

**ACCESSIBILITY BUILT ENVIRONMENT
INDICATOR FOR PERSONS WITH
DISABILITIES IN GEORGE TOWN, PENANG**

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**ACCESSIBILITY BUILT ENVIRONMENT
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by

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INDIKATOR AKSESIBILITI ALAM BINA UNTUK ORANG KURANG

UPAYA DI GEORGE TOWN, PULAU PINANG

ABSTRAK

Orang Kurang Upaya menghadapi beberapa cabaran yang menghalangi mereka untuk menggunakan sepenuhnya hak mereka dan mengambil bahagian dalam aktiviti sosial, profesional, dan budaya ketika hendak mengakses persekitaran alam bina. Berbanding dengan mereka yang tidak memiliki ketidakupayaan, Orang Kurang Upaya mempunyai peluang yang lebih sedikit untuk terlibat dalam sebarang aktiviti kerana tidak dapat akses persekitaran alam bina. Kajian ini memberikan gambaran keseluruhan tahap aksesibiliti dan menyiasat cabaran aksesibiliti yang dihadapi oleh Orang Kurang Upaya (orang kurang upaya fizikal, pendengaran dan penglihatan) ketika bergerak di persekitaran alam bina di George Town, Pulau Pinang. Yang dijalankan untuk menambah baik reka bentuk bandar dengan menggunakan Teori Rangkaian Sosial, yang mungkin mempunyai implikasi terhadap pengurusan mobiliti fizikal bagi individu kurang upaya. Pendekatan kaedah gabungan (mixed method) digunakan untuk mendapatkan maklumat dari organisasi yang berkaitan dengan Orang Kurang Upaya dan untuk mendapatkan data dari Orang Kurang Upaya. Temu bual dijalankan ke atas Majlis Bandaraya Pulau Pinang, Think City Penang, George Town World Heritage Incorporated, Persatuan Orang Kurang Upaya Pulau Pinang dan Persatuan Pemulihan Penyayang bagi Orang Kurang Upaya. Manakal, soal selidik ini dilakukan ke atas pengguna kerusi roda, individu yang mempunyai masalah berjalan

kaki, orang kurang upaya penglihatan, dan orang kurang upaya pendengaran di kawasan George Town. Majoriti besar Orang Kurang Upaya menghadapi tiga cabaran utama, seperti laluan pejalan kaki yang sempit, permukaan laluan pejalan kaki yang tidak rata, terdapat halangan di laluan pejalan kaki dan kerb yang merbahaya. Kemudahan aksesibiliti di George Town masih perlu ditingkatkan untuk memudahkan Orang Kurang Upaya untuk bergerak. Berbagai cabang dan langkah diusulkan untuk meningkatkan aksesibiliti bagi Orang Kurang Upaya di kawasan George Town, termasuk dari segi dasar, koordinasi, kesedaran, penglibatan Orang Kurang Upaya dan kerjasama. Penemuan dan cadangan dalam kajian ini akan membantu meningkatkan akses semasa ke persekitaran alam bina agar Orang Kurang Upaya dapat mengunjungi kawasan George Town dengan mudah dan selamat.

ACCESSIBILITY BUILT ENVIRONMENT INDICATOR FOR PERSONS WITH DISABILITIES IN GEORGE TOWN, PENANG

ABSTRACT

Persons with disabilities confront several challenges that hinder them from fully exercising their rights, and participating in social, professional and cultural activities in terms of accessing built environments. Compared to those without disabilities, persons with disabilities have less opportunities to engage in activities because of their inaccessibility within social environments. This study provided an overview of the accessibility level and investigated the accessibility challenges that persons with disabilities (persons with disabilities of physical, hearing and vision) face when moving around in external built environment in George Town, Penang. Which was carried out with the intention of improving urban design by using Social Network Theory, may have implications for the management of physical mobility for individuals with disabilities. The mixed-method approach was employed to elicit information from organizations related to persons with disabilities, and to obtain data from a group of persons with disabilities. The interviews were conducted with the Penang Island City Council, Think City Penang, George Town World Heritage Incorporated, Penang Society of Disabled Persons and Caring Rehabilitation Society for persons with disabilities. The questionnaire was conducted with wheelchair users, the walking-impaired persons, the visually-impaired persons, and the hearing-impaired persons in George Town areas. Most persons with disabilities confronted

