
Research Article

Enhancing Urban Mobility and Reducing Visual Pollution on Wasfi Al Tal Street in Amman: Implementing Interactive Kiosks for Better Navigation, Traffic Flow, and Aesthetic Appeal

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Abstract

Cities today are increasingly challenged by the dual pressures of mobility inefficiency and declining urban visual quality, particularly in rapidly expanding contexts such as Amman, Jordan. Wasfi Al Tal Street, as one of the city's primary commercial corridors, exemplifies these challenges through persistent traffic congestion and a high degree of visual pollution resulting from fragmented and unregulated signage. This study explores the potential of interactive kiosks as an integrated urban intervention aimed at improving mobility and reorganizing the visual environment. Rather than relying on empirical data collection, the research adopts a conceptual and scenario-based approach, grounded in a critical review of literature, analysis of comparable international case studies, and contextual interpretation of the study area. Through this framework, the study examines how centralized digital information systems can enhance wayfinding, support more efficient traffic distribution, and contribute to a more coherent and visually balanced streetscape. The findings highlight the role of interactive kiosks not only as technological tools, but as urban design elements capable of restructuring the relationship between movement, information, and visual perception. The study ultimately proposes a set of design and planning considerations for integrating such systems within the urban fabric of Amman, contributing to ongoing discussions on smart mobility and sustainable urban development in similar contexts.

Keywords: Urban Mobility, Smart City, Interactive Kiosks, Visual Pollution, Urban Design, Sustainable Urban Development.

1. Introduction

1.1 Theoretical framework and previous studies

Status of urban mobility in the digital era

With the emergence of digital technologies, there have been a lot of changes in urban mobility patterns globally. Some of the smart urban mobility solutions being implemented in cities include:

- Real-time Traffic Monitoring: AI-based traffic management systems have been implemented to optimize traffic flow and prevent congestion on the road (Kadkhodayi et al., 2023).
- Shared Mobility Services: Ride-sharing services, e-scooters, and bike-sharing services have become very popular alternatives to traditional modes of transport (Luca & Malek, 2022).
- Intelligent Public Transport Systems: Smart ticketing systems, GPS tracking, and scheduling have been implemented to improve public transport services (Elassy et al., 2024; Kazi et al., 2018).

Urban mobility for advertising

In addition, urban mobility's increasing integration of digital technologies has opened new avenues for advertising within smart transportation systems. Digital billboards, in-vehicle advertising, and kiosks are some of the technologies being utilized for advertising in urban areas, particularly in high-density environments (OEM Kiosks, n.d.). These technologies enable:

- Personalized advertising: AI-based advertising, which is dynamic and responsive to user behavior.
- Location-based marketing: Targeted advertising, which is geotargeted and visible in public spaces and transit centers (Li, 2024).
- Interactive consumer engagement: Digital kiosks, which not only serve as navigational aids for consumers but also as advertising tools for businesses and organizations, as discussed in (Balti et al., 2024; Sung et al., 2021).

Smart advertising has been integrated in London and New York, utilizing real-time data to display context-specific advertisements within public transportation systems (Cutter, 2023).

Visual Pollution in Urban Mobility

Definition and significance

Visual pollution can be defined as the presence of too many disorganized, and/or offensive visual elements in an environment. For example, in urban environments, visual pollution is mainly caused by overcrowding in signages, billboards, electrical wiring, and planning in infrastructure (Daradkeh, 2019).

The effect of visual pollution is not only physical, but it also affects mental states, mental processes, and the efficiency of mental navigation. It has been proved in research that environments with high levels of visual pollution increase stress and reduce the satisfaction of pedestrians in a specific area (Gelan, 2025).

Visual pollution in urban mobility

The infrastructure, such as roads, within an urban mobility system can have significant visual clutter due to issues such as:

- Excessive amount of information: Too much information from different signs creates confusion.
- Unmaintained infrastructures: Old or dilapidated billboards can cause urban blight.

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- Uncontrolled digital signage: Too much information from LED signs creates sensory overload (Gelan, 2025).

Nonetheless, Wasfi Al Tal Street, just like all other main streets in urban areas, faces the issue of visual pollution at a high level. This impacts the street's efficiency and aesthetic sense. To address this issue, it is necessary to adopt a set of strategies that will not only assist in the streamlining of signages and advertisements but also in the incorporation of "smart technologies" such as interactive kiosks (Daradkeh, 2019).

Cognitive Perception and Conceptual Metaphors in Urban Communication

The current trends in cognitive linguistics, especially the conceptual metaphor theory, offer great insights into how human beings process and perceive visual information in urban spaces. It is essential to note that metaphors in human communication are not just used for rhetorical and aesthetic purposes, as Lakoff and Johnson (1980) argue. Rather, metaphors are essential concepts in human cognition, perception, and communication (Abu Romman, 2025).

Interactive kiosks, public postings, and navigation aids, for example, seem to rely on visual and verbal signals. These signals are understood in terms of conceptual metaphors such as "traffic flow" (fluidity of movement), "navigation paths" (travels), and "decision points" (crossroads). Metaphors play an important role in the usability and clarity of interfaces, and poorly aligned metaphors can lead to cognitive overload and visual disorientation, which are part of visual pollution (Abu Romman, 2025).

By using cognitive metaphor theory in the planning and designing process of an urban communication system, such as an interactive kiosk, it is possible for designers and planners to look past the surface level of designing an aesthetically pleasing system. Instead, it is possible to design an interface or signage within an urban space that is based on the cognitive process by which the human mind processes the concept of movement and space. This not only makes it an easy system to utilize, but it also eliminates unnecessary information through the elimination of illogical information. Cognitive perception is the basis for a visually harmonious system (Abu Romman, 2025).

Status of Urban Mobility for Advertising use in Jordan

Urban Mobility for advertising in Jordan

It is noticed that Jordan, specifically Amman, has witnessed an increase in outdoor advertisements with the rise of urbanization and business activities. For example, Wasfi Al Tal Street is crowded with advertisements, such as billboards and banners. This has resulted in visual clutter (GAM, 2018). The following figure shows an example of the urban mobility status in Wasfi Al Tal Street, located in Amman.

The current condition of commercial signage along Wasfi Al Tal Street reflects a high level of visual congestion and lack of coordination. This is shown in Figure (1).



Figure (1): Status of Commercial signages in Wasfi Al Tal Street [7]

However, despite all the efforts made by local authorities, such as the Greater Amman Municipality (GAM), in controlling the issue related to sign usage, the recent emergence of digital ads has also caused an increase in the issue related to visual pollution and information overload (Daradkeh, 2019). Some of the major challenges that are being faced in the urban advertising scenario of Jordan include:

- Disruption of visual harmony by unregulated use of billboards.
- There is no standard policy for digital advertisements.
- Usage of smart advertising technology is very low compared to other countries.

Interactive kiosks as an urban mobility for advertising in Jordan

Interactive kiosks represent one of the contemporary, structured, and efficient ways to replace traditional means of advertising. This is because interactive kiosks have the advantage of improving urban mobility and wayfinding, as well as digital advertising (Manohar Digital Team, n.d; Martinez et al., 2024).

The potential advantages that can be achieved by using interactive kiosks in advertising in Jordan are:

- Reducing the number of billboards in the country by incorporating advertising information within a single screen with multiple facilities.
- Adhering to location-based advertising according to the movements of the consumers in real time.

- Encouraging community interaction by providing information through means such as direction information (DSR Technologies, n.d.)

There are many cities around the world, like Dubai and Singapore, where interactive kiosks have successfully been included in their infrastructure, taking into consideration the need for advertisements as well as aesthetics and accessibility. The aim of this research is to identify how these ideas can be used in Amman to enhance mobility, reduce visual pollution, and improve advertisements (Addad & Al-Taani, 2024).

