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Rehumanize the Streets and Make Them More Smart and Livable in Arab Cities: Case Study: Tahlia Street; Riyadh City, Saudi Arabia

Khalid Mohammed Almatar

Department of Urban and Regional Planning, College of Architecture and Planning, Imam Abdulrahman Bin Faisal University, P.O. Box 1982, Dammam 31451, Saudi Arabia; kmalmatar@iau.edu.sa

Abstract: An urban revolution has brought a qualitative change related to the globalization of technologies and the economy. This, in turn, leads to changes in the city's "human face". Riyadh is the capital city of Saudi Arabia, which has been impacted by rapid population growth. The significant urban expansion negatively impacted various human characteristics as streets became more devoted to transportation than urban space. Various efforts have been made to re-establish the human aspects of streets by creating built environments and urban spaces. This study aims to determine the physical street features that impact Riyadh city streets' livability. The study also determines people's perception of the physical quality of Riyadh's city streets. An exploratory sequential mixed research method has been adopted. Two separate qualitative and quantitative research approaches have been used to answer the research questions. Through a questionnaire survey and semi-structured interviews, the physical aspects of the case study street were assessed, and physical issues were identified. The finding of this study showed that physical issues such as scarce planting, lack of services for disabled people, traffic congestion, inadequate seating, and inadequate canopies and shelter are deteriorating the Riyadh city street livability. Responding to these physical problems will require measures to be built in municipalities to make Saudi cities more livable. The first practical measure is the provision of facilities such as seating and street furniture, adequate parking spaces, adequate shelter, and services for disabled people. The second is improving the quality of existing facilities, such as planting and landscaping. Lastly, traffic congestion can be controlled by changing Tahlia Street to a transit street that allows only public transport. Overall, the findings of this study will help planners and decision-makers create a livable environment within the framework of the re-humanization of the cities. A collaborative system to support the rehumanization of urban spaces should be adopted by encouraging smart design and improving the open spaces functions to fulfil the community need through a participative method, including the involvement of citizens.

Keywords: rehumanization; livability; Riyadh city; urban spaces

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1. Background

Since early times, the livable street has been known to be a place for individuals to walk or cross and be involved in recreational, social, and commercial activities. In the late 1950s, two contradictory methods of street development were anticipated [1,2]. The first proposal was to increase the street dimensions to accommodate the rapidly increasing vehicles and population. The second approach offered diverse streets that could accept public transport options instead of cars [1–3]. The trend is towards the livable street that meets needs ranging from basic and food safety to cultural aspects, improving quality of life, and sense of belonging to a community. The city is not only a place on the map but, in reality, is created by the feelings of each individual [4,5]. The quality feature of a city mainly determines its competitiveness and attractiveness as a place for different activities [4,5]. The quality of life in cities means an economically vital space and an urban, aesthetically attractive, and comfortable environment. This is why modern spatial progress is mainly

aimed at re-humanizing the city so that it not only becomes convenient for living, but also leads to cultural and social development [6].

Livable urban space is mainly referred to as being safe, walkable, accessible, inclusive, contented, friendly, pleasant, and livable; it motivates people to stroll, cycle, walk, enjoy free time, meet each other, and engage in all kinds of activities. Among all these attributes, the urban space inclusiveness and the people's ability to use and access space irrespective of their religion, ethnicity, class, gender, and age is found as a main value in public urban space as it leads to vitality, livability, and safety [7]. Many urban design scholars have explored the human scopes in urban spaces and emphasize the approaches of human-centered spatial planning that encourage a social, livable, inclusive, and walkable urban environment [8]. Urban livability has often appeared in government plans as an aim to be attained by providing suitable living conditions and services in cities and by attracting social and economic capital to urban spaces. Saudi Arabia has also advocated forming livable cities in the country's ongoing urbanization processes. In the last few years, few efforts have been made in Saudi Arabia to make livable cities [9]. However, the physical and social problems that deteriorate urban livability remain unsolved. In addition, in most of the present studies, regardless of the type of urban spaces, physical and social issues deteriorate the livability of the urban environment [10]. According to the studies, most social problems in urban spaces mainly originate from physical issues [10,11]. However, improving the physical environment cannot solve all social issues but may help prevent problems. Since Riyadh city is recognized for its rich historical heritage and modern developments, a disparity exists in the livability and physical conditions between its historical areas and modernism [12].

Urban streets are mainly considered as the urban landscapes' representative, identifying the urban style visual quality. Because the components of urban streets are usually related to the people, the main purpose of evaluating the urban style is to explore people's perception of street livability in terms of vitality, beauty, and comfort [13–15]. Recently, Tahlia Street has undergone a great transformation mainly aimed at improving livability and forming a pedestrian-friendly environment [16]. Despite this, there may still be challenges related to the complete street concept. The concept of a complete street refers to a street design that can safely accommodate all modes of transportation and aims to achieve the other objectives of the community, specifically related to entertainment, social integration, economic growth, environment, and lifestyle [16]. It can be seen that present research literature on the evaluation of livability is relatively lacking [16]. This study is carried out with the main aim of determining the current condition of the livability of Tahlia Street. The study also determines the effective strategies for the enhancement of physical issues and improving the quality and livability of Tahlia Street. This is particularly interesting as many cities in Saudi Arabia are transforming into livable cities. Evaluating the implemented livability concept in Tahlia Street is important for developing future urban development interventions and strategies. The findings will help inform future decision-making related to urban development in Saudi Arabia and contribute to the understanding of effective strategies for improving livability in other cities of Saudi Arabia and worldwide.

