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The impact of public infrastructure on neighbourhood liveability: A study of residents' perceptions and satisfaction

Foroogh ALI KOMAK[1*], Nor Azlina ABU BAKAR[2], Faziawati ABDUL AZIZ[3], Norsidah UJANG[4]
[1] foroogh.upm@gmail.com • Department of Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang, Malaysia.
[2] ab_azlina@upm.edu.my • Department of Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang, Malaysia.
[3] blurpp2@yahoo.com • Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang, Malaysia.
[4] norsidah@upm.edu.my • Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang, Malaysia.

** Corresponding author*
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Abstract
Urban areas face obstacles hindering services and sustainable development, reducing neighbourhood contentment, and resulting in a lack of dynamism and efficiency. This paper discusses the potential impact of "neighbourhood quality design in terms of public infrastructure provision" on residents' satisfaction and neighbourhood liveability in Cyberjaya, the smart city of Malaysia. This study aims to investigate the relationship between neighbourhood liveability, public infrastructure provision, and residents' satisfaction. Data was collected through a public survey and reviewing government reports, and the latest blueprint (Sustainable Smart City Action Plan) of Cyberjaya. The findings shed light on the importance of quality neighbourhood characteristics and its public infrastructure availability in enhancing liveability and resident satisfaction with the neighbourhood as their living area. The findings suggest that despite the availability of basic amenities, residents may experience lower levels of satisfaction and emotional response due to a lack of variations in social infrastructure that foster a sense of community and liveability.

Keywords
Neighbourhood design, Neighbourhood liveability, Public infrastructure, Residents' satisfaction.

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1. Introduction

Complete neighbourhood design improves connectivity, beauty, and liveability (Komninos, 2021). "Smartness" in new urban neighbourhoods extends beyond adding digital interfaces to ineffective infrastructure or enhancing municipal operations. It also involves smartly using data and technology to improve decision-making and life. The air people breathe, their sense of security when walking, their ability to connect and socialize, and other variables affect their quality of life. Urban agglomerations and economies of scale have allowed most cities to thrive and innovate since the 1950s.

Many cities also face obstacles that limit their ability to provide services to residents and create a more sustainable urban future for all, which lowers neighbourhood satisfaction. City neighbourhoods lack the dynamism, efficiency, and capacity to provide high-quality life. The liveability of urban areas is influenced by the needs of its citizens. Human capital is an urban dimension; hence a neighbourhood's current situation cannot be determined without people (Fu et al., 2019). Although residents' satisfaction is a multidimensional concept that is affected by objective and subjective variables that have different meanings for different individuals with different temporal-spatial, social, economic, cultural, and physical conditions, local urban services play a significant role in how residents perceive their living environment. Therefore, the residents' feelings about the surroundings are more relevant than physical attributes, contrary to earlier studiess (Bernhard, 2018)

This work emphasizes physical traits, although residents value social variables more (Holbert et al., 2021; Salaripour, 2021). This study addresses four research questions. (1) What "neighbourhood quality design" factors affect residents' satisfaction with their living areas and their public infrastructure provision? (2) Does good neighbourhood design affect people' satisfaction? (3) How does good neighbourhood design and its level of public infrastructure provision affect satisfaction? (4) How does liveability affect neighbourhood satisfaction? The study will use survey data collected in Cyberjaya, Malaysia. Descriptive and linear regression analyses show the association between quality neighbourhood design regarding public infrastructure provision and residents' satisfaction.

1.1. Quality neighbourhood design and neighbourhood satisfaction

In developing countries, urbanization is accruing faster than ever. In such rapidly changing spatial contexts, quality of life cannot be measured in one dimension, as it includes physical, social, and dynamic factors that affect human life (Das et al., 2021; Shanbehzadeh et al., 2021). Since Aristotle spoke about the "good life" and well-being and how effective policies might lead to excellence, researchers and urban designers have focused on quality of life. New cities aim to give residents more quality service, monitor and optimize existing infrastructure, enhance collaboration among various economic actors, and stimulate creative business models in both the private and public sectors. Smart City or technology hub projects are gaining popularity worldwide. As many cities are expected to receive large numbers of migrants, their audacious goal is to improve local communities' competitiveness through innovation and raise residents' quality of life through better public services and a cleaner environment (Appio et al., 2019). Since Cyberjaya is known as Malaysia super corridor and South-East Asia tech hub, linking the concept of neighbourhood design quality to quality of life in such city is necessary in body of knowledge. Rapid urbanisation, privatisation of public spaces, and technocratic infrastructure planning in Asia has led to urban sprawl, socio-economic segregation, and failure to meet the residents' needs. Public infrastructure, both hard and soft, can improve urban liveability. However, there is a lack of information on the influence of quality public infrastructure on the liveability of residential areas and the urban satisfaction among international residents in smart cities (Komak et al.,

2023). The theory of neighbourhood design in cities can be seen as a built-out archetype that was put into practice in the late 20th century to: respond to public needs, analyse population dynamics in the city, provide residents with a sustainable and efficient way of life through equal public infrastructure and services, and enable cities to develop a competitive advantage (Alagirisamy and Ramesh, 2022). The city's quality of life is determined by citizens' satisfaction with public amenities and services (McShane and Coffey, 2022). Thus, the minimal expectation of a modern city is that key services are delivered quickly and successfully.