four key challenges: narrow sidewalks, uneven sidewalk surfaces, barriers on sidewalks and dangerous drop curbs. Accessibility facilities in George Town still need to be improved to increase ease of travelling for persons with disabilities. Various branches and ways have been proposed to increase accessibility for persons with disabilities in the George Town area, including policy, coordination, awareness, involvement of persons with disabilities and cooperation. The findings and recommendations in this study would assist in improving the current access to the built environment so that persons with disabilities may visit the George Town areas easily and safely.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Accessibility in built environment plays a significant role in connecting people and places, directly affecting place-making and giving characters to the whole city. The built environment is defined by the Centre for Digital Built Britain as all types of buildings (commercial, residential and industrial), urban space, infrastructures (above and below ground), and landscape between and around buildings (Bolton et al., 2018). In short, the built environment refers to all kinds of human-made elements in our surroundings that provide the settings for human activities, including parks, buildings, green space, transportation networks, and facilities. Usually, the built environment is designed and intended for young and healthy persons who are able to climb a high pedestrian curb, ascend the stairs, and overcome any obstacle (Yılmaz, 2018). It is important to realize that the built environment is for everybody, including older people, children, pregnant women, and persons with disabilities. There should not be any restriction on their rights to access or move safely and freely in public parks, public buildings, or densely populated urban areas where various activities are carried out.

Persons with disabilities account for a sizable proportion of the total of world population. Persons with disabilities are a diverse group of individuals who are not defined solely by their disability or circumstances (Ju'beh, 2015). It is possible to have disabilities that are visible or invisible, and their onset can occur at any time during childhood, adolescence, adulthood or old age. Disability is difficult to define because

it is “complex, dynamic, multidimensional, and contested” (World Health Organization; WHO, 2017). Since there is no single definition of what constitutes a disabled individual (Mitra, 2006), the interpretations of disabilities differ from one country to another, and in some cases quite widely. In Malaysia, a person with disabilities is defined as those who have long-term physical, mental, intellectual, or sensory impairments, which when combined with other barriers, may impede their full and effective participation in the society (Akta Orang Kurang Upaya, 2011). The Department of Social Welfare Malaysia (2016) has divided persons with disabilities into seven categories: hearing disabilities, vision disabilities, speech disabilities, physical disabilities, learning problems, and mental disabilities.

In the estimated global population in 2010 (a total of about 6.9 billion people), about 15% have a specific form of disability (World Health Organization, 2011). According to statistics from the WHO, 10% to 16% of Malaysia’s population (a total of about 3 million people) were with some forms of disabilities in 2017 (Balqis Jazimah Zahari, 2017). The statistics from the Department of Social Welfare Malaysia (2016) shows increasing population size of registered persons with disabilities from 318,132 individuals in 2014 to 409,269 individuals in 2016. The increase was bolstered by the data from the Department of Statistics Malaysia (2018): persons with disabilities registered until 2017 were 453,258 individuals. From the statistics, the physical disabilities category recorded 35.2%, followed by learning disabilities (34.8%), vision disabilities (8.9%), and speech disabilities (0.5%). These numbers are predicted to rise in tandem with the growing population, longer life expectancy, and

overall number of road and industrial accidents (Rahim & Samad, 2010). Meanwhile in Penang, persons with disabilities registered until 2018 were 28,030 individuals. From the statistics, the physical disabilities category recorded 41.2%, followed by learning disabilities (29.8%), vision disabilities (10.3%), and hearing disabilities (8.2%), mental disabilities (6.2%), multiple disabilities (3.7%) and speech disabilities (0.6%) (Shaari, 2020).

The built environment should provide more support to disadvantaged population so that they are not ignored. Persons with disabilities Act 2008 states that the provision of transportation facilities and infrastructure must conform to the Universal Design in order to ensure easy accessibility for disabled persons (Hussein & Yaacob, 2018). In order to overcome this matter, Ron Mace, the founder of the Center for Universal Design, envisioned Universal Design as a basis for a more welcoming and usable world for all. Universal Design is a concept that advocates solutions that increase the accessibility of the environment to the greatest extent possible for people of all ages and abilities (Mace, 1998). Even though it is impossible to accommodate everyone at all times, Mace et al. (2015) have developed seven Universal Design principles: Equitable Use, Flexibility In Use, Simple And Intuitive, Perceptible Information, Tolerance for Error, Low Physical Effort, Size and Space For Approach and Use. There are four design requirements that must be considered in designing the accessible built environment to promote opportunities for greater mobility: (1) sensory, including guideways, information and tactile warnings; (2) outdoor environment, including signages, street furniture, obstructions, drop curb, pedestrian

crossing, pathways, children's playgrounds and parking space; (3) horizontal areas, including doors, entrance areas and lobbies, corridors, handrails and railings, toilet and bathrooms; (4) vertical areas, including lifts, stairs, and ramps (Australian Government, 2013).

George Town is a popular tourist destination in Malaysia because it is a scenic and culturally significant city on the island of Penang. This city is an important part of the country's economic and cultural life, and everything that