2. Literature Review

The literature search was grounded in a comprehensive exploration of peer-reviewed scholarly articles related to the environmental design, urban studies, and street livability. The literature review is carried out using the keywords "complete street", "livable street", and "urban design". Initially, 87 articles were identified as relevant to the topic of street livability from the Web of Science database. After screening, 17 articles were deemed pertinent to the topic. Additionally, through cross-referencing on Google Scholar, five more articles were discovered, bringing the total number of included papers to 22 for this literature review. The appropriate data were collected from online sources published in the last 10 years. The two important topics were looked at in these twenty-two articles.

(1) Livable street definition, complete city concept; (2) discussion on keywords such as living street, complete street, people, human, greenery.

2.1. Livability Concept

Since the formation of cities, economic, cultural, and social activities have always been present on the street. However, with the start of modernism, the role of the street changed completely, and since then, it has only been used for the automobile movement. Therefore, broad lanes for private vehicles and inadequate space for pedestrians became important rules for the design of roads worldwide. However, recently, due to great attention to the significance of walkable design, a paradigm shift has been seen in building livable streets [8]. Previously, the concept of a livable street was only a place for individuals to walk or cross and be involved in recreational, social, and commercial activities. However, presently, the global trend is towards the lively street. The livability concept comprises various definitions which mainly emphasize quality of life. As an urban construction and development goal, livability has attracted great attention in street planning and design. However, there is no single definition of livability due to its multidimensional characteristics. According to Pacione, livability refers to a quality that is not a characteristic inherent in the environment but an associated function of the collaboration between personal and environmental characteristics [17]. According to Newman, livability is a requirement of humans for wellbeing, health, and social amenity and comprises both community and individual wellbeing [18]. According to Ruth and Franklin, livability comprises a population that strains services, goods, and the city's environment [19].

Two well-known methods currently prevail in forming sustainability in cities. The first approach emphasizes the environmental performance of a city. Recently, this approach has led to a compact city where high density mainly seeks to increase resource exploitation efficiency, thus reducing environmental problems [20]. Different cities have mainly been regarded as paradigms of their public transportation efficacy in maintaining economic sustainability [20]. The other approach emphasized social sustainability, primarily dealing with improving the lives of the citizens. In return, this has led to the city livability concept as an essential aspect of sustainability [21].

2.2. Characteristics of Livable Streets

Livability refers to the grade to which any place, whether city, town, or neighborhood, satisfies the life quality, wellbeing, and health of the people who visit, work, or live there [22]. In other words, it refers to the product of collaboration between environmental, health, economic, and social conditions, which impacts social and human wellbeing [22]. Attaining a livable street is a significant trend worldwide and one of the major goals of policymakers and researchers. A livable street reflects ecological vitality, economic stability, and social justice, where an automobilist is not omitted but gives vehicles space by allowing a balance with other street users, like cyclists and walkers, so that the street can be equally used [23,24].

The concept of livability mainly focuses on people who live in or near the street; therefore, it is a human-centered concept [25]. For example, humans are primarily seen as a main aspect of the street, interacting with various components such as street trees, which impact the street's livability [25]. The main factors that address street livability are location, design, social, cultural, environmental, and urban planning [26]. All these factors are essential in defining space, maintenance, efficiency, and humanitarianism. The natural aspects represented by plants and trees play a significant role in shielding the street from harsh weather [23,24]. The location component comprises various variables, such as the ability of the sidewalk and street to involve multiple activities and the diversity of building patterns, which provide great user opportunities and distinct street ends. The characteristics of the livable street are described below, as shown in detail in Table 1.

Table 1. Characteristics of a livable street.

Street Life	The main measure of street life success is the presence of pedestrians, diversity, and activities.
Safety	Streets are designed so that they are not separated from the surroundings. Different lighting spots are present to allow safe access to all street users.
Social Aspect	The street allows social interaction by providing recreational facilities, communication, facilities for disabled people, gathering spaces, sitting areas, and sidewalks.
Accessibility and Transportation	The street provides easy access to all facilities and is user friendly. Mode of transportation allows safe and easy movement from one area to another and prevents traffic congestion.
Environmental Aspects	Arcades, rrees, and canopies are present to protect against bad weather.
Attractiveness	Street art is present along with plantation to create more comfort for users.
Infrastructure	The infrastructure allows walking and pavement facilities.

2.2.1. Street Design

Different studies have focused on the flexibility of design aspects of streets. The four components considered in previous research are natural, street location, design, and in-between spaces [27]. In-between space is mainly related to the facades, details, and edges between outdoor and indoor spaces [28,29]. The design of the street comprises various components to accommodate different activities, the versatility of building patterns to give users more opportunities, and the street's distinct ends and lengths [29]. Plants and trees mainly represent natural parts and significantly shield the street from harsh weather [28,29]. Lastly, the design comprises the street technical element that can be visible, discussion, or motor activities as a vital component of the built environment and standalone, providing safe, comfortable, and attractive walkways, reducing congestion, environmental pollution, and sustaining public health [28,29]. These elements' main goals include the streetscape definition, efficiency, comfortableness, calmness, and maintenance.

2.2.2. Social Aspects

This aspect is mainly related to the communication and social life in the street, demonstrating that streets are not just physical spaces but also have social values. Social features encompass human needs, desires, activities, personalization, and vending [28,30]. Providing proper accessibility and convenient transportation mainly leads to livable streets. These components must be considered when advancing a street to have an organized society. For example, when undesirable performers or sellers attract visitors, they contest for suitable space daily. Different strategies have been developed to try to solve these problems. Furthermore, the activities that occur in the street are categorized as social, noncompulsory, and necessary, each with its visitors and nature [31,32].