Case Studies

Case Study: Interactive Kiosks in Miami Beach

The city of Miami has introduced kiosks, which are referred to as IKE, Information Kiosk Everywhere, launched in 2021, located in a region referred to as Wynwood. This kiosk resembles a large smartphone, which has touch screens on both sides. This kiosk allows people to access free Wi-Fi, information about local attractions, transport, etc. In addition, people can transfer information from the kiosk to their own smartphone. The kiosk also includes a surveillance camera, emergency messages, environmental sensors, etc. The kiosk earns money through advertising, which leads to minimal costs for the government (Garcia & Torres, 2021). The following figures show an overview of IKE kiosk along with its features.

Interactive kiosks are becoming popular as multifunctional elements in the urban space, providing information services along with digital advertising. Figure (2) shows how kiosks show advertising content when they are not being used.

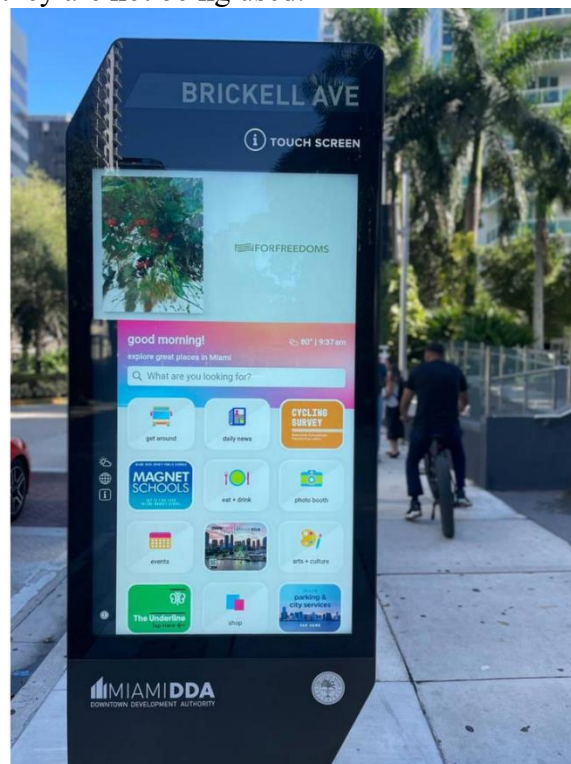


Figure (2): IKE displaying a loop of ads when nobody is using it (Rodríguez Ortiz, 2023)

Besides advertising, interactive kiosks have a crucial role in facilitating way-finding and navigation in urban spaces. Figure (3) illustrates the application of kiosks in facilitating way-finding for hotel visitors.

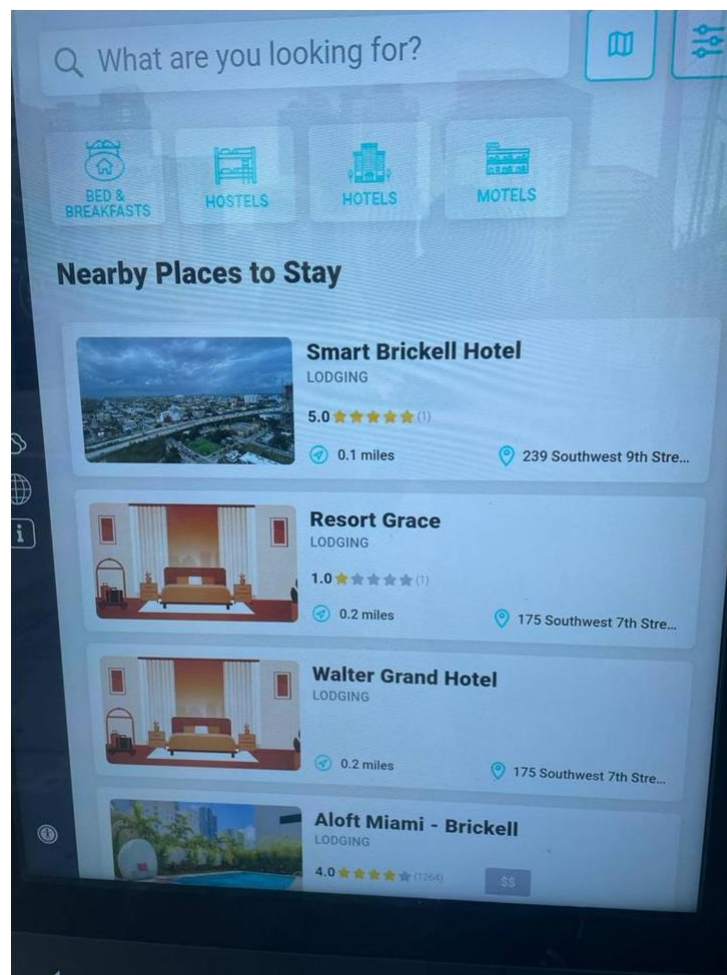


Figure (3): The use of IKE for hotel wayfinding (Rodríguez Ortiz, 2023)

Beyond navigation and advertising, interactive kiosks can also serve critical safety functions within public space. As shown in Figure (4), kiosks may include emergency communication features for public use.



Figure (4): IKE emergency call button to call 911 (Rodríguez Ortiz, 2023)

Introduction to the Case Study

Context and Relevance

- In 2021, the city of Miami Beach introduced IKE interactive kiosks to enhance urban mobility and provide access to information to the public. The IKE interactive kiosks were first introduced in the Wynwood area of the city and aim to incorporate technology into urban infrastructure (Garcia & Torres, 2021).
- The case study is relevant to the research on interactive kiosks in that it represents the power of technology to increase accessibility and provide information in real time to the public. The case study could be used as an example in the urban area around Wasfi al-Tal Street in Amman.

Location and Scope

- Location: Wynwood neighborhood, Miami Beach, Florida.
- Scope: The project began with kiosks in key urban locations, and the plan is to expand the kiosks to the whole city. The kiosks have various functions, including the provision of

transportation information, promotion of local businesses, emergency alerts, and the provision of free public Wi-Fi services.

Objectives to the Case Study

Purpose

- The most fundamental purpose of the kiosks in Miami Beach was to facilitate public access to essential urban information, improve public way-finding, and create a more user-friendly city experience (Garcia & Torres, 2021).
- The overall purpose of the kiosks was to offer essential services such as free Wi-Fi, public transportation, and alerts for emergencies, ensuring inclusiveness for those without personal mobile devices (Garcia & Torres, 2021).

Research Questions

- How can interactive kiosks help solve urban mobility problems in Miami Beach?
- How can interactive kiosks improve accessibility for people who do not own digital devices?
- What are the social and economic effects of the kiosks in promoting local businesses and urban involvement?

Methodology and Approach

Implementation Process

- The kiosks were placed in areas with high volumes of traffic, such as pedestrian areas and transport nodes. The kiosks had user-friendly and two-sided touch screens for easy interaction.
- The project was a partnership between the city government, technology firms, and investors. The advertising revenue from the kiosks funded the project (Garcia & Torres, 2021).

Data Collection

- Analytics tools are also provided to monitor kiosk usage statistics, including navigation assistance requests, public transportation queries, and local business listings.
- Feedback was obtained from users in the form of a survey to measure kiosk usability in a real-world environment.

Participants

- The major stakeholders in this case would include the city planners in Miami Beach, the technology providers (IKE Systems), business owners, and citizens.
- The tourists are also benefiting from this kiosk service because they are able to support multiple languages to assist non-English speakers.