Public infrastructure is defined as a complex system of facilities, programs, and public networks that aim to improve the quality of life (Tahmasbi et al., 2019; Yhee et al., 2021). In cities, there are two types of public infrastructure: hard and soft. The "soft" infrastructures, such as the arts, cultural institutions, public space, and amenities, are becoming increasingly important for economic growth and creativity. In order to provide high-quality services and facilities to people, planners, designers, and city developers are concentrating on the quality of urban infrastructures in order to make cities more pleasant and appealing places to live. The quality of the environment is influenced by the availability of certain amenities and services. Public facilities cover a large portion of the city, particularly in the city's neighbourhood areas. Civic centres, community and community centres, and libraries are some general classifications for these facilities. Due to the obvious nature of these urban areas, they are inextricably linked to the surrounding neighbourhoods and serve as a gateway for human interaction.

Alonso established in 1964 a theory of public infrastructure in neighbourhood design, which is still in use today. This concept builds a link between the local centre and the activities of the surrounding neighbourhood. In another similar theoretical approach, the neighbourhoods canter is a location that is immediately accessible to infrastructural resources (Moreno, 2021). In a broad sense, "infrastructure" refers to a company's or country's core physical systems, such as transportation, communication, sewage, water, and electric systems (Sobnath et al., 2020). These systems tend to boost a city's high capacity to accommodate numerous people, as well as its liveability. Infrastructure is divided into physical and social categories, according to Obateru (2005). Other research classified infrastructure into economic and social groups. Healthcare, education, and penal institutions are in the second group, while utilities, airports, power plants, and pipelines are in the first (Asunogie et al., 2020; Olanusi et al., 2022). Public infrastructure is one of the most important indicators of neighbourhood design. According to Jerome (2006), the most significant indicators of neighbourhood design are social, physical, and environmental public infrastructure. Funding for new and improved urban infrastructure comes from both sides of the political spectrum, with the idea that "public capital" is critical for both economic development and growth as well as improving citizens' quality of life.

A sense of having a high quality of life appeared in human life when people felt that their lives had been improved by food, water, their place of residence, the use of open spaces in their surroundings, a sense of security, dynamism, and vitality, a sense of belonging to a community, and opportunities to discuss global issues, among other things that had taken away people's sense of freedom and enjoyment of life in the past (Sapena et al., 2021). The concept of quality comes from community, services, and opportunities in life that are experienced by a group of people in different ways and affect their lifestyle and sense of satisfaction (Yadav, 2019).

Many academics measure quality of life in terms of living places. McCrea et al. (2005) found that younger residents are particularly concerned about regional services, including health and education, and the expense of living. Housing happiness was best predicted by home age and homeownership, whereas neighbourhood satisfaction was best predicted by social contacts,

neighbourhood crime, and public facilities (parks, libraries) (Emami and Sadeghlou, 2021). However, Clark and Kahn (1988) suggested that adding cultural activities such as a museum, theatre hall, musical instruments, and culture-related services as public facilities might boost the quality of the location through income and improve urban quality. According to several studies, housing prices affect quality of life (Zheng et al., 2020). Lora and Powell (2011) noted that the availability of public services can affect neighbourhood property prices and quality. Sung and Ki (2021) discovered that neighbourhood public services were one of the most important factors affecting life satisfaction. The pleasure of neighbours is improved by meeting their basic requirements.

The seven main characteristics of urban quality are environmental, physical, mobility, social, psychological, economic, and political (Serag El-Din et al., 2012; Crane et al., 2021). Previous studies, from 2012 to 2021, as mentioned above, showed that there are 13 types of different quality dimensions that are predictable for a good neighbourhood, which are: a place with high-quality stores, a place with high-quality restaurants, a place to raise children, a place that is entirely residential, a place with a wide selection of goods and services close to home, a place that has a definite centre, where a lot of neighbourhood activity happens and you are likely to run into people from the neighbourhood, a place where residents have a similar lifestyle, a wide diversity of people live here, a place where people know one another, a place where neighbours are outgoing and friendly, a place where people take care of one another, a place where residents are private and go their own ways and, a place where there is no pressure to join local groups and socialize. Hence, based on those researches, a quality neighbourhood comes from a combination of social, physical, and environmental aspects, which they listed in the form of theory of good neighbourhood areas. The indicators of the quality of life in urban residential areas were examined in all the researches, but the examined cities or, more broadly, the examined cases were addressed in a general way, and the standards offered by them could be generalized to all cities. The significance of urban services and infrastructure as a separate element has had little impact on people' quality of life and ultimately on their level of satisfaction with their living area.

1.2. Neighbourhood liveability through public infrastructure provision

Urban areas reflect residents' social lives, according to Carmona (2021). Urban space attracts people (Lynch, 1991). Migration will continue due to political, social, and economic inequities and a changing climate. Especially in the recent decades due to rapid growth of new cities and their potential opportunities to provide higher quality of job and life, migration to them became one of the most critical key concern. Thus, the linkage between the concept of quality neighbourhood design in terms of public infrastructure provision and the residents' satisfaction must focus on managing migration to people final destinations where they can meet their required standard of living. Migrants still move to cities for better jobs, higher wages, and easier access to urban infrastructure and services (Monachesi and Witteborn, 2021). According to a World Economic Forum report on migration and cities, migration increases demand for urban infrastructure and services in destination communities to boost neighbourhood vibrancy and resident happiness.

Social, economic, political and cultural activities in a city play a role in countering anxiety and fears associated with migration. Many cities should be recognized and lauded for their effective efforts and innovative strategies in response to recent migration, especially in the context of slow or accommodating national policies. However, given the extent of governmental decentralization, political will, institutional capacity and financial resources are required for local governments to innovate and implement effective policies that welcome refugees and migrants. Such decentralization is an

influential factor that could enhance or hinder the nature and scope of city action in response to migrants.

