting the rights and welfare of human research subjects. Your most important right as a human subject is informed consent. You should take your time to consider the information provided by this form and the research team, and ask questions about anything you do not fully understand before making your decision about participating.

TIME COMMITMENT

Participation in this study will last approximately 20 minutes.

RESEARCH PROCEDURES

The procedures which will involve you as a research participant include:

- 1) Read through this Informed Consent and talk with the researcher to make sure that any questions you may have are answered; then make your choice about whether to participate.
- 2) If you agree to participate, you will be asked interview questions which were prepared by the researcher. Questions will be related to your experience of using Interactive Digital Kiosk at West End, Dallas.

IRB Approval Date: 3/16/2019

v. 2019-0205



The University of Texas at Arlington (UTA)

Informed Consent for Studies with Adults

- 3) If you agree to participate as a designer/manufacture, you will be asked interview questions which were prepared by the researcher. Questions will be related to design features of the Interactive Digital Kiosk at West End, Dallas.
- 4) Other comments mentioned by the participant/designer about the kiosk will be recorded as well.

This interview will be audio recorded. After the interview, the tape will be transcribed, which means they will be typed exactly as they were recorded, word-for-word, by the researcher. The tape will be destroyed after transcription.

POSSIBLE BENEFITS

The data conducted from interview will be contributed to urban space design. When designing and planning future urban spaces, these observations can be implemented to enhance the aspects of human social behavior studied in this thesis.

POSSIBLE RISKS/DISCOMFORTS

There are no perceived risks or discomforts for participating in this research study. However, if you do experience any discomfort, please inform the research team.

COMPENSATION

No compensation will be offered for participation in this study.

ALTERNATIVE OPTIONS

There are no alternative options offered for this study. However, you can elect not to participate in the study or quit at any time at no consequences.

CONFIDENTIALITY

The research team is committed to protecting your rights and privacy as a research subject. All paper and electronic data collected from this study will be stored in a secure location on the UTA campus and/or a secure UTA server for at least three (3) years after the end of this research. If audio/visual recordings will be used, the recording will be immediately destroyed after transcription."

The results of this study may be published and/or presented without naming you as a participant. The data collected about you for this study may be used for future research studies that are not described in this consent form. If that occurs, an IRB would first evaluate the use of any information that is identifiable to you, and confidentiality protection would be maintained.

While absolute confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law. In addition to the research team, the following entities may have access to your records, but only on a need-to-know basis: the U.S. Department of Health and Human Services and the FDA (federal regulating agencies), the reviewing IRB, and sponsors of the study.

IRB Approval Date: 3/16/2019
v. 2019-0205



The University of Texas at Arlington (UTA)
Informed Consent for Studies with Adults

CONTACT FOR QUESTIONS

Questions about this research study or reports regarding an injury or other problem may be directed to Dr. Diane Jones Allen at diane.allen@uta.edu or 817-272-2801. Any questions you may have about your rights as a research subject or complaints about the research may be directed to the Office of Research Administration; Regulatory Services at 817-272-3723 or regulatoryservices@uta.edu.

CONSENT

By signing this form, you are confirming that you understand the study's purpose, procedures, potential risks, and your rights as a research subject. By agreeing to participate, you are not waiving any of your legal rights. You can refuse to participate or discontinue participation at any time, with no penalty or loss of benefits that you would ordinarily have. Please sign below if you are at least 18 years of age and voluntarily agree to participate in this study.

SIGNATURE OF VOLUNTEER

DATE

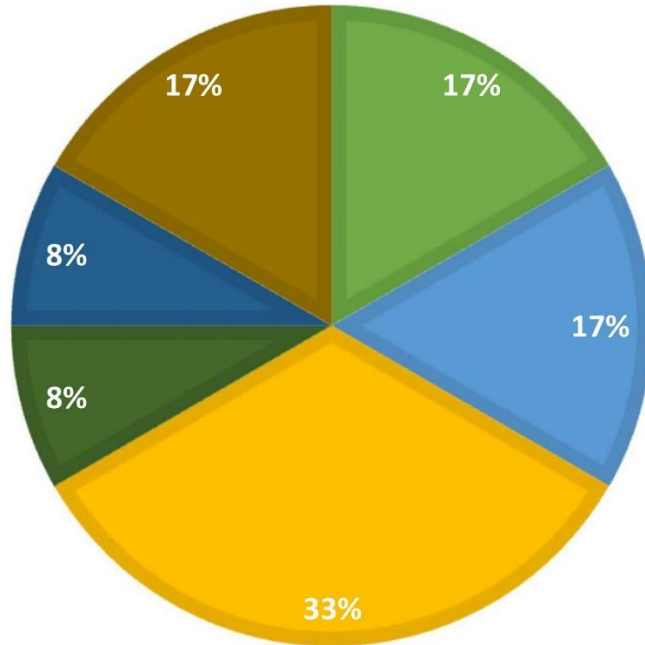
**If you agree to participate, please provide the signed copy of this consent form to the research team. They will provide you with a copy to keep for your records.*