2.2.3. Cultural Aspects

The cultural part comprises place and considers regional and local context, adequate personal space, time, and demographics. Studies have shown that public spaces should be open for safety and communication [28,30]. The cultural component gives the street a sense of place, considering regional and local context. Hall has categorized society into two parts: low-context cultures and high-context cultures. Both these have personal and private characteristics that determine the street comfort position [31,32].

2.2.4. Street Planning

At the street planning level, the researchers have pointed out different indicators, such as adequate space, diversity, context, density, and accessibility. Accessibility is an indicator categorized by the following sub-indicators: sustainable transportation, active, shot blocks, and connectivity [33]. Connectivity mainly refers to reaching the place from various directions or accessing opportunities. The other indicator is density, which enables economic and social exchange and allows closeness and movement in the community. Context mainly concerns conserving natural resources, plantations, and open spaces and preserving urban spaces. Diversity refers to the variety in the economic system, physical structures, building patterns, social composition, urbanization, and land uses to meet the population's needs [33].

3. Conceptual Framework

In the last few years, in Riyadh city, rapid growth has led to a significant urban sprawl with great dependence on private cars due to the lack of reliable public transportation [34]. This also led to shopping venues, frequent and prolonged commutes to work, recreation centers, and socialization affecting all people and increasing the vehicle numbers, leading to traffic congestion, CO_2 emissions, and economic, social, and environmental sustainability impacts [34]. Extensive investment has been made in infrastructure in Riyadh city to provide an efficient and effective road network and improve the livability and overall sustainability of the city. Despite the efforts to improve the livability of the streets, obstacles still prevent the formation of truly livable streets. For example, Tahlia Street underwent a great transformation to enhance its livability and a sense of community involvement. However, despite this, challenges persist concerning achieving the livability. Therefore, this study is carried out to investigate the challenges faced by Tahlia Street in attaining its livability goals. The study also proposes strategies to help make positive changes toward implementing livable streets. The findings of this study will be of significance as it aims to address the great need to improve the livability of urban streets in Riyadh city, considering the lessons learned from the experiences of Tahlia Street reformation. The findings of this study will provide evidence-based insights that will help form effective strategies for improving the livability of other streets in Riyadh city, thereby improving the overall quality of life for visitors and residents. In addition, the findings of this study will inform policy formation, urban planning decisions, and investment decisions, ultimately leading to vibrant, inclusive, and sustainable streets in Riyadh.

To demonstrate the framework for the streetscape investigation, the livability attributes that impact the livability and design of urban areas were determined through a comprehensive literature review [1–3]. The theoretical literature review in this study provided a comprehensive knowledge base related to the most significant indicators for increasing street livability [1–3]. The identified attributes according to priority are design and location, social aspects, cultural aspects, street planning, and environmental aspects. Under each attribute, specific indicators have been determined, which were rated by respondents for Tahlia Street. The location and design aspects comprise the street's physical elements and characteristics, which lead to changing people's activities from essential to optional, allowing people to walk in the street. This aspect of the street includes three major indicators: location, natural component, and design. The design aspect comprises street furniture (instruction and signs, lighting, seating), attractiveness (accessibility and art), sustainable infrastructure (renewable energy, management of street water and waste, bicycle lanes and pavement), and traffic (maintenance and mitigation). The natural component comprises weather, plants, trees, topography, and pollution levels. Cultural and social aspects mainly result from society's culture, manners, and values, which are significant in social communication and interaction on the street. The environmental context comprises comfort (shading (trees, buildings), noise pollution, and air pollution) and visual appeal (green open spaces, clean streets, maintained landscapes, trees, and canopies). Through the study, a suitable

research framework was deduced for the rehumanizeation the streets and make them more smart and Livableity, consisting of as shown in Figure 1.

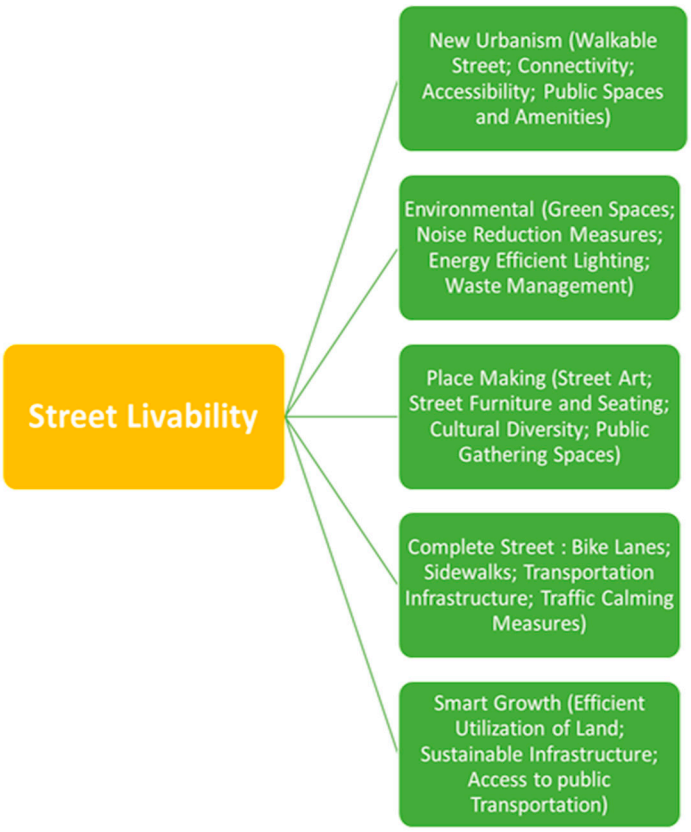

Figure 1. Research framework.