Cities are booming in Asia because they are hubs of economic and social opportunities. While urbanization has driven regional productivity growth, it has also created major challenges. Increasing urbanization does not necessarily translate to increasing opportunities for all city residents. Cities will continue to grow, but may not fulfil their potential due to unsynchronized spatial and economic planning, lack of affordable housing, marginalization of the poor and vulnerable, significant air and water pollution, failure to mitigate the effects of climate change, and deficits in urban infrastructure. It is a common observation of migration policy that states are not particularly adept at consistently controlling and regulating international migration. Such an observation, often referred to as the 'gap' between policy and practice, has highlighted both that states that might be restrictions in rhetoric and public posturing end up home to significant populations of migrants and that migration policies end up being much less successful than intended. That is what exactly Cyberjaya faces as a new technology hub in the south-east of Asia. The figure below shows the position of Kuala Lumpur in migration destination world map (Arbour et al., 2017; World Economic Forum, 2017; Angelidou, 2017a; Angelidou, 2017b).

Shamai (1991) found that people are willing to participate in a variety of place-related activities based on their feelings of place and other criteria. His studies highlighted social attraction and communication. According to his study on collective activity quality, location attachment is a significant aspect that emerges from compassionate and nurturing feelings. He believed that mingling with family, friends, and neighbours in a living space creates a sense of belonging, place connection, and residential neighbourhood liveability. Patwardhan et al. (2020) noted that any changes in the nature of places might lead to people's discontent and boost their feeling of place in them, owing to nature's distractions from new building shapes (physical and environmental aspects of neighbourhood design). Thus, major environmental changes can affect them. It has to be mentioned that, since the sense of satisfaction, attachment and being the part of new environment is subjective for each individual, so every small change in their living environment can affect them either positively or negatively if it's not what they have been desired to meet. Sense of place affects not only social and communication behaviour but also private life (Dastjerdi et al., 2021). A sense of place does not necessarily improve sustainability and liveability. Because of the relationship between people's moods and their pleasure with their neighbourhood, this research's sense of place notion is crucial. Clark et al. (2017) found three dimensions of attraction between people and places: cognitive, behavioural, and emotional. Neighbourhood quality is closely related to attachment and sense of place satisfaction (Poortinga et al., 2017). People connect to a location through their physical surroundings and experiences (Ramkissoon, 2020).

Urban spaces are accessible to all and have cultural, business, and living functions, according to city philosophy. Most residents shop, walk, or commute through these urban regions regularly. Residents gather in urban spaces, especially public ones (Abusaada and Elshater, 2021). Human relations, public or group activities, and local traits can be seen in these locations (Amini et al., 2020). The provision of public infrastructure as a fundamental indicator of neighbourhood design links neighbourhood satisfaction to excellent neighbourhood design. Quality neighbourhood design should be related to urban planning in order to provide the best future agenda for the sustainability of city neighbourhoods.

The indicators of quality of life in urban residential areas were thoroughly explored, and the examined examples were generalized so that their standards could be applied to all cities. However, urban infrastructure's impact on quality of life has not been extensively explored. Rostami et al. (2021) identified 16"quality factors of urban design" to assess a city's quality: Readability, visual character, time feeling, colour

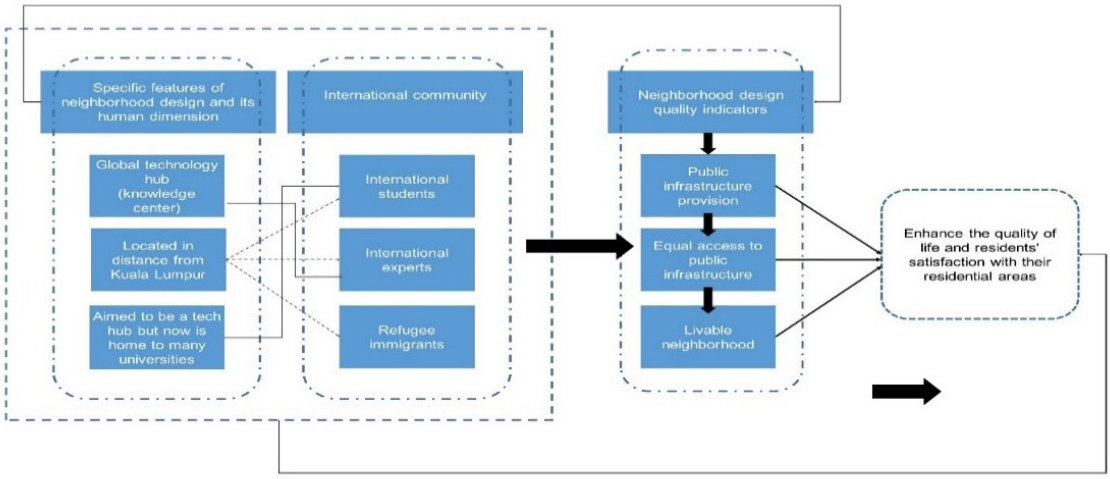

Figure 1.*Model showing potential links between quality neighbourhood design indicators and residents satisfaction.*

senses, informativeness, permeability and mobility, user disorder, form, comprehensiveness, public quality, climate comfort, security and privacy, flexibility and movement, energy-application disorder, environmental application, and cleaning.