Appendix C

On-site Interview Results

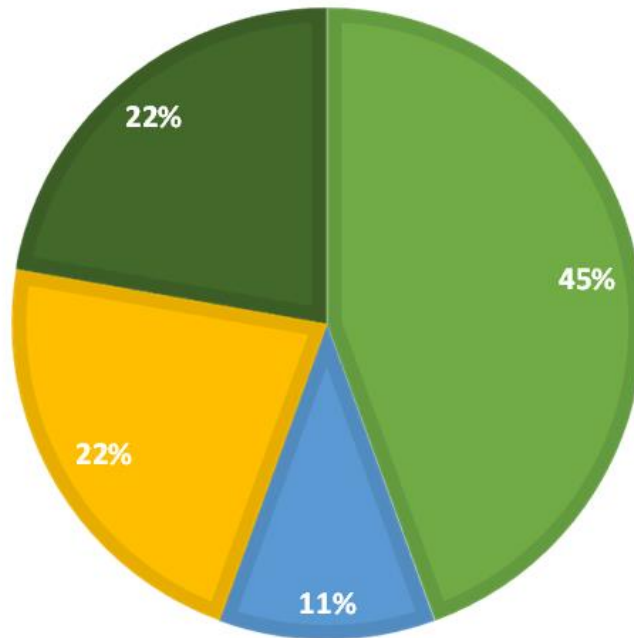
1) Are you a visitor/local/resident/business owner?

■ Business Owner ■ Employees ■ Visitors ■ Student ■ Bike cop ■ DIA Team Members

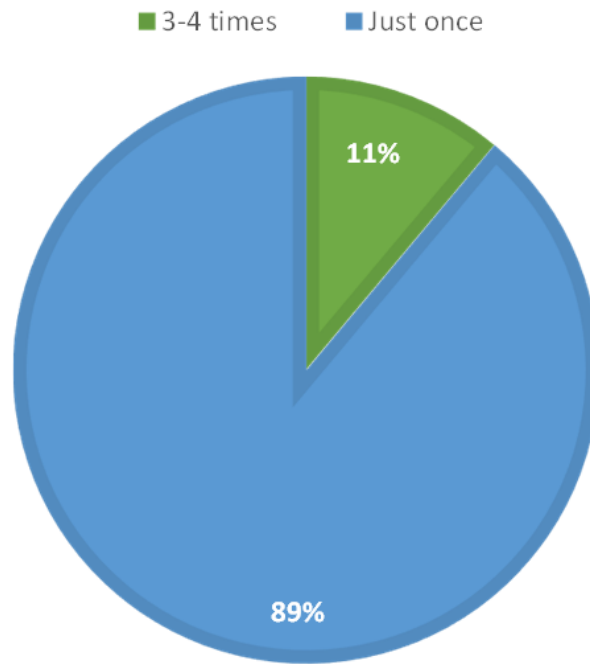


2) What was your purpose for coming here?