4. Methodology

4.1. Study Setting

Riyadh city has observed major urban growth in the last few decades due to population growth and urbanization. Figure 2 shows that the population increased from 2,100,000 in 1990 to 7,538,000 in 2022. In Riyadh, urban development is mainly represented by the horizontal spread, with a concentration of urban masses on the main roads. In Riyadh, the urban growth area is almost 58%. The horizontal spread has led to the vehicle's dominance over other means of transportation [34]. The streets usually comprise private cars, and they have lost their characteristics as livable streets. This study's main aim is to determine the livability of Tahlia Street. Tahlia Street was chosen as it is one of the most significant social and economic streets with high accessibility and vitality. In addition, Tahlia Street became a popular attraction for the world in the mid-2000s, particularly when the government of Saudi Arabia reformed the street to enhance its social, economic, and traffic performance and change it into a dynamic, attractive, and safe urban space. Based on this, evaluating the implemented livability concept in Tahlia Street is important for developing future urban development interventions and strategies. This street is 5 km long and 60 m wide, comprising a 15 m sidewalk. Tahlia Street can be divided into four main zones: the eastern half, which is a main commercial area comprising restaurants and coffee shops; the middle part that crosses the Riyadh urban area and where the office block is present; the third part is the mid-west zone where furniture and commercial stores are present; and zone four is the western street end and is known as an expensive residential area.

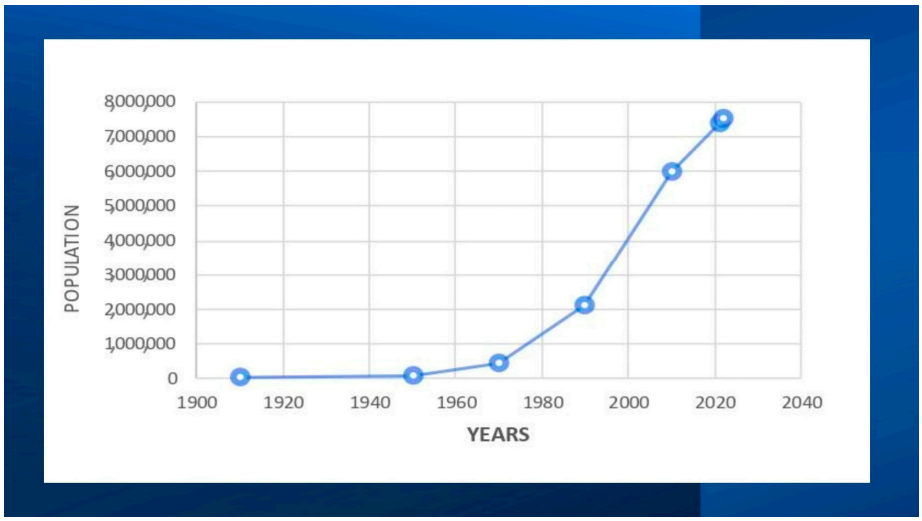

Figure 2. Riyadh city population growth.

4.2. Study Design

This study explores Tahlia Street's physical environment in the urban planning and design literature [13–15]. In this study, a mixed study approach has been used to investigate the present condition of the livability of Tahlia Street and the challenges.

Tahlia Street faces challenges in attaining its livability goals and developing strategies for implementing livable streets. This study is carried out in two phases: in the first phase, quantitative data comprise surveys provided to the residents and visitors of the studied street. In the second phase, qualitative data are collected from interviews with urban planning experts.

4.3. Study Participants

For the quantitative study, the sample comprises 150 respondents, selected randomly, including residents, shop owners, and street visitors. As the variation in the passersby was great and the exact sample size number could not be determined, almost 150 respondents were selected to make this analysis possible. In addition, the respondents were selected after first asking the people how well they knew the street, and then the questionnaire was handed to them to fill out. It was impossible to evaluate the exact livability of Tahlia Street without involving the residents and visitors. The respondents were questioned about the Tahlia Street livability and quality and the identified issues. These respondents helped uncover the problems and their effect on deteriorating the livability of the street.

4.4. Data Collection

The data were collected through surveys and semi-structured interviews. A questionnaire was developed to determine the present condition of the livability of Tahlia Street. The questionnaires mainly tend to uncover the users' viewpoint towards the identified issues and their effect on the deterioration of the livability of the street. The respondents were asked about the livability and quality of the studied street and the identified problems. The questionnaire was reviewed by a group of experts to identify the problems. The group of experts included professors from the university. All questions that could not help obtain useful information were discarded, and changes and final revisions were made. The validity of the questionnaire was determined by pretesting the questionnaire with 30 respondents. The Cronbach alpha was calculated to be 0.766, after which no changes were made. The questionnaire comprises two sections. The respondents' demographic information section of the questionnaire comprises four questions related to their age, gender, and purpose for being on the studied street. The second section of the questionnaire comprises questions related to the general livability and physical aspects of Tahlia Street. The Likert scale questions with four or five response items were used to measure people's perspectives on the

physical problems in the street. After analyzing the questionnaire data, the study sought to explore whether the study respondents agree or disagree with the presence of identified issues. Since the agreement extent was insignificant due to this study's objectives, and their agreement or disagreement matters only, the four or five categories were collapsed into only agree, disagree, or neither agree nor disagree. Due to the presence of tourists on the street studied, the respondents were categorized into two groups: foreigners and locals.