Literature and theories demonstrate that neighbourhood quality is linked to neighbourhood design, facilities, and residents' satisfaction or dissatisfaction with living there. This study tries to link citizens' opinions of their neighbourhoods to excellent neighbourhood design metrics. This research used theories to better understand Cyberjaya's problem of unplanned neighbourhoods with critical public infrastructure and services, which dissatisfied residents. This research also addresses a methodological feature that has been missing from relevant studies on how neighbourhood design, public infrastructure, and service provision affect people's needs. To better understand this relationship, neighbourhood public service provision and location (services distribution pattern) can affect both physical (equal access to services and facilities) and perceived neighbourhood characteristics (neighbourhood satisfaction and residential area liveability). This study focuses on Cyberjaya's international residents. The sample population of this study (international residents of Cyberjaya) mentioned unexpected issues base on their perception of the new city which made the study path to focus on the problem of public infrastructure provision in Cyberjaya which decreased the neighbourhood satisfaction among residents over the years.

The Cyberjaya Blueprint (Sustainable Smart City Action Plan) states that residents' dissatisfaction with their quality of life, especially in meeting their needs, puts the city at risk of being rejected by them due to declining demand for housing and rental prices (Yusof and Van Loon, 2012; GTH Blueprint, 2014; Angelidou, 2017a; Shayan et al., 2020; Nakano and Washizu, 2021). Most people here compare Cyberjaya to other cities, which is the start of a city's liveability problem. Figure 1 depicts the study's neighbourhood design model. The model analyses correlations between quality neighbourhood design, residents' satisfaction with their residential areas based on neighbourhood characteristics, and urban liveability at the neighbourhood level (measured using public infrastructure satisfaction based on residents' perception). The model is partially based on earlier conceptualizations of neighbourhood design determinants (Fu et al., 2019; Holbert et al., 2021; Salaripour, 2021).

2. Methodology

The objective of this study is to investigate the perspectives of

international residents regarding the adequacy of public infrastructure provision in Cyberjaya and its relationship with the level of satisfaction with the neighbourhood areas in Cyberjaya. The study will specifically focus on the planning and design of high-quality soft and hard infrastructure that enhances the subjective sense of satisfaction in the residents of neighbourhood. This investigation employed a quantitative approach as its primary research methodology. Following this, the study employed solely a qualitative approach to corroborate the quantitatively derived data and to enhance the data's credibility. The selection of the methodology was appropriate as it pertains to an investigation that examines the impact of autonomous factors such as social, physical, and environmental infrastructures on the dependent variable of neighbourhood satisfaction.

By reviewing similar researches, it can be concluded that the adopted research method is suitable for achieving the research objectives. Since the quantitative method has a numerical and statistical nature, it is useful for evaluating measurable factors. For example, measuring the influence of public infrastructure on neighbourhood satisfaction but since research on urban qualities such as quality of life and satisfaction should also be measured qualitatively, therefore, the qualitative approach as a sub-research method is also adopted to support the quantitative data.

Targeting this demographic has the goal of highlighting the thriving global community that has arisen in this new urban development in the Kuala Lumpur suburbs, as well as their relationship with the innovative visionaries of Cyberjaya, where the campaign is taking place. In recent years, the city, which is made up of members of the tech industry, students, and residents, has grown steadily. Tech workers, students, and residents have progressively increased the city population; the day-time population is about 140,000 and expected to increase to 350,000 by 2039 (Saad, 2023). Numerous migrants including tech experts, students, and people who desired to find a better quality of life moved to Cyberjaya because of its significant international corporations and private institutions. Smart and creative people cooperate on innovative initiatives in this vibrant neighbourhood. City authorities feel the latest published Cyberjaya action plan will help the future plan by including modern and high-tech amenities. Cyberjaya is a futuristic city that defies convention. Cyberjaya's cutting-edge construction and many recreational attractions make it different from neighbouring cities, which are densely packed with towers. Public amenities and green lung zones cover half of the city. It promotes work-life balance. This region is important to study because comparing Cyberjaya's public infrastructure to the local government's promises or in a broader sense, comparing the promised quality to the reality of the current neighbourhoods situation will help the city designers and planners to understand the problems and find solutions to overcome the future risks. (GTH Blueprint, 2014; Sepang Local Plan, 2020; Saad, 2023).

The important stage of analysing the obtained data have been taken place subsequently. The research's statistical analysis program, SPSS version 25, gathered all coded variables. SPSS Statistics 25 is a statistical analysis program that produces three types of numerical outputs which are, demographic analysis, statistics, and descriptive tables. The tables were initially evaluated by frequency percentage, then the Descriptive statistics followed and then variables were prioritized along with a T-test.

At this stage of data analysis, the findings include information on the demographics of international residents of Cyberjaya which presented in Table 1, and statistical T-tests and prioritizing the effective variables were used to investigate the criteria and factors of quality neighbourhood design that influence the liveability of city neighbourhoods and increase neighbourhood satisfaction. This analysis also highlighted the existing conditions and guidelines for public infrastructure provision in Cyberjaya as a global technology hub to develop a set

Table 1. *Demographic characteristics of the statistical sample.*

	Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Female	139	42.1	42.1	42.1
	Male	191	57.9	57.9	100.0
	Total	330	100.0	100.0	
Age	19-23 years old	88	26.7	26.7	26.7
	24-28 years old	117	35.5	35.5	62.1
	29-33 years old	100	30.3	30.3	92.4
	34-39 years old	25	7.6	7.6	100.0
	Total	330	100.0	100.0	
Education	High school	19	5.8	5.8	5.8
	Bachelor's degree	128	38.8	38.8	44.5
	Master's degree	146	44.2	44.2	88.8
	PhD or higher	37	11.2	11.2	100.0
	Total	330	100.0	100.0	
Employment	Employed Full- Time	82	24.8	24.8	24.8
	Employed Half- Time	23	7.0	7.0	31.8
	Seeking opportunities	51	15.5	15.5	47.3
	Just study	174	52.7	52.7	100.0
	Total	330	100.0	100.0	

of criteria for quality public infrastructure for Cyberjaya's neighbourhood design to improve international residents' liveability and satisfaction.