■ Work ■ College ■ Game ■ Downtown

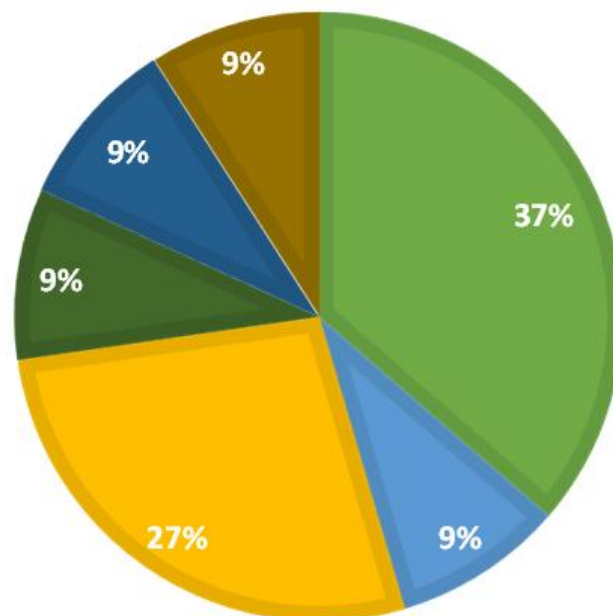


3) How often do you use the kiosk?

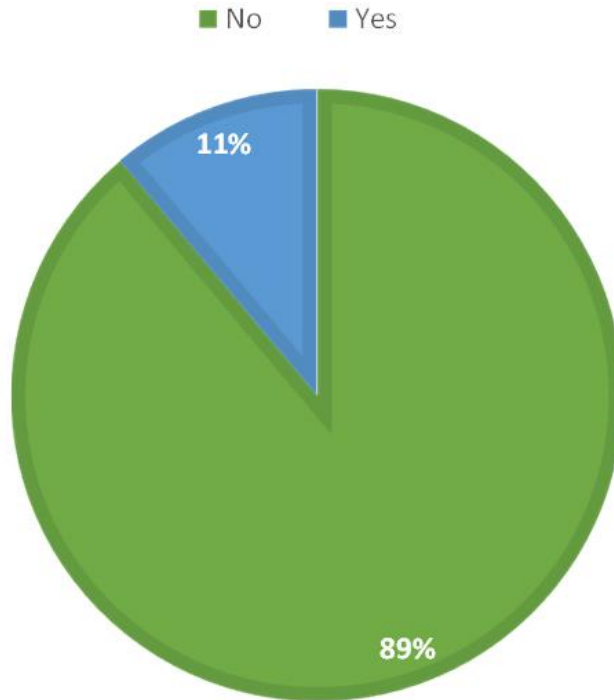


4) What are you looking for when using the kiosk?

- Nearby Restaurants
- Downtown Map
- Wayfinding
- Point of Interest
- Entertainment
- Selfie

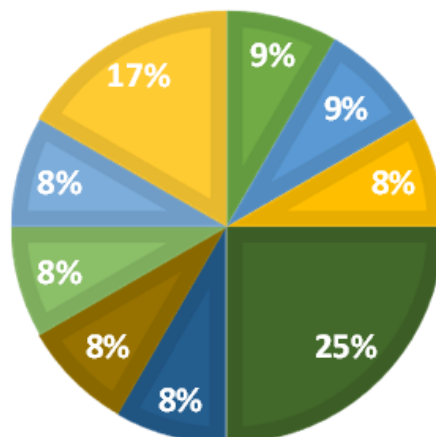


5) Do you usually meet new people while exploring through the kiosk?



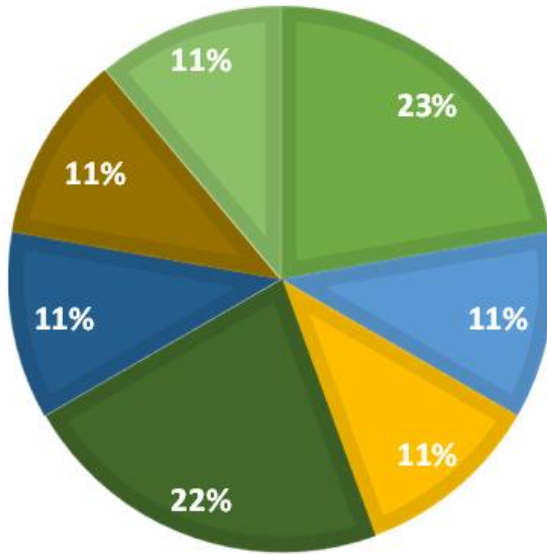
6) Can you suggest any other locations for the kiosk around the city?