The respondents who were greater than 18 years were categorized into the following groups: 18–34 (young), 35–50 (middle age), and above 50 (older adults). The respondents were selected randomly above 18 without making any difference between women and men or locals or foreigners. In the second phase, qualitative interviews were conducted with five experts in urban planning. The main purpose of the interviews was to determine the livability of the street, the challenges present, and the solutions related to the successful implementation of the livability. At the start of each interview, participants were told about the scope of the study. All participants were assured that their information would be kept confidential and information would only be used for study purposes. Each interview lasted 20–30 min. The participants were asked about the main challenges currently impacting the Tahlia Street livability, design features, or physical aspects that impact the overall quality of Tahlia Street livability and the interventions or strategies for improving the Tahlia Street design and layout. The interviews were recorded, and field notes were the supporting data source. All important and relevant information used during data analysis was highlighted.

4.5. Statistical Analysis

Both quantitative and qualitative data were analyzed separately. The quantitative data were analyzed using SPSS version 21. The percentages and frequencies were calculated to determine the livable street significance and presented in figures and tables. The mean score was found for each component. The qualitative data were analyzed using thematic analysis.

5. Results

In the present study, 150 questionnaires were distributed among respondents; 140 were duly filled, giving a response rate of 93.3%. Table 2 shows the descriptive profile of the area's livability according to the respondents. The Tahlia Street survey respondents comprised 45% males and 55% females, 72.1% locals, and 27.8% foreigners. The reliability and validity of the studied street were determined. The result showed 0.766 as the Cronbach Alpha value.

Table 2. Demographic information of respondents.

Variables		Frequency (Percentage)
Total number of respondents		140
Gender	Male	63 (45)
	Female	77 (55)
Category of respondents	Local	101 (72.1)
	Foreigners	39 (27.8)

5.1. Location and Design Aspect

The location and design aspects of Tahlia Street have been determined. This aspect comprises street furniture, attractiveness, infrastructure, traffic congestion, trash management, street maintenance, and cycling lanes. The street furniture includes seating, signs, lighting, and a ramp for disabled people. In addition, trash management, traffic congestion, and street maintenance have also been seen. As shown in Table 3, the findings have demonstrated a significant difference in response. Most respondents gave a negative rating for ramps for disabled people (70.2%), followed by seating (31.6%). Most respondents rated the lighting and presence of signs in Tahlia Street positively (78.1% and 79.5%, respectively).

Table 3. Livability assessment of Tahlia Street.

Location and Design Aspects		Good	Neutral	Poor
Street Furniture	Signs	79.5	8.5	12
	Lighting	78.1	8.9	13
	Seating	60.2	8.2	31.6
	Ramp for disabled people	19.9	9.9	70.2
Attractiveness	Accessibility	75.8	13.0	11.2
	Parking	71.7	15.1	13.2
	Street art	70.8	15.0	14.2
Infrastructure	Pavement	75.8	15.1	15.3
	Walking	70.9	14.0	14.9
	Connectivity and crossing facilities	70.8	11.3	12.1
Traffic Congestion		53.1	10.3	36.6
Street Maintenance		78.5	13.5	8
Trash Management		69.2	21	9.8
Proper Cycling Lanes		70.1	16.9	13.0
Social Aspect				
Recreational Facilities		62.2	23.0	14.8
Facilities for Disabled People		41.2	16.9	41.9
Needs and Desires	Communication	75.4	11.3	12.3
	Presence of people	70.8	10.9	10.9
	Food and variation in goods	70.1	11.4	26.9
Gathering Space	Sidewalks present	69.1	31.2	9.3
	Sitting areas (benches)	48.1	19.2	23.1
Environmental Context				
Comfort	Shading (trees, building)	11.2	19.9	68.9
Visual Appeal	Shading/canopies and shelter	8.2	17.8	74
	The street is clean and maintained	70.1	11.3	18.6
Pollution Level	Air pollution	64.1	24.5	11.4
	Noise pollution	63.2	19.2	17.6

Regarding attractiveness, parking space, accessibility, and street art have been considered. Infrastructure includes walking, pavement, and crossing facilities. Most respondents rated the attractiveness components positively (72.8%). Almost 75.8% of the respondents stated that the street is accessible and adequate parking spaces are available (71.7%). Respondents (70.8%) indicated that street art is good on Tahlia Street. Street infrastructure was also given a positive rating by the respondents (72.5%) for the ability to accommodate the increasing needs of the street. Street maintenance was rated positively by 78.5% of the respondents for the presence of repair and cleaning services. Traffic mitigation and cycling lanes received a positive rating from (53.1%) and (70.1%) of the respondents. Respondents in this study were also satisfied with the trash management (69.2%).

5.1.1. Environment Context

The respondents were asked questions to determine the environmental situation on Tahlia Street in Riyadh city. The most negative rating was given for planting (68.9%), followed by visual appeal (46.3%). Respondents gave a positive rating on pollution levels (64.1% for air pollution) and (63.2% for noise pollution).

5.1.2. Social Aspect

The social aspect comprises performances and shows, personalization, goods variety, stalls, vending, and desires and needs. The desires and needs of people in the street, demonstrated by the presence of people, communication, food, and goods variety, were positively rated by the majority of the respondents (70.8%), followed by recreational facilities (62.2%) and gathering space (58.6%). The positive rating for vending and stalls was (53.2%) due to the presence of various activities, such as shopping and eating (Figure 3).