To answer the first research question, neighbourhood quality design indicators that affect residents' satisfaction with their living area. A well-designed neighbourhood with good public infrastructure is liveable for residents. The theoretical background explains neighbourhood design characteristics. This stage uses linear regression because all variables for this research question are measured at the neighbourhood level. The study explores the statistical effects of neighbourhood design elements on residents' satisfaction, liveability, and quality of life to answer the second, third, and fourth research questions. This test helps determine which of the three categories of public social, physical, and environmental infrastructure has the greatest impact on Cyberjaya's residential areas' liveability and residents' satisfaction.

2.1. Data sources

The survey was conducted in Cyberjaya from June to August 2020. The survey included 330 people aged 19–40 from three Cyberjaya Municipality neighbourhoods. The survey comprised low, medium, and high-density metropolitan areas. The study surveyed international residents of all ages in the three designated neighbourhoods and all the obtained data are originally for this research that the author has collected. This study's survey sample size was determined by De Vaus's (1986) Likert scale. Due to similar participant conditions and community perceptions, each neighbourhood received the same number of questionnaires. Students, employees, and immigrants who started their own enterprises moved to Cyberjaya. These people answered questions about their ages, employment, and quality of life. The final questionnaire format used in this research includes closed-ended questions that measure satisfaction and the current state of their neighbourhood and open-ended questions that examine residents' perceptions of public infrastructure provision and their required infrastructure based on their subjective ideal, liveable place.

2.2. Variable descriptions

Population-based surveys examined neighbourhood satisfaction, perceived neighbourhood design, public infrastructure and service quality, and demographic data. The selected sample population for this study evaluated the satisfaction status of residential neighbourhoods based on categorized criteria. Participants rated how responsive the neighbourhood is to their everyday needs on a scale from "strongly disagree" (0) to "absolutely agree (5). Participants were asked to rate their overall life satisfaction from "very dissatisfied" (0) to "very satisfied" (5). Participants rated how often they felt linked to their neighbours on a scale from "once per day to never." Participants were asked to rate their safety (public neighbourhood safety) from "very unsafe" to "not safe in terms of crime". Residents' happiness with public infrastructure and services was measured by asking them to rate their neighbourhood's current situation in terms of availability of those public infrastructure on a scale from "very dissatisfied" (0) to "very satisfied" (5). They were asked to assess their neighbourhood's internal (physical and social) and external (urban facility access) aspects.

The poll defined the neighbourhood as the local area within 10 minutes walking distance from the respondent's home with equal access to public infrastructure and services for all neighbourhood residents to ensure uniformity across respondents. Emotional response to the living area was measured in addition to cognitive neighbourhood satisfaction. Participants were asked to rate their feelings in public spaces in their neighbourhood from "very bad" (1) to "very good" (5). The study captured neighbourhood perceptions. On a scale of 1–5, respondents rated neighbourhood safety, loudness, cleanliness, aesthetic quality, and reputation. Participants rated their neighbourhood affiliation from "not at all" (1) to "a great deal" (5).

Demographic characteristics included age, gender, cohabitation status (living with a partner or spouse), household income, employment status, education, and time living in the current housing. The length of residence was rated from "less than a year" to "more than five years". Using public infrastructure and service data, neighbourhood design characteristics and features were measured. The neighbourhood design characteristics that affect neighbourhood satisfaction are social (communication and social relationship safety, education, health, sense of attachment, international relationship and culture, welfare facilities, equity in services, vitality of the place, public spaces, technology, and smartness in design), physical (accessibility, affordability, connectivity, mobility, beautification. The study assesses Cyberjaya residents' neighbourhood liveability index satisfaction.

3. Findings

Given Cyberjaya's mission as a smart city, international citizens come in hopes of finding a smart and vibrant city with advanced urban services and facilities that can offer them a high quality of life. Investigating the standards and components of high-quality public infrastructure that affect residents' satisfaction is therefore necessary to determine how they feel about living in a new city with the intention of developing into a global technology hub.

3.1. Neighbourhood design characteristics and neighbourhood satisfaction indicators in the general terms

International residents were asked to rate the statement "I feel a sense of satisfaction in the way Cyberjaya looks and feels, and my neighbourhood area is a great place to live" from strongly disagree to strongly agree. 47% of residents are dissatisfied with their area, and only 30% are content with Cyberjaya. 22% of residents are dissatisfied or extremely dissatisfied. Table 2 shows descriptive statistics of all survey variables that measure residents' satisfaction, neighbourhood design factors, and other variables. Table 2 shows that perceived neighbourhood characteristics strongly affect neighbourhood satisfaction. Three design dimensions—social, physical, and environmental—improve neighbourhood satisfaction from residents' perception. Social indicators

Table 2. *Influential neighbourhood design indicator on resident's satisfaction.*

Row`	Indicator	Rank	Mean	Std.deviation	I do not know	I am not sure	Disagree	Agree	Strongly Agree	MIS
1	Having good services in terms of daily needs	1	2	1/41	64	1	0	32	0	233
2	Current situation of neighborhood	2	1/97	1/40	65	1	0	31	0	233
3	Possibility of having social relationship with neighbors	3/5	1/93	1/39	67	1	0	30	0	232
4	Different public spaces for residents gathering	3/5	1/93	1/39	67	1	0	30	0	232
5	Beautiful architecture design and city beautification	5	1/87	1/36	69	1	0	28	0	232
6	Beautiful nature and clean environment	7	1/84	1/34	70	1	0	27	0	232
7	Safety and security of the places	6	1/81	1/33	71	1	0	26	0	232
8	Quiet and peaceful place to live where provide calmness	9	1/65	1/24	76	1	0	21	0	232
9	Beautiful landscape design	8	1/65	1/24	76	1	0	21	0	232
10	Mobility and dynamism	25	1/07	0/44	95	1	0	2	0	232

affect neighbourhood satisfaction more.