Technology and features

Technology Used

- Interactive Touch Screens: The high-definition touch screens on both sides will facilitate access to information for the users (Garcia & Torres, 2021).
- Wi-Fi Access: The kiosks will offer free access to Wi-Fi for the users.
- Real-Time Information: The kiosks will offer real-time information on transport, weather, and directions to key places.
- Emergency Messages: The kiosks will also offer emergency messages during critical situations.

Key Features

- Wayfinding & Transit Assistance: Provides real-time information on multi-modal transportation options including buses, bike-sharing options, ride-sharing options, etc.
- Public Information & Digital Equity: Provides Wi-Fi access points and access to business listings, events, government information, jobs, social services, etc.
- Emergency Alerts: Displays real-time information on public safety alerts provided through FEMA's Integrated Public Alert and Warning System
- Cultural & Business Promotion: Displays public art projects, museum exhibitions, and QR code promotions of local businesses (Billboard Insider, 2025)

Implementation & Community Impact

- Initial installations have been set up in Wynwood, with future plans for Downtown, Brickell, Little Havana, Coconut Grove, Overtown, and Allapattah.
- 10% of the kiosks are set aside for underserved communities.
- Partnerships with organizations such as the Perez Art Museum Miami (PAMM) and Wynwood Walls are part of public art programs.
- This project further cements Miami's position as a city committed to smart city living, pedestrian-friendly spaces, and digital inclusiveness.

Lessons Learned and Insights

Success Factors

- The kiosks were successful in providing a wide variety of public services in a small format. The integration of the kiosks with the urban fabric of Miami Beach was a contributing factor to the success of the kiosks.
- The kiosks, being accessible, catered to individuals with varying levels of digital literacy and those without a smartphone.

Challenges and Solutions

- Operational Efficiency: The high-traffic areas led to wear and tear. The city had to ensure regular maintenance and software upgrades for the kiosks.

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- Privacy Concerns: The city also had to deal with issues of data security. They had to ensure strict policies were put in place for data collection and privacy (Garcia & Torres, 2021)

Recommendations for Future Projects

- Future implementations could be aided by the addition of other interactive elements, such as communication with city services or other public services (e.g., health services).
- User feedback is going to be critical in further refining the interface and involving other members of the public.

Relevance to the Research

How it informs the Study

The Miami Beach case study demonstrates the effectiveness of interactive kiosks in improving urban mobility and accessibility to necessary services. The results of this case study indicate that interactive kiosks could be effective in Wasfi al-Tal Street, Amman, and could improve wayfinding, minimize visual clutter, and provide useful services to users.

Transferability

The success of the interactive kiosks in Miami Beach can be emulated in the implementation in Amman, especially in terms of helping tourists and giving real-time information for transportation. With its user-friendly interface, support for multiple languages, and advertising options, the kiosks can be very helpful in enhancing the quality of life for residents in a multicultural setting like Wasfi al-Tal Street.

Similar Initiatives in Other Cities

Stamford, Connecticut

In March 2025, Stamford Downtown introduced four kiosks that assist people in navigating their way around Stamford. These kiosks are 8 feet tall, providing people with real-time information about the weather, air quality, city news, and information about MTA and CT Transit schedules. One side of the kiosk is a touchscreen with a QR code that helps people access interactive features, while the other side is a static map showing people the key places to visit in Stamford Downtown. A fifth kiosk will be installed near Stamford Transportation Center (Laguarda, 2025). The following figure shows a new solar-powered kiosk installed at the corner of Main and Bank Streets Stamford:



Figure (5) :new solar-powered kiosk at the corner of Main and Bank streets in downtown Stamford on Tuesday, March 4, 2025. The kiosks, which come from Cambridge-based Soofa, feature information on weather, air quality and a map of downtown (Laguarda, 2025)

Stamford Downtown has introduced four kiosks in March 2025 to help people navigate their way around Stamford. These kiosks are 8 feet tall, helping people get timely updates regarding weather, air quality, news, and MTA and CT transit schedules.

These kiosks help users get environmental and navigation-related information through a single interface. Figure (6) further describes the various components of such kiosks.

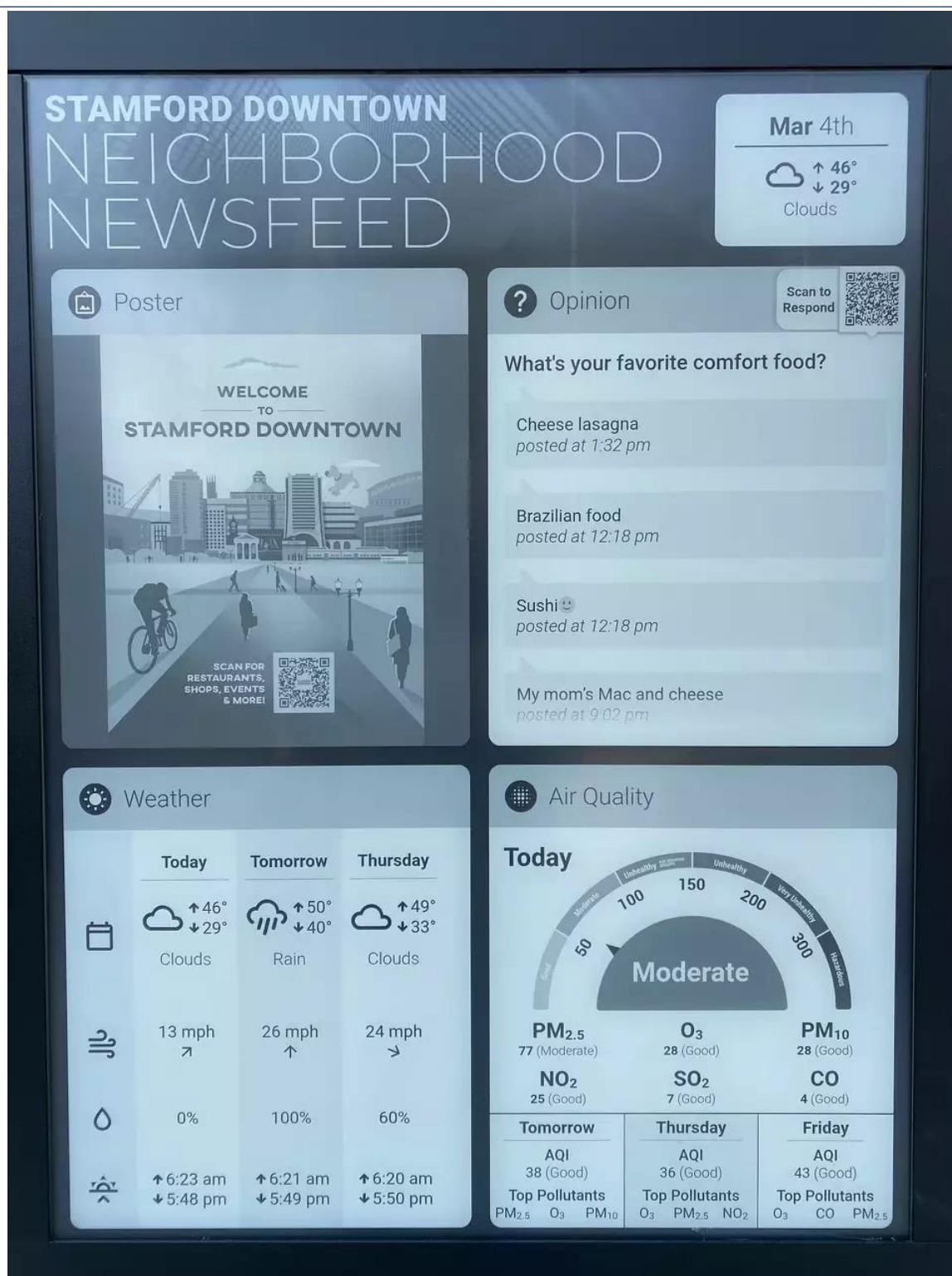


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based Soofa, feature information on weather, air quality and a map of downtown (Laguarda, 2025)

Pittsburgh and Las Vegas

The interactive kiosks installed in Pittsburgh and Las Vegas by Connectpoint have seen considerable usage. In Pittsburgh's Port Authority system, a single kiosk recorded 25,119 monthly "route planning interactions," while in Las Vegas, RTC kiosks recorded 18,932 similar interactions in a month's time. Such kiosks offer real-time updates and trip planning assistance with numerous transportation options, improving the commuter experience (CHK America, n.d.).