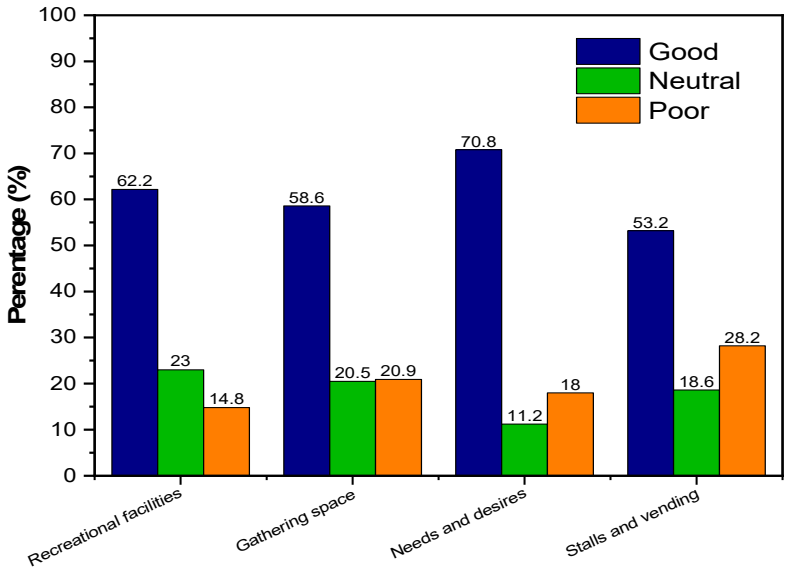

Figure 3. Social aspect.

5.2. Street Planning

The planning aspect of the street is categorized by five major indicators: density, safety, diversity, accessibility, connectivity, and setting. Accessibility comprises access points, parking, and permeability, and connectivity comprises connected to transit, road hierarchy, and connected street system. Safety comprises traffic safety, crime safety, good lighting, and child and pedestrian use. Among respondents, 66.3% rated the accessibility factor as good. Diversity is one of the most significant livability factors, comprising physical components and land use. The diversity factor is rated positive by 61.2% of the respondents. Connectivity is rated positively by 55.6% of the respondents. Most respondents have stated that Tahlia Street is safe and secure (69.3%) (Figure 4).

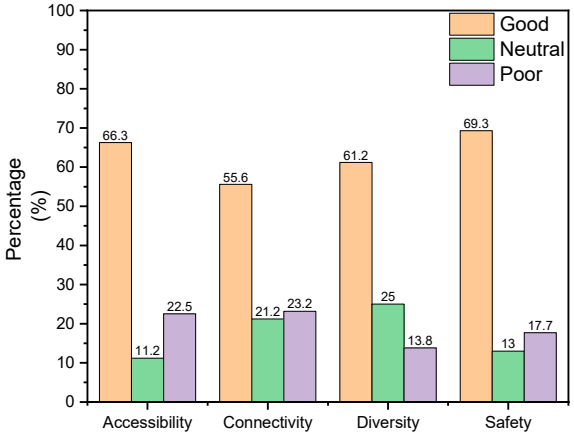

Figure 4. Street planning.

5.3. Qualitative Findings

The thematic analysis was carried out to determine the current condition of livability in Tahlia Street and the challenges present in achieving livability. Almost all the participants have stated that Tahlia Street is designed in such a manner that it fulfills most of the livability requirements. Following are the themes found in the analysis.

5.3.1. Urban Design and Planning

Interventions in urban design play an important role in shaping the street's overall livability and physical aspects. Through qualitative interviews, the impact of different urban design components, such as zoning regulation, street furniture, and landscaping, has been investigated, with the main emphasis on identifying areas for improvement. Different lighting spots are present to allow safe access to all street users, such as pedestrians, motorists, and cyclists. However, participants were unsatisfied with the street greenery, facilities for disabled people, traffic management, and seating. "*Walking down Tahlia Street, you notice lack of greenery. Tahlia landscape is plain, and lacks the liveliness and vibrancy that green spaces bring to urban areas*". (Key Informant 1)

> "The canopy and shelter are missing . . .no means of protection against harsh weather is present except few areas with trees; even these don't provide shade". (Key Informant 3)

> "Surfaces are made of concrete tiles, and the green areas are absent, a major issue in Tahlia Street. It's not at all comfortable to sit or walk in open spaces due to the harsh weather condition of Saudi Arabia. Well, it's important in future to consider the street design in detail in order to provide people with a safe and ecofriendly environment". (Key Informant 5)

Participants have stated that to improve the street's visual appeal, it is important to focus on planting more trees and building shaded areas to make walking easier on hot days.

> "Street is accessible for users. However, street greeneries are not up to the mark. Although palm trees are present, they are not enough to provide proper shade. There is a significant need to plant larger trees that can make the street easier for walking, especially on hot days". (Key Informant 2)

Most participants in this study felt that inadequate facilities for disabled people are the main obstacles to the livability of the studied street.

> "The areas for disabled people were also not up to the mark, and only a few ramps were seen for the disabled. Most of the shops have stairs which prevent the movement of disabled people". (Key Informant 4)

The findings have demonstrated many street furniture elements, such as wastebins, lighting, and benches, as the main urban design components. The participants demonstrated that the present furniture on Tahlia Street lacks diversity.

> "I feel there is a great need to add new aspects to the street furniture that enhance the overall appearance of the streetscape". (Key Informant 5)

Furthermore, the participants emphasized the need to incorporate technology advancements such as digital information technology to create a more user-friendly environment.