Neighbourhood satisfaction is positively correlated with emotional response. Life satisfaction in neighbourhood areas is positively associated with the neighbourhood's ability to meet residents' needs through quality public infrastructure provision, suggesting that equipped neighbourhoods are happier, lively and more vibrant. Living in a new neighbourhood is associated with younger, male, single, lower-income, and student residents who have lived in their current residence for less than five years. 232 of the 330 respondents are categorized under this group. Based on Table 2, "Having good services in terms of daily needs" ranks highest at 1.41, while "Mobility and dynamism" ranks lowest at 0.44 in creating resident satisfaction.

3.2. The influential public infrastructure and services on neighbourhood satisfaction according to the international resident's desired neighbourhood

Table 3 extensively analyses the city's residential infrastructure and public services from the residents' perspective. It ranks them by importance. Residents' selection frequency determines their importance. The research revealed 29 infrastructures as the residents' most important demands, which must be included in neighbourhood planning. Each variable was scored inversely. Statistically, "1" was the most important and 5 the least. Welfare, housing, and transportation infrastructure are most important here. Social communication infrastructure is the fourth most important, followed by public open space infrastructure. Economy and financial infrastructure, followed by safety and security. Governance, administrative, and urban management infrastructure are the eighth most essential. Food, restaurants, food delivery infrastructure, and healthcare and medical infrastructure rank ninth and tenth. According to the residents' prioritization of the indicators affecting the liveability of a residential neighbourhood, it can be concluded that the perspective of international residents has been towards having a quality life with various amenities in a neighbourhood. The international residents taking part in the survey may not have a complete definition of a smart city's main infrastructure, but the way they prioritize effective infrastructure on neighbourhood liveability is such that they are aware of the differences between a city with a standard design and a city with the title of a technology hub. This can indicate that not only the theories examined but also the opinion of the residents of the neighbourhoods indicate the importance of the infrastructure mentioned above.

Table 3. *The influential public infrastructure and services on neighbourhood satisfaction.*

Row	Indicator	Rank	Mean	Std.deviation	5	4	3	2	1
1	Welfare infrastructure	25	1/00	0/00	330	0	0	0	0
2	Housing infrastructure	25	1/00	0/00	330	0	0	0	0
3	Transportation infrastructure	25	1/00	0/00	330	0	0	0	0
4	Social communication infrastructure	25	1/00	0/00	330	0	0	0	0
5	Public open spaces infrastructure	25	1/00	0/00	330	0	0	0	0
6	Economy and finance infrastructure	25	1/00	0/00	330	0	0	0	0
7	Safety and security infrastructure (including security teams, police, fire department, emergency services)	21/5	1/06	0/244	309	21	0	0	0
8	Governance, administrative and urban management infrastructure	21/5	1/06	0/244	309	21	0	0	0
9	Food, restaurant, food delivery infrastructure	19	1/09	0/288	300	30	0	0	0
10	Healthcare and medical infrastructure	19	1/09	0/288	300	30	0	0	0

Table 4. *Satisfaction with the aspects of living in Cyberjaya in terms of public infrastructure and services provision.*

Row	Indicator	Rank	Mean	Std.deviation	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied	Not applicable - no arts scene
1	City Beautification and revitalization	1	4/39	0/529	0	1	3	195	130	1
2	Economic Development	2	4/33	1/15	0	4	74	155	3	94
3	City Planning	3	4/14	0/877	0	1	55	221	4	49
4	Fire Services	4	4/13	0/736	0	1	31	257	5	36
5	Police Services	5	4/07	0/745	3	3	26	263	7	28
6	Street Maintenance	6	4/06	0/307	0	1	4	301	24	0
7	Water/sewer	7	3/81	0/543	0	10	54	252	14	0
8	By law enforcement including parking, street nuisance, noise regulation, unsightly buildings, animal control	9	3/50	0/658	0	27	115	185	3	0
9	Digital tech and internet/ Wi-Fi, broadband	10	3/31	0/804	4	58	100	168	1	0
10	Arts, Culture, Heritage and tourism	8	3/28	1/13	6	34	236	11	1	42

3.3. Status of public infrastructure and services provision in Cyberjaya and residents' satisfaction

In this section of the questionnaire, participants were prompted to evaluate the performance of various infrastructures based on their level of satisfaction with each infrastructure in their neighbourhood. The study assessed 14 public infrastructure items in various neighbourhoods in Cyberjaya and analysed the residents' satisfaction levels. The prioritization method was used to determine the effectiveness of services from residents' perspectives. The top ten priorities were identified as city beautification and revitalization, economic development, city planning, fire service, police services, and street maintenance that is presented in Table 4. As it mentioned in the table below, Water/ sewer service was ranked seventh, while by-law enforcement service was

eighth. Digital technology and internet were ranked ninth, and arts, culture, heritage, and tourism industry were ranked tenth. The findings highlight the importance of prioritizing and addressing residents' satisfaction with public infrastructure in Cyberjaya. 155 respondents expressed extreme dissatisfaction, while 163 expressed dissatisfaction, indicating that the majority of residents are dissatisfied with the quality of transportation services. The lack of timely and cost-effective transportation services results in issues such as the absence of such services in public spaces and the encouragement of them to be in a consensual environment. In addition, it has raised the cost of living for residents, especially those who don't own their own car.