Similar initiatives in other cities underscore the importance of kiosks in improving public transport systems and interaction. Figure (7) is an example of the implementation of interactive kiosks in transport environments.



Figure (6): CHK America [5]

Interactive Kiosks in Urban Mobility

One of the best examples of the potential of interactive kiosks for improving urban mobility can be seen in the use of kiosks for mobility hubs in Brussels and Rotterdam. The study had 105 participants, and it focused on the usability and acceptance of kiosks, especially for improving inclusiveness by allowing people without a personal device to access digital technology (Martinez et al., 2024).

In European mobility hubs, interactive kiosks have been used for improving accessibility and inclusiveness for various user groups. Figure (8) shows the various stages of interface for a digital kiosk.



Figure (7): Left: the digital kiosk in Anderlecht—middle: starting screen of the digital kiosk—right: detailed page on carsharing (Martinez et al., 2024)

Study Overview

The aim of the research was to explore the potential of digital kiosks for assisting users who have a low level of education, do not speak the local language well, and have little or no knowledge of using digital technologies in accessing mobility services. The participants were asked to complete seven predetermined tasks, for example, check the schedule of public transport services, book shared mobility services, and learn about additional amenities that the mobility hubs can provide. The study adopted a mixed-method approach, combining participant observation and surveying for collecting comprehensive information (Martinez et al., 2024).

Key Findings

Usability Across Demographics

The research found that digital kiosks are accessible to people with low digital literacy and those who are not proficient in the local language. The participants found it easy to use, showing that digital technology is not exclusive to the disadvantaged (Martinez et al., 2024).

Design Considerations

For better accessibility, the study recommended the importance of user-friendly and self-explanatory interfaces. The recommendations included the use of appropriate colors, font size, and pictograms for users of different literacy levels (Martinez et al., 2024).

Potential for Inclusivity

Moreover, the research concluded that digital kiosks could help minimize the transportation disadvantages of marginalized groups. This is because they can bridge the gap for those who do not own a smartphone (Martinez et al., 2024).

Summary and comments on previous studies

Amman is the capital city of Jordan. It is a city that has undergone rapid urbanization in recent times. Urbanization is a process that is linked to various challenges. One of the most pressing challenges in a rapidly urbanizing city is how urban mobility is managed. Wasfi Al Tal Street is a street in the city of Amman. It is a street that faces a number of challenges in the form of traffic congestion, inefficient way-finding systems, and a high level of visual pollution. These are challenges that not only create a negative experience for users of the street but also contribute to the aesthetic degradation of the city, thus creating visual pollution.

Visual pollution is a factor that is usually ignored in the planning of a city. It entails any visual feature that contributes to the degradation of the aesthetic quality of a particular environment. The issue of visual pollution on Wasfi Al Tal Street is demonstrated through the presence of street signs, advertisements, and infrastructure that are not well maintained. It has been established through research that visual pollution affects mental and emotional states since it results in stress and anxiety (Daradkeh, 2019; Ulrich, 2006).

Visual disorder affects cognitive processes such as attention and memory, thereby having a negative effect on the experience of users of the street, whether pedestrians or drivers (Kaplan & Kaplan, 1989).

However, the issue of visual pollution along Wasfi Al Tal Street has been around for some time. Figure (9) shows an earlier state of visual clutter along the street.



Figure (8): Visual Pollution on Wasfi al Tal Street in 2006 (GAM, 2018)

Efforts have been made by local authorities to reduce visual pollution through regulations and design interventions. Figure (10) is an example of guidelines for the removal of signages implemented by the Greater Amman Municipality.



Figure (9): Implementation of GAM's signage removal guidelines by Riwaq (GAM, 2018)

One of the most effective ways of addressing these issues is through the utilization of interactive kiosks. This is because, through the utilization of electronic devices, there is an ability to display real-time information for navigation and traffic updates. This, in effect, helps to address the issue of traffic congestion and, in turn, enhances the aesthetic quality of the built environment. This is particularly true in the context of utilizing traditional signage and street furniture, replacing them with modern and contemporary electronic devices, which are aesthetically pleasing and functional in urban spaces (Israk Solutions, 2024). The aim of the research is to explore the potential for enhancing the quality of the built environment along Wasfi Al Tal Street through the utilization of interactive kiosks.

Interactive kiosks in urban spaces, such as in the city of Miami, demonstrate their potential as multifunctional urban devices. Figure (11) is an example of an interactive kiosk utilized in the urban space of Miami Beach.



Figure (10): Interactive kiosk in focus for Miami Beach in 2020 (Miami Today News, 2020)

2. Research Problem and Guiding Questions

2.1 Research Problem

One of the most active urban routes in the city of Amman, Wasfi Al Tal Street, demonstrates a high volume of traffic, commercialization, and a dense quantity of visual elements. Despite the significance of this route, the current condition of the street faces a series of challenges related to traffic, inefficient way-finding systems, and a high volume of visual pollution caused by disordered and uncontrolled signage.

This not only affects the efficiency of traffic but also affects the spatial experience, perception, and comfort of users. The lack of a unified way-finding system leads to a series of inefficiencies and disordered visual elements within the urban route.

In this sense, the incorporation of interactive kiosks suggests a new way of thinking about the structure of urban routes.

2.2 Guiding Research Questions

In this context, this study is informed by the following research questions:

1. What is the potential role of interactive kiosks in enhancing wayfinding and navigation in complex urban spaces like Wasfi Al Tal Street?
2. In what ways do centralized digital information systems have the potential to facilitate more efficient movement of traffic?
3. What is the potential role of integrating interactive kiosks in reducing visual pollution in urban spaces?
4. What design strategies are required to integrate interactive kiosks in the urban context of Amman?

3. Objectives and Significance of the Study

3.1 General Statement

In this study, the potential of interactive kiosks as an integrated urban intervention for improving movement and reducing visual pollution in Wasfi Al Tal Street in Amman is investigated. By rethinking the potential of digital way-finding systems in the urban environment, the study aims to improve movement and make it more efficient, while creating a more cohesive and visually balanced urban environment.

3.2 Research Purpose and Objectives

Research Purpose

The aim of this research is to explore how interactive kiosks can work as a smart urban solution within the framework of Wasfi Al Tal Street. The research will concentrate on their contribution to navigation systems, visual communication, and a more organized urban experience.

Research Objectives

1. To examine the role of interactive kiosks in facilitating wayfinding and navigation in the urban environment.
2. To examine the role of interactive kiosks in facilitating efficient movement of traffic.

3. To examine the role of interactive kiosks in eliminating visual pollution in the urban environment.
4. To examine the role of interactive kiosk design in enhancing the aesthetic quality of the urban environment.
5. To examine the design and planning considerations of integrating interactive kiosks in the urban environment of Amman.

3.3 Research Significance

This research contributes to the study of urban design and smart mobility by understanding the role of interactive kiosks not only as smart technologies but also as components of the urban space. It reveals the possibility that smart technologies hold in transforming the structure of information, mobility, and visual composition in the city (Sharifi et al., 2023).