> "Although technology integration is present in the Tahlia Street in different forms such as digital broadcast media, there is still a need for the incorporation of technology advancement to address problems related to traffic congestions, and improving the quality of life for street users". (Key Informant 1)

5.3.2. Traffic Calming on Tahlia Street

Another theme in this analysis is the traffic calming measures taken on Tahlia Street, such as broader sidewalks, which contribute to its livability. In addition, the Tahlia Street

architectural design helped create a livelier and more vibrant environment by removing the service road, which allows the cafes, restaurants, and informal vendors to extend into the sidewalks. All these design elements have contributed to the traffic calming measures, improving the overall experience of visitors and residents. All participants stated that the width of the sidewalks is according to the requirements for complete streets and livability.

> "The widening sidewalks have provided the sufficient space for strolling, walking and involving in outdoor activities which enhance the pedestrian friendly environment".

> "The wide sidewalk in Tahlia Street has improved safety by decreasing the traffic congestion by giving more space to pedestrians and separating them from vehicles. It has created a more comfortable and relaxed street environment". (Key Informant 3)

> "The street consists of a three-lane road on each side, a service road and sidewalks. A series of spaces were present for informal use and the informal vendor's presence. Cafes and restaurants were expanded into the sidewalks, which give the street a feeling of vibrancy". (Key Informant 5)

5.3.3. Preservation of Social and Cultural Identity

Another theme that emerged in this study is the preservation of social and cultural identity, highlighting the importance of enjoying the heritage of Tahlia Street and creating a sense of community, belonging, and pride. The findings reveal that Tahlia Street has transformed into a socially engaging and vibrant urban space where leisure activities and social interaction have become an important street identity.

> "The street has become a great site for the national celebration and art events which creates a great sense of community vibrancy. However, still there is great room for improvement. There is a need to add more elements of local identity, history, and culture into the street design, such as the preservation of heritage, cultural festivals, and installation of public art". (Key Informant 3)

> "It is important to create opportunities for the exchange of culture and uplifting historical landmarks and buildings. This street holds great cultural significance for the community, and it is important to celebrate its cultural heritage through effective strategies, and we are looking into it". (Key Informant 4)

The findings further reveal that replacing local shops with international brands has lost diversity or cultural authenticity.

> "Previously, the street had its unique character with various small businesses; however, now it seems like any other commercial area. While the presence of many prominent international brands has enhanced the appeal and status of Tahlia Street, it has also raised questions regarding the balance between the international brands and local businesses. This leads to the loss of diversity and vibrancy on Tahlia Street". (Key Informant 2)

5.3.4. Economic Aspect of the Tahlia Street

The findings show that Tahlia Street has undergone urban development initiatives and various changes in the last few years, making it a vibrant hub today. The redesign of the street in the early 2000s comprised expanding the sidewalk, adding cafes and restaurants to the sidewalks, and removing service roads. The findings reveal that these changes have led to increased economic activities on Tahlia Street. Small restaurants, informal vendors, and independent businesses have attracted many visitors and activities on the street.

The analysis reveals that the street has become a main shopping and dining destination and attracts many visitors and locals. The presence of restaurants and upscale shops has improved the street's aesthetic appeal, particularly at night, thus making it vibrant, lively,

and resilient. This has also increased business opportunities and enhanced the economic growth in the area.

> "A positive shift has been seen in the economic activity on Tahlia Street over the last few years, changing from an ordinary roadway to a bustling social and commercial center". (Key Informant 5)

> "Before the redevelopment initiatives, the street comprised a three-lane road in either direction, parking spaces, and narrow sidewalks. The economic activities were also normal and lacked the diverse and vibrant business scenario that is seen today". (Key Informant 4)

5.3.5. Challenges in Making Tahlia Street More Lively

Another theme in the analysis is the challenges involved in making the street more vibrant and livelier. Some of the challenges identified in this analysis include balancing modernization with the preservation of cultural identity:

> "Careful consideration is needed to make any changes related to the street heritage". (Key Informant 1)

> "We must carefully consider the factors related to the Tahlia Street sense of place and unique character. We need to ensure that any new amenities introduced into the street complement instead detract from the street heritage". (Key Informant 4)

Another challenge is the resistance from some of the conservative factions present in the society, who perceive some of the elements of the vibrancy as improper. The findings show that considering societal values and norms is important in overcoming this resistance to change.

> "We have faced resistance from some conservative sections of our society who view some of the aspects of the transformation of Tahlia Street as inappropriate. It is very important to involve all stakeholders in forming strategies related to the urban development initiatives". (Key Informant 3)

5.3.6. Future Developments

The participants have demonstrated that various efforts have been made in the past to make Tahlia Street more vibrant, such as widening sidewalks and F&B-led retail development. In addition, Tahlia Street in Riyadh city is visually appealing. However, the street lacks greenery. Participants emphasized the need to improve the public spaces, including more plantations, and improved cycling and pedestrian crossings to form a pedestrian-friendly environment on Tahlia Street. Participants stressed creating more green spaces that improve the street's aesthetic appeal and environmental sustainability. The participants emphasized using different types of plants, such as succulents, climbers, shrubs, and palm trees.

> "Although palm trees are present, these cannot provide appropriate shade, and there is a great need to plant other larger trees that can make streets in Riyadh city easier for walking, particularly on hot days, and to improve visual appeal". (Key Informant 4)

The participants emphasized the significance of preserving Tahlia Street's diversity by promoting local businesses and preserving the street's cultural identity. The future steps that can be taken for Tahlia Street based on the analysis include increasing the diversity and frequency of cultural activities to allow community involvement and improve the street's cultural vibrancy. The participants emphasized improving the public spaces to create more opportunities for community gathering and social interactions. Another finding in the analysis is introducing a diverse mix of business establishments that cater to the needs of different groups of residents and visitors and make the street environment more inclusive and dynamic. Furthermore, the low-carbon district heating network should be installed to

provide a sustainable heating mode for businesses in the area and support the ambition of Riyadh city to become carbon neutral by 2030.