4. Discussion

This study investigates the correlation between residents' satisfaction with their neighbourhood and the liveability of urban areas, focusing on design features, public infrastructure, and overall well-being. The study investigates the performance of neighbourhoods in Cyberjaya, Malaysia with respect to physical and social aspects. The results show that physical aspects, such as green space, vegetation, beautification, architecture design, and public local facilities, were not poorly performed. However, the social needs of international residents were found to be inadequately addressed, leading to lower neighbourhood satisfaction and a diminished sense of belonging to the area.

The study also investigates the relationship between design quality differences and residents' perceptions and well-being outcomes in Cyberjaya neighbourhoods. The study aims to address the contradictions with previous research in the context of smart cities, highlighting that satisfaction with the neighbourhood among residents is not necessarily related to design aspects of a smart city in terms of technology. The study also identifies challenges and risks associated with relocation, such as social isolation, cultural adjustment, and financial strain. The study highlights the complex and multifaceted nature of global relocation and migration to technology hubs, such as Cyberjaya in Selangor, Malaysia.

The study reveals that despite the attention given to the technology sector, unfortunately the human dimension of the city is not satisfied with the quality of neighbourhood public infrastructure and services according to the result of survey. The findings also indicate the distribution of smart public infrastructure is uneven across different areas of the city, which poses a potential threat to the city's attractiveness as a preferred destination for the global community. The study also investigates the factors that influence neighbourhood satisfaction and liveability in the Cybejaya neighbourhoods, finding that perceived neighbourhood design characteristics and its ability to meet residents' needs were the strongest factors in influencing neighbourhood satisfaction.

In conclusion, this study provides a deeper understanding of the factors that influence neighbourhood satisfaction and emphasizes the importance of considering a range of design criteria when evaluating neighbourhood liveability. The study reveals the lower levels of public infrastructure provision in a city than previous studies, negatively impacting residents' perceptions of quality of life. The integration of the international community in Cyberjaya with local society is less significant than in other cities because the perception of international community in Cyberjaya is slightly different with the locals in terms of their standards requirements and desired living area. The relationship between neighbourhood design and satisfaction is less significant according to the statistical analysis and the outcome of the study, with physical and environmental infrastructure being less significant factors. The study found that public infrastructure provision is effective in improving neighbourhood satisfaction, and a lack of attention to the importance of neighbourhood quality design criteria specifically in terms of public infrastructure provision may reduce the level of satisfaction with the perceived neighbourhood, sense of belonging, and overall satisfaction. The variability

Table 5. *Influential indicators of neighbourhood satisfaction.*

Public infrastructure	Design indicators	Coefficient
Social indicators (public infrastructure) that influence the livability of neighborhood design	Social relationship	-.053
	Safety	.004
	Education	-.015
	Health	-.002
	International relationship and culture	.105
Physical indicators (public infrastructure) that influence the livability of neighborhood design	Welfare facilities	.026
	Equity in services	.187
	Vitality of the place	-.049
	Public spaces	.026
	Technology and smartness in design	.075
	Accessibility	.189
	Affordability	.003
Environmental indicators (public infrastructure) that influence the livability of neighborhood design	Connectivity	.082
	Mobility	.019
	Beautification	.065
	Walkability	.053
	Flexibility of design	-.144
	Climate design	-.025
	Clean and renewable energy	-.007
	Environmental friendly design	.084

of quality of life metrics may be due to the rigidity of infrastructure and design standards in different contexts.

Statistical T-tests and prioritizing, the effective variables were carried out to investigate the criteria and factors of quality public infrastructures that influence the liveability of the neighbourhood areas of the cities and ultimately increase the level of neighbourhood satisfaction. At the same time, this analysis highlighted the existing conditions and guidelines of public infrastructure provision in Cyberjaya as a global technology hub to develop a set of criteria for quality public infrastructure for Cyberjaya's neighbourhood design towards improving the liveability of the international residents' living area. Finally, after classifying the effective variables of the liveability of Cyberjaya urban areas, a regression test was proposed to check the impact of each variable. With the help of this test, it is possible to get a correct understanding of the effectiveness of the three categories of public social, physical, and environmental infrastructure and determine which category has the greatest impact on the liveability of Cyberjaya's residential areas. This study analysed the relationships and effects of social, physical, and environmental factors on neighbourhood liveability at a macro level. The results of regression test showed a significant positive association between social factors and neighbourhood liveability and satisfaction in both short and long term. The study also examined the impact of physical and environmental factors on residents' perceptions of neighbourhood liveability. According to the results, physical and environmental factors had negligible effects on residents' assessments of liveability and ultimately their satisfaction with their living area. Further research is needed to explore the mechanisms underlying this relationship and identify effective strategies for promoting social factors in neighbourhoods.