This research offers a conceptual model that could guide urban planners, designers, and planners in the formulation of strategies that could address the issues of functionality and visual composition in rapidly expanding cities such as Amman.

Moreover, the research offers valuable lessons that could be applied in other cities similar to Amman, which could aid in the creation of more harmonious, accessible, and visually appealing streets through the integration of smart technologies.

4. Study terms

This section presents a discussion on the key terms that form the basis for the conceptual and analytical framework of this research. These definitions aim to provide a better understanding of how concepts such as urban mobility, visual communication, and digital interventions are understood within a specific context such as Wasfi Al Tal Street.

- Urban Mobility: This concept has been understood as a phenomenon through which urban movement is facilitated and experienced within a given urban setting, particularly focusing on pedestrian, vehicle, and public transport systems, as well as their efficiency and accessibility (Rodrigue, 2024).
- Visual Pollution: This concept has been defined as a phenomenon through which visual elements within a setting tend to interfere with both visual clarity and aesthetic appeal of a setting.
- Wayfinding: This concept has been understood as a process through which users tend to interpret spatial elements within a setting, particularly through a combination of physical elements, signage systems, and digital elements.
- Interactive Kiosks: This concept has been understood as a phenomenon through which digital elements tend to provide users with navigational guidance, as well as forming part of a setting such as a street.
- Smart Mobility: This concept has been understood as a phenomenon through which digital elements tend to facilitate urban transport systems.

5. Limitations of The Study

5.1 Study Limitations

It is to be noted that the study is of a conceptual and scenario-based nature, and hence its results and findings need to be viewed in the context of analytical and design-based research.

It is to be noted that one of the major drawbacks of the study is the absence of field-based data collection. The proposed concept of using interactive kiosks is analyzed from a theoretical perspective, contextual understanding, and reference to similar international case studies.

It is to be noted that the study is limited to Wasfi Al Tal Street, and hence its applicability to other urban contexts needs to be adapted to suit the requirements and needs of other urban environments.

It is to be noted that the proposed scenarios for urban design are of a speculative nature, and although they are derived from existing literature and urban issues, their applicability and success need to be viewed from a prospective and applied research context.

5.2 Scope for Future Development

Although there are certain limitations in the study, it has offered a conceptual framework, which can be used as a basis for further research. Other studies can be conducted further, and the empirical method can be included in the study to assess the performance of the interactive kiosk systems in the urban environment.

6. Research Approach and Analytical Framework

6.1 Research Approach

In this study, a conceptual and scenario-based method is employed to assess the potential of interactive kiosks as an urban intervention for improving mobility and reducing visual pollution in Wasfi Al Tal Street, Amman. This study is not based on empirical data collection; instead, it is founded on a combination of theoretical exploration, contextual assessment, and review of case study examples.

The method is informed by existing literature related to smart mobility, urban perception, and visual communication systems, in addition to some examples of international best practices in the implementation of interactive kiosks (McKinsey & Company, 2023), which are used to develop an analytical framework through which the context of the study area is re-assessed.

6.2 Analytical Framework

The analysis is broken down into the following four interrelated dimensions that are informed by the challenges identified within the study area:

- Urban Mobility: An examination of the efficiency and accessibility of the system, and the relationship between the user and the system.
- Wayfinding and Navigation: An understanding of the way in which spatial information is conveyed and interpreted within the urban space.
- Visual Pollution: An evaluation of the effect that the fragmentation of signage and visual information has upon the user and the system.

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- Urban Aesthetic Quality: An evaluation of the way in which the visual identity and balance are achieved within the urban space.

The above dimensions are not intended as measurable elements, but rather as an analytical device that allows for a more interpretive and design-led understanding of the urban condition.

6.3 User Context and Urban Actors

The research will look at the variety of people who use Wasfi Al Tal Street, including pedestrians, drivers, residents, tourists, and decision-makers. These people will be considered from an experiential perspective, referring to their experience of using the space.

This helps to inform the creation of design scenarios that not only meet the functional needs, but also the experiential aspects of movement and spatial interaction.

6.4 Visual Assessment Criteria

To evaluate the degree and consequences of visual pollution, the research will apply a range of qualitative assessment criteria based on theory and literature in urban design:

- Sign Density and Distribution: The level and distribution of signage and advertising.
- Aesthetic Integration: The level of correspondence between visual elements and the architectural style of the area.
- User Perception: The impact of visual pollution on users in terms of their ability to get their bearings and cognitive processes.

In addition, the analysis will also encompass broader issues such as the psychological effect, cultural significance, and the urban quality. These will be the guidelines rather than measures of the analysis.

6.5 Case Context: Wasfi Al Tal Street

The case context of Wasfi Al Tal Street will be analyzed as a representative urban corridor with high levels of traffic activity, commercial intensity, and visual fragmentation. The analysis will focus on identifying the spatial conditions of the area, including areas of congestion, areas of high pedestrian interaction, and areas of excessive signage. The spatial structure and key characteristics of the case will be depicted in Figure (12).

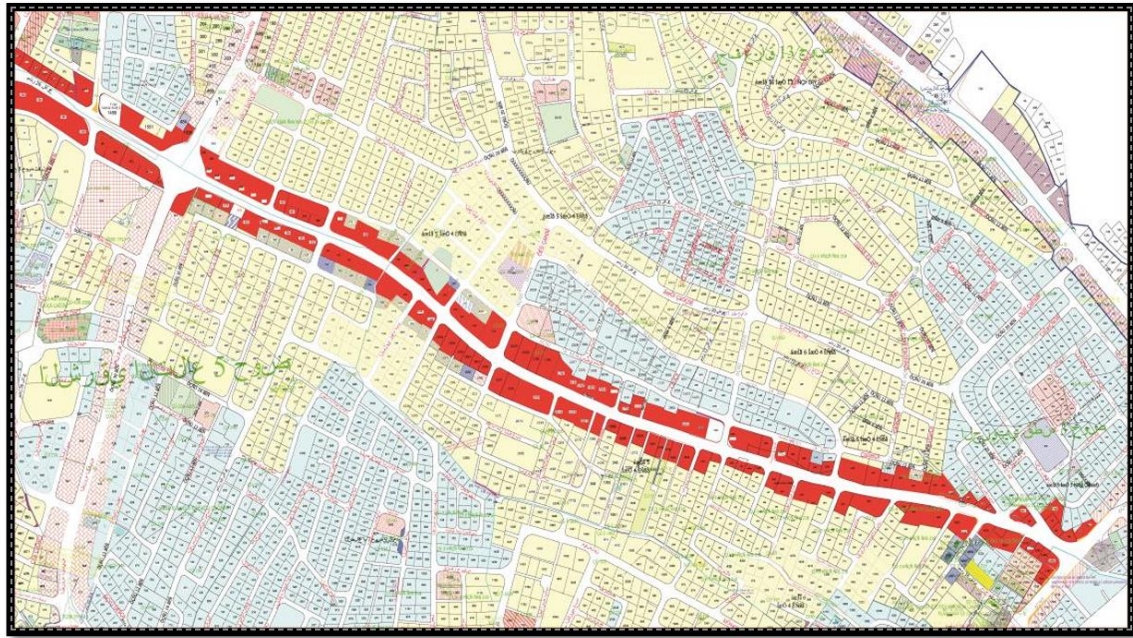


Figure 11: Wasfi Al Tal Street map (GAM, 2018)

6.6 Scenario Development

Following this analytical framework, the study proposes a range of design scenarios that consider the integration of the interactive kiosks into the existing urban landscape. While the scenarios are not empirically tested, they are proposed as informed design propositions, based on observed circumstances and informed by international case studies.