- Sixth Floor Museum at Dealey Plaza
- DART Station
- American Airlines Center
- Major tourist places
- KBH Convention Center
- John F. Kennedy Memorial Plaza
- Along McKinney Ave
- Klyde Warren Park
- No suggestions



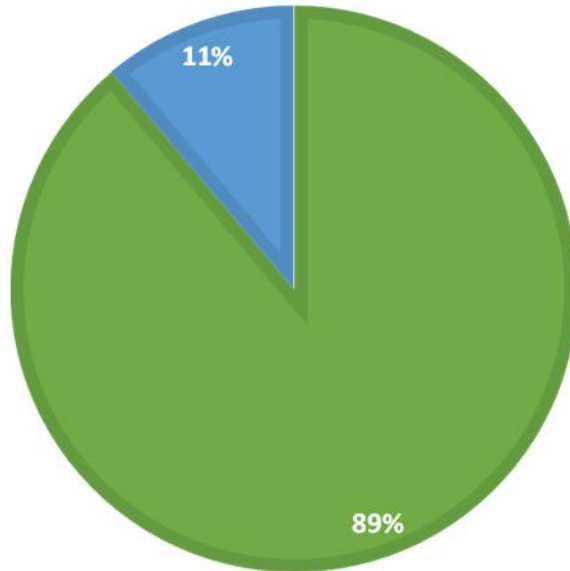
7) Does the kiosk increase your perception of safety?

- Congregation of People
- Businesses
- Restaurants
- Police
- Phone
- Tidy spaces
- Removal of Panhandlers

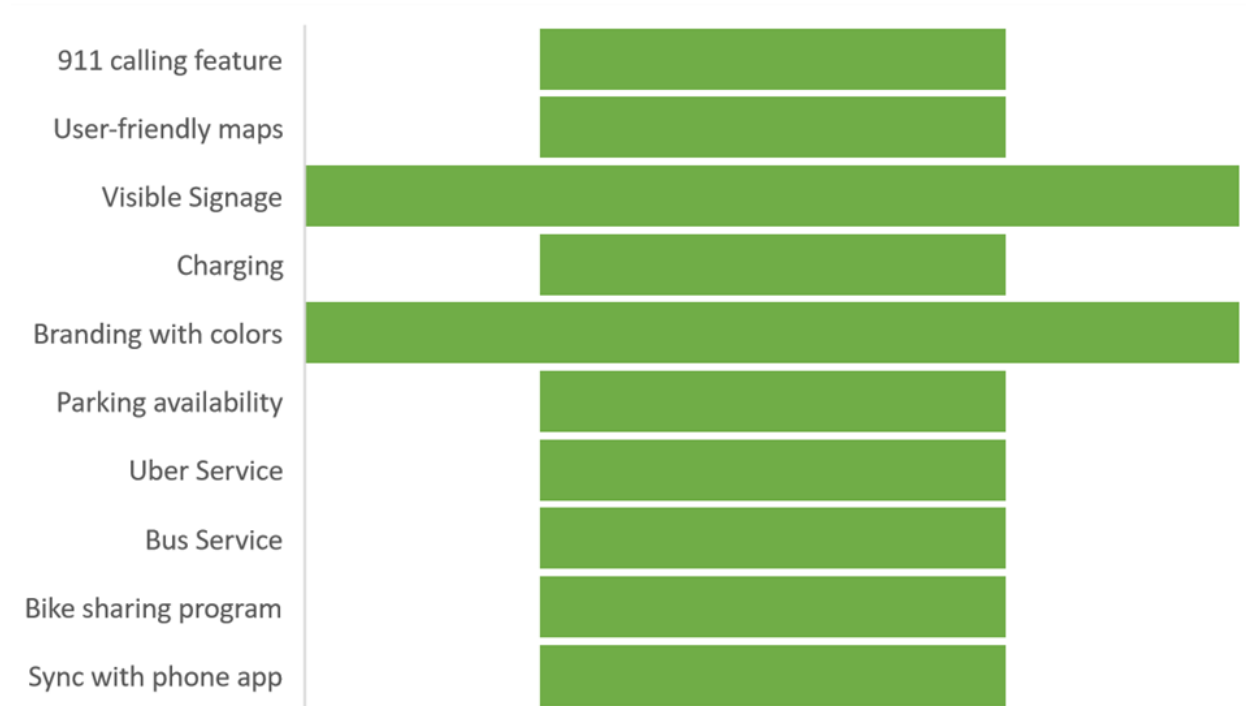


8) What is your opinion on the kiosk being a conversation starter?

- No
- Yes



9) Can you suggest any improvements to the kiosk?



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