The study proposes a multiple linear regression model to prioritize the effectiveness of independent variables. Following the Cronbach's Alpha test, variables that demonstrated sufficient validity and reliability were selected for inclusion in a regression model for each group. These variables were arranged in a linear model. Based on the results of the study, this paper examines the impact of various variables on the improvement of liveability in Cyberjaya neighbourhoods and the subsequent enhancement of resident satisfaction with their residential areas. The variables are ranked in order of effectiveness based on their respective effectiveness coefficients.

The results obtained from the regression analysis hold significant importance in this study as they aid in prioritizing the impact of independent variables on the quality of neighbourhood design. The summary of the re-

gression test results is presented in the Table 5. The present study aims to establish a ranking system for neighbourhood features based on their impact on liveability. This ranking system can aid in developing a comprehensive understanding of the significance of these features in quality neighbourhood design.

A linear multiple regression model for influential factors on neighbourhood liveability in Cyberjaya neighbourhoods confirmed the fact that there is a significant relationship among public social infrastructure and neighbourhood liveability. Meanwhile, the provision of these public infrastructures can positively increase the quality of life in urban neighbourhoods. Consequently, while public infrastructure enhances the liveability of the neighbourhood, the sense of satisfaction with living in particular neighbourhood areas will increase among international residents of Cyberjaya. The evaluation of these chosen areas, which represented the larger area of the city as well as the chosen sample of the population, shows that accessing social infrastructure in city spaces is what can make people feel they are living in a lively environment. Implementation of a situation that connects people with their community, their living environment, and the services provided to them by the government makes them satisfied with living in a high-quality urban neighbourhood.

5. Conclusion

Conducting background research on residential design contributes to the practical aspect of urban design as well. To begin with, there is a general lack of awareness of the impact of public infrastructure on the quality of residential architecture. Second, the local authorities' and urban developers' failure to recognize the critical nature of prioritizing urban infrastructure based on resident requirements. The lack of adequate management in urban areas is abundantly obvious. Third, a shortage of funding for the private sector to construct necessary infrastructure projects in urban areas is one of the factors contributing to the practical sector's weakness. Prioritizing technological projects has resulted in the city performing poorly in terms of enticing citizens to neighbourhoods. Despite city leaders' understanding of the serious limitations of urban liveability, the focus remains on the commercial and technological sectors. Finally, the city's general lack of proximity to services and integrated infrastructure has made living there challenging.

Local city officials acknowledge that public infrastructure is a priority, and a review of Cyberjaya's executive guidelines and blueprints reveals that this infrastructure is included in the executive programs, but given the many years since Cyberjaya launched as a technology hub, significant progress in terms of urban liveability has not been made. Lack of easy access to public services has diminished residents' willingness and courage to live in Cyberjaya.

This study reveals that satisfaction with a living area extends beyond physical infrastructure and amenities, with residents' perception of their neighbourhood holding greater significance. The study highlights social indicators in neighbourhood design as the most influential factors in shaping residents' satisfaction with their neighbourhood areas. The presence of quality neighbourhood design indicators has a positive correlation with neighbourhood satisfaction. The study also found a significant correlation between the need for social infrastructure to improve residents' social lives and their level of satisfaction. Cyberjaya neighbourhoods exhibited lower levels of satisfaction according to residents' perceptions of their living areas, even after controlling for individual socio-demographic characteristics, neighbourhood location, and proximity.

Urban designers and planners should consider all aspects of physical and environmental infrastructure when strategizing and executing neighbourhood planning and development. Social infrastructure plays a crucial role in promoting robust, contented, and thriving communities, ensuring diverse housing options and a secure, well-planned physical environment. The absence of such infrastructure or inability to ensure equitable access may

impact residents' satisfaction levels, constituting a deficiency in the neighbourhood's design quality.

The results of the study indicate noteworthy policy implications for urban designers and city officials to improve the standards of neighbourhood living and overall quality of life. It is important to keep in mind that an individual's subjective perception plays a significant role in determining their level of satisfaction with their living environment. Consequently, urban policies can only serve as a supplementary measure to those that seek to impact the objective and subjective perceptions of residents regarding the conditions of their neighbourhood (Bernhard et al., 2018; Poortingaetal., 2017). The study results indicate the determinants that impact the enhancement of neighbourhood satisfaction, and empirical analyses have verified that social factors are the primary drivers of residents' satisfaction in residential localities (Holbert et al., 2021; Salaripour et al., 2021). However, physical and environmental factors also hold significance, albeit to a lesser extent.

Moreover, the study's precise outcomes illustrate the diverse categories of associations among social, physical, and environmental determinants and the calibre of design in residential areas, along with the degree to which these determinants enhance the satisfaction of the neighbourhood. At times, latent intra-links may subsist amidst attributes, evidencing that the amalgamation of all these facets can propel a locality towards the notion of liveability.

To summarize, the provision of sufficient physical access notwithstanding, the availability of public spaces within neighbourhoods plays a crucial role in facilitating social interactions among urban dwellers, thereby enhancing their affinity for urban living (McShane and Coffey, 2022). An alternative illustration that could be employed is the application of climate design. Adequately designed urban spaces that account for the rainy climate of a city may enhance the mobility of its residents, ultimately contributing to the overall liveability and vibrancy of the urban environment while mitigating the risk of social isolation among urban residents. According to Fernandez et al. (2015), the incorporation of environmental factors in climate design has a modest yet favourable impact on the perceptions of residents and their satisfaction with the locality.

The majority of previous studies have focused on physical factors, so comprehending the comparative influence of social components can facilitate the formulation of forthcoming policies (Angelidou, 2017b). The utilization of technology in urban planning can lead to a more accurate depiction of liveable neighbourhoods with high level of satisfaction.

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