The proposed scenarios consider:

- Strategic placement of kiosks at urban nodes.
- Integration of kiosks with existing streetscape elements.
- Consolidation of fragmented information systems.
- Improvement of functionality and visual coherence.

6.7 Design Considerations for Interactive Kiosks

The proposed kiosks will be examined in terms of their technology and their urban design aspects, in relation to the following considerations:

- Functional Integration: Real-time navigation, information on traffic, and information on public transport.
- Aesthetic Contribution: Contribution to the visual quality of the streetscape.
- User Accessibility: Easy and inclusive interaction with the users.
- Sustainability: Environmental sensitivity and energy efficiency.

6.8 Scope and Limitations

This research, as a conceptual and scenario-based research, does not include the process of validating the research using field measurements and/or surveys of users. Instead, it provides a design-oriented analytical framework.

The results of this research must be interpreted and understood as a foundation for future research that may include the process of validating the research.

7. Analytical Insights and Scenario-Based Findings

This section will discuss the analytical insights drawn from the conceptual framework and contextual interpretation of Wasfi Al Tal Street, in reference to international best practice. The discussion will not focus on the empirical findings but rather how interactive kiosks may be utilized as a comprehensive solution to address the issues of mobility and visual pollution.

7.1 Urban Mobility and Wayfinding Efficiency

The existing spatial condition of Wasfi Al Tal Street indicates the ongoing difficulties associated with spatial navigation. The information presented within the space is fragmented, inconsistent, and lacks a centralized system to assist with effective spatial navigation. This results in disorienting conditions for both pedestrians and drivers, especially within busy areas.

Considering the above spatial condition, it is possible to understand the role of interactive kiosks within the spatial context, which can reorganize the existing information within the space. This results in the application of a centralized system for spatial navigation, avoiding the disorienting effects associated with the existing fragmented information system.

The change from fragmented to integrated information systems indicates the opportunities associated with the application of digital information systems for spatial navigation, which can improve spatial orientation within complex environments, see Figure (13).



Figure 1: Transformation of Wasfi Al Tal Street

Figure (12): Proposed transformation of Wasfi Al Tal Street into a smart mobility corridor.

Source: Authors

7.2 Traffic Flow and Congestion Patterns

The nature of the observed traffic conditions on Wasfi Al Tal Street suggests that there is a pattern of congestion around intersections and commercially active areas. This is largely related to a lack of access to real-time information and inefficient route decisions.

In light of insights provided by successful smart mobility systems in similar contexts, it is possible to argue that the inclusion of interactive kiosks in this system is related to improving the nature of traffic awareness and decisions. This could ultimately result in more balanced movement in terms of accessibility on the street network.

This scenario, although not empirically examined in this research, is related to extensively explored relationships between information accessibility and mobility efficiency. This system suggests an approach towards more informed movement patterns, see Figure (14).

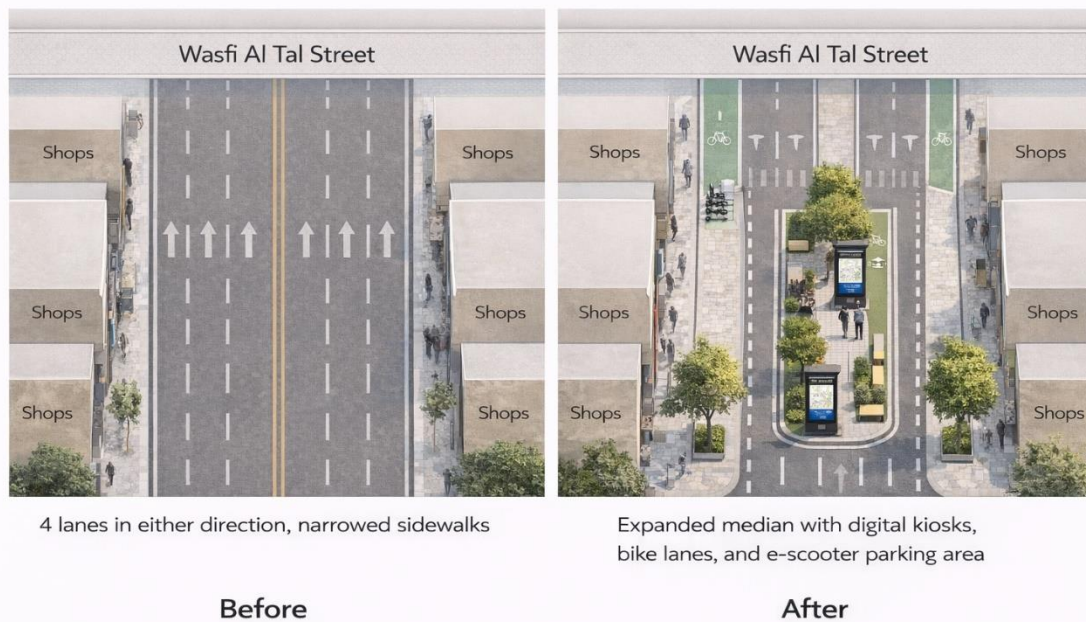


Figure 2: Proposed Traffic Flow Improvement on Wasfi Al Tal Street

Figure (13): Conceptual illustration of improved traffic flow and navigation efficiency. Source: Authors

7.3 Visual Pollution and Urban Aesthetic Quality

One of the most critical issues identified in the study area is the level of visual pollution. The streetscape is dominated by excessive and uncoordinated signage, overlapping advertisements, and uncoordinated visual elements, resulting in a fragmented image of the urban environment.

Interactive kiosks, from an urban design perspective, provide not only a technological solution but also a spatial and visual reorganization strategy. This is because they have the ability to centralize multiple layers of information into a single digital platform, thereby eliminating the need for redundant physical signage and creating a more balanced visual environment.

This is not only a change in terms of visual environment but also cognitive. A more organized visual environment allows for better perception and creates a better experience of the urban environment, thereby overcoming information overload, see Figure (15).



Figure 3: Reduction of Visual Pollution on Wasfi Al Tal Street.

Figure (14): Reduction of visual pollution through centralized digital systems. Source: Authors

7.4 Insights from Comparative Case Studies

The review of international case studies in cities like Miami, Stamford, and European mobility hubs also provides significant insights into the role of interactive kiosks in influencing urban environments.

From all these case studies, it is evident that there are certain underlying principles that govern the effective application of interactive kiosks in urban environments:

- Emphasis on user-centric and user-friendly design
- Strategic placement in high-density zones
- Integration with transportation infrastructure

From an urban context in Amman, it is evident that the application of global strategies in urban environments is subject to local factors.

7.5 Integrated Discussion

From an analytical perspective, all of these insights indicate a strong potential for interactive kiosks to function as a multifunctional urban intervention. The value of such kiosks is not only in their technological functionality but also in their potential to transform the organization of movement, information, and visibility within the urban space.

From a more specific perspective, such as Wasfi Al Tal Street, the integration of kiosks can be seen to function within a framework of:

- Clarified and facilitated navigation.
- Informed and responsive traffic behavior.
- Reduced visual complexity through centralized information.
- Enhanced aesthetic qualities of the urban space.

Ultimately, however, the success of such urban interventions will depend on their integration within a wider urban design strategy. Thus, interactive kiosks should not simply be seen as technological devices but also as architectural elements that can actively impact urban spatiality.

This further underlines the importance of ensuring a strong interrelation between technological innovation and urban design to facilitate a strong contribution to both functionality and visuality within the urban space.

8. Recommendations

With the above analytical insights in mind, the following recommendations are made that could inform the integration of interactive kiosks as part of a broader initiative to improve urban mobility and minimize visual pollution along Wasfi Al Tal Street and similar contexts.