6. Discussion

This study was carried out with the main aim of determining the physical aspects of Riyadh city, with a specific focus on Tahlia Street. The livability concept has gained significant attention in the last few years. Urban planning is a main livability component and is vital in creating more livable cities. This study will have many implications for urban policies and planning. Urban infrastructures are mainly long lived and hard to change. Therefore, an urban system planning should include regulations that organize vehicle and traffic mobility in residential areas and neighborhoods, good accessibility, visual appearance, lively open areas, and environmental elements [2,3]. The street design needs to consider detailed information about the street's urban qualities, including open spaces, roadway design, sidewalks, and street furniture that give people a friendly and safe environment [2,3].

The findings from this study indicated that Tahlia Street complies with most of the requirements of the complete street policies. However, a particular failure was noted concerning the suitable street greenery and protection against harsh weather. This is also reflected in previous studies by Kala and Martin (2015) and Alabdullah (2017), which stated that the loss of street space affects environmental quality [35,36]. A significant correlation has been found between inadequate planting and the street's livability in a study by Layne (2009), which demonstrated the significance of site settings in urban spaces [37]. Therefore, future designs should focus on the importance of greenery in improving the thermal comfort experienced by pedestrians.

Furthermore, continuous shading should be provided through canopies, trees, and structures that promote street activity and pedestrian use. In addition, street furniture should be provided throughout and compatible with the walkways, vehicle access, and routes (service, parking, loading, etc.). These strategies coincide with the requirement of the complete street concept, such as providing shades by artificial covers, buildings, and trees and using water coolers to reduce the impact of dry wind and heat.

The findings have demonstrated that the Tahlia Street layout adopts traffic-calming strategies based on the complete street design concept. The layout of the complete street indicates that walking should be considered the preferred mode of transportation over the use of vehicles by reducing the number and width of available lanes of vehicles and on-street parking. However, the findings show that street signals need improvement to make the street safer for businesses and residents. The lack of amenities for disabled people has been found in Tahlia Street that needs consideration. Previous studies have also discussed the lack of public infrastructure in the streets of Saudi Arabia [38].

The findings demonstrated that retrofitting Tahlia Street in line with the requirement of a complete street has some challenges, such as balancing modernization with the preservation of cultural identity and resistance from some conservative factions in society. The transformation of Tahlia Street shows that cities in Saudi Arabia can afford the gradual transformation of their streets to fulfill the requirement of a complete street. The challenges this study identified will help policymakers better plan retrofitting other streets in Riyadh city.

The study demonstrated that most of the issues that emerge on urban streets are mainly due to the design practices that fail to incorporate flexible livability street aspects in street design. Therefore, embracing the street dynamics that are suitable for each city is important. A new method for data collection, visualization, stakeholder engagement, technology deployment, and institutional policy will help decision-makers and planners link what is present now with what is lacking to meet the livability of the street in the future [39].

Traffic-calming measures such as speed bumps and wider sidewalks have been found to improve the street environment by limiting traffic speed and volume, improving chil-

dren's and pedestrian safety, enhancing social interaction, and reducing crashes and accidents. However, proper cycling and bike lanes need some improvement to increase safety.

The findings offer practical recommendations for improving the green infrastructure and public spaces on Tahlia Street. However, the challenges in implementation need further exploration. There is a need to develop a comprehensive strategy that addresses finance, governance, and community involvement to translate these recommendations into practical outcomes. The findings showed that Tahlia Street has undergone several transformations to improve its livability and appeal. Tahlia Street has become a vibrant hub with various restaurants, cafes, and shops. The redesigning of the street, such as the sidewalk widening, has created a pedestrian-friendly environment that allows community involvement and social interaction. Tahlia Street can serve as a convincing case study for enhancing the livability of other streets, providing a valuable lesson that can be applied to improve other streets. The redesign of Tahlia Street demonstrated how urban design intervention can impact the livability and vibrancy of the street. By leveraging the successful reformation of Tahlia Street as a case study, policymakers and urban planners can use the best possible practices to improve the attractiveness and livability of other streets in Riyadh, ultimately leading to the formation of a more sustainable, vibrant, and pedestrian-friendly environment.

7. Conclusions and Recommendations

Humanized public spaces are mainly represented as safe, walkable, livable, inclusive, and enjoyable to permit lively social interaction in areas where individuals can meet their friends, spend their leisure time, and come across other people. This study was carried out to determine the existing situation of Tahlia Street regarding the social, functional, and physical attributes of a livable and well-designed street and the challenges present in achieving livability. The study also proposes approaches to make positive changes toward implementing livable streets. The findings have shown that Tahlia Street is vibrant and lively as it contains different urban aspects such as sidewalks and pedestrian facilities. Challenges identified in the study include balancing modernization with cultural preservation, overcoming resistance from the society's conservative factions, and involving all stakeholders in making strategies related to urban development. The perceived challenges can be resolved through the sincere and collaborative efforts of all stakeholders in creating a livable street. The findings of this study have provided evidence-based insights from the experience of the Tahlia Street reformation. The findings have shown a great need to revive the existing street network to completely re-humanize the urban space and broader community and transportation objectives. Based on the findings, it is recommended that priority be given to user needs, particularly those of disabled people. Flexible street design guidelines related to tree canopy, pedestrian crossing, parking, and seating furniture should be formulated to be generalized to all city sections.

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