8.1 Urban Design and Streetscape Integration

Therefore, a consistent framework of design should be used for the integration of the kiosks, such that they are consistent with the architectural style and visual identity of Amman. Rather than kiosks being introduced as a technological innovation, they can be incorporated as part of a comprehensive streetscape concept that considers the functional and visual elements of the urban environment.

This can facilitate a move from a fractured and overused signage style towards a more integrated and centralized urban information concept. This can, in turn, support a more enhanced visual organization, as well as a spatial identity of the street.

The development of kiosks can be considered as part of a broader architectural concept, where their integration into existing structural elements can support a more consistent continuity.

As can be seen from Figure (16), kiosks can be integrated into existing structures of the arcades.



Figure 4: Integration of Arcade Structures Along Wasfi Al Tal Street for Pedestrian Protection

Figure (15): Integration of interactive kiosks within the arcade structure. Source: Authors
Strategic Placement and Urban Efficiency

The efficiency of such kiosks is also closely related to their spatial distribution within the urban setting. Therefore, strategic placement should target key impact areas such as intersections, public transport nodes, and busy commercial areas where both pedestrian and vehicular traffic converge.

For instance, there should be a special focus on areas characterized by high levels of congestion and visual clutter, as this will represent key points where such kiosks can bring significant improvement to urban mobility and spatial clarity.

There should also be a phased approach to strategic placement, starting with key nodes. Figure (17) presents a strategic placement approach for kiosks within key urban nodes, depicting how their distribution can improve accessibility, facilitate improved information flow, and enhance efficient movement across the street.

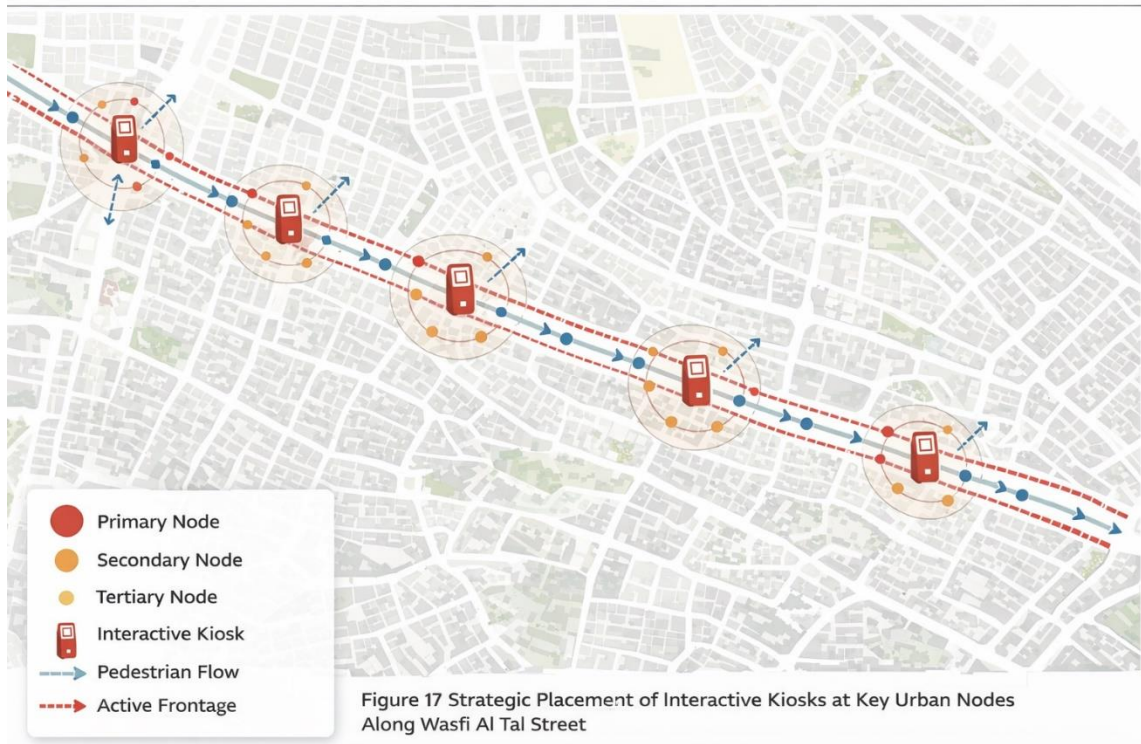


Figure (16): Strategic placement of interactive kiosks at key urban nodes. Source: Authors

8.3 Functional and Technological Considerations

For the interactive kiosks to function effectively in the urban system, they must incorporate real-time navigation, traffic information, and public transportation information. This way, the users are able to make adaptive decisions, thus creating a more adaptive and effective urban system.

Another aspect that is essential in the design of the interactive kiosks is the user interface. The user interface must be intuitive and accessible to all users, including those who are not technology-savvy. The user interface must also incorporate the ability to provide information in more than one language in order to effectively serve the residents and visitors.

Moreover, the integration of green technology, such as solar power, into the kiosks is likely to contribute to the sustainability of the kiosks and the urban system. As illustrated in Figure 18, the design of the interactive kiosk integrates the functionality and the user interface, thus creating an effective system.



Figure 5: Detailed view of interactive kiosk design proposed for Wasfi Al Tal Street.

Figure (17): Proposed interactive kiosk design and interface features. Source: Authors

8.4 Policy and Regulatory Framework

For the successful implementation of interactive kiosks, it is necessary that a favorable policy and regulatory framework is present. This includes the formulation of guidelines for the effective management of outdoor advertising, as well as the causes of visual pollution.

Public-private partnerships can prove to be effective for the funding, implementation, and management of such projects. However, it is also necessary that such projects are consistent with the overall urban development and smart city concepts.

Moreover, regulations related to the use of data, privacy, and information technologies are required for the ethical use of such technologies.

8.5 User Experience and Social Considerations

User-centric design is an essential element in all aspects of kiosk development and implementation. This includes considerations for different types of users, such as pedestrians, drivers, residents, and visitors.

Particular attention should be paid to users who are not familiar with digital technologies in order to make it easier for them to interact with kiosks. Moreover, public awareness is also an essential element in facilitating the usage of this system.

The interaction between users and kiosks is an essential element in understanding how people experience and interact with their urban environment. Figure 19 demonstrates different

scenarios in terms of user interaction in the urban environment in relation to kiosks.



Figure 6: Conceptual visualization of pedestrian interaction with the proposed kiosks along Wasfi Al Tal Street.

Figure (18): User interaction with interactive kiosks in the urban environment. Source: Authors

8.6 Directions for Future Research

Further studies need to be carried out to investigate the long-term effects of integrating interactive kiosks in urban environments, specifically in terms of mobility patterns, user behavior, and visual quality.

Future studies on this subject may follow this conceptual framework but also include empirical studies to test the application of this system in practice.

Another avenue that may be explored is the integration of kiosk systems with mobile application technologies and smart city infrastructure. This approach may also be adapted in other urban environments in Jordan to draw comparisons.

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Disclosure of AI Tools Used

This research has made limited use of artificial intelligence tools, particularly OpenAI's ChatGPT, for assistance with language refinement, grammatical correction, and structural clarity.

The intellectual content, interpretation, and conclusion are original and critically crafted by the authors, adhering to the journal's standards for academic integrity.

Ethics Declaration

This research is considered a conceptual study and does not include human participants, data gathering of personal information, or experimentation. Thus, formal ethical clearance was not necessary.

This research has been conducted in accordance with the ethical guidelines of the Jordan Journal of Applied Science to ensure academic integrity and proper references to sources and materials.

Data Availability Statement

This article is conceptual in nature and does not require data collection or analysis. All the insights have been derived from literature review, contextual analysis, and comparative case studies.

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The authors declare no conflicts of interest.

Author Contributions

Inas Daradkeh and Nour El Qirem conceived the work, developed the research framework, and carried out the analytical interpretation of the data. The authors also shared the manuscript writing and revision process.

Consent for Publication

The authors declare that the manuscript is original, has not been published elsewhere, and is not under consideration for publication elsewhere. All authors approved the final version of the manuscript.

References

- Abu Romman, O. (2025). The theory of conceptual metaphor in cognitive linguistics. *Jordan Journal of Applied Science: Humanities Series*, 43(2), 1182. <https://doi.org/10.35192/jjoas-h.v43i2.1182>
- Addad, M., & Al-Taani, S. (2024). Leveraging AI for energy-efficient smart cities: Architectural and urban planning solutions for sustainable growth - A comparative case study of Amman city and international examples. *Journal of Civil Engineering and Architecture*, 18, 620–632. <https://doi.org/10.17265/1934-7359/2024.12.006>
- Balti, A., Lakhous, M. N., & Sayadi, M. (2024). Overview of smart city technologies: A case study of designing a multi-service smart kiosk for citizens. *International Journal of Computers*, 9, 12–21.

- Billboard Insider. (2025, March 31). IKE Smart City installing 15 digital kiosks in Miami. *Billboard Insider*. <https://billboardinsider.com/ike-smart-city-installing-15-digital-kiosks-in-miami/>
- CHK America. (n.d.). Smart transit: Unprecedented usage for transit interactive kiosks – CHK America's Connectpoint® interactive kiosk fulfills transit agencies' goals and objectives. Retrieved from <https://connectpoint.com/smart-transit-unprecedented-usage-for-transit-interactive-kiosks/>
- Cutter, L. (2023, August 14). Smart cities can be huge for OOH with the right partnerships. *The Media Leader*. <https://uk.themedialeader.com/smart-cities-can-be-huge-for-oooh-with-the-right-partnerships/>
- Daradkeh, I. (2019). The impact of the commercial signage on visual pollution of commercial street: Amman City: Wasfi Al Tal Street as a case study. *Middle East University*.
- DSR Technologies. (n.d.). Benefits of interactive kiosks. *DSR Technologies*. Retrieved March 30, 2025, from <https://dsrtechnologies.co.uk/benefits-of-interactive-kiosks/>
- Elassy, M., Al-Hattab, M., Takruri, M., & Badawi, S. (2024). Intelligent transportation systems for sustainable smart cities. *Sustainable Cities and Society*, 16. <https://doi.org/10.1016/j.scs.2024.1000277>
- Garcia, A., & Torres, A. (2021, June 22). Wynwood gets city's 1st interactive kiosk experience. *Local 10 News*. <https://www.local10.com/news/local/2021/06/22/wynwood-gets-citys-1st-interactive-kiosk-experience/>
- Gelan, E. (2025). Assessing visual pollution: The impact of urban outdoor advertisements in Addis Ababa, Ethiopia. *MDPI*. <https://www.mdpi.com/2673-8945/5/1/9>
- Israk Solutions. (2024). The evolution of interactive kiosk usage in 2024: Redefining customer engagement. *Israk*. Retrieved March 28, 2025, from <https://www.israk.my/the-evolution-of-interactive-kiosk-usage-in-2024-redefining-customer-engagement>
- Kadkhodayi, A., Jabeli, M., & Aghdam, H. (2023). Artificial intelligence-based real-time traffic management. *Journal of Electrical Electronics Engineering*, 2(4), 368–373. https://www.researchgate.net/publication/375006146_Artificial_Intelligence-Based_Real-Time_Traffic_Management
- Kaplan, S., & Kaplan, R. (1989). *The experience of nature: A psychological perspective*. Cambridge University Press.
- Kazi, S., Bagasrawala, M., Shaikh, F., & Sayyed, A. (2018). Smart e-ticketing system for public transport bus. In *Proceedings of the International Conference on Smart Cities and Emerging Technologies (ICSCET)*, 1–5. <https://doi.org/10.1109/ICSCET.2018.8537302>
- Laguarda, I. (2025, March 5). Stamford Downtown unveils new solar-paneled kiosks to provide 'more robust wayfinding system'. *Stamford Advocate*. <https://www.stamfordadvocate.com/news/article/stamford-downtown-solar-energy-20201764.php>
- Li, T. (2024). AI empowered personalized digital advertising marketing. *Frontiers in Business Economics and Management*, 15(2), 439–442. <https://doi.org/10.54097/k0wjgk28>

- Luca, A., & Malek, B. (2022). Bike-sharing, car-sharing, e-scooters, and Uber: Who are the shared mobility users and where do they live? *Sustainable Cities and Society*, 86(5), 104161. <https://doi.org/10.1016/j.scs.2022.104161>
- Manohar Digital Team. (n.d.). The role of smart city kiosks in sustainable urban development. *Medium*. Retrieved March 28, 2025, from <https://medium.com/@manohardigitalteam/the-role-of-smart-city-kiosks-in-sustainable-urban-development-66124ff9992e>
- Martinez, L., Garritsen, K., Baguet, J., Grigolon, A., Münzel, K., Keserü, I., & Geurs, K. (2024). Digital kiosks and inclusivity: A novel perspective on mobility hubs. *European Transport Research Review*, 16(1), 1–13. <https://doi.org/10.1186/s12544-024-00676-8>
- GAM (Greater Amman Municipality). (2018). Signage regulations and visual pollution control guidelines in Amman. Retrieved from <https://media.ammancity.gov.jo/En/NewsDetails/Deadline to Remove Billboards Covering Buildings is 30th August>
- McKinsey & Company. (2023). Infrastructure technologies: Challenges and solutions for smart mobility in urban areas. *McKinsey & Company*. Retrieved March 30, 2025, from <https://www.mckinsey.com/industries/infrastructure/our-insights/infrastructure-technologies-challenges-and-solutions-for-smart-mobility-in-urban-areas>
- Miami Today News. (2020, October 21). Interactive kiosk bonanza back in focus for Miami Beach. *Miami Today News*. Retrieved March 28, 2025, from <https://www.miamitodaynews.com/2020/10/21/interactive-kiosk-bonanza-back-in-focus-for-miami-beach/>
- OEM Kiosks. (n.d.). Smart cities. *OEM Kiosks*. Retrieved March 30, 2025, from <https://oemkiosks.com/?page=smart-cities>
- Rodrigue, J. P. (2024). Urban mobility. In *Transport geography*. Retrieved March 30, 2025, from <https://transportgeography.org/contents/chapter8/urban-mobility/>
- Rodríguez Ortiz, O. (2023, October 27). These giant touch screens are popping up in Miami. What are they? Do they call 911? *Miami Herald*. <https://www.miamiherald.com/news/local/community/miami-dade/downtown-miami/article280074224.html>
- Sharifi, A., Allam, Z., Bibri, S. E., & Khavarian-Garmsir, A. R. (2023). Smart cities and sustainable development goals (SDGs): A systematic literature review of co-benefits and trade-offs. *Sustainable Cities and Society*, 90, 104396. <https://doi.org/10.1016/j.scs.2023.104396>
- Sung, C., Bae, S., Han, D.-I. D., & Kwon, O. (2021). AI-empowered personalized digital advertising marketing. Retrieved from https://www.researchgate.net/publication/381528657_AI_Empowered_Personalized_Digital_Advertising_Marketing
- Ulrich, R. S. (2006). The environment's impact on stress. In S. Kaplan & R. Kaplan (Eds.), *Environmental psychology* (pp. 37–61). Retrieved from https://www.researchgate.net/profile/Roger-Ulrich-2/publication/291177936_The_environment's_impact_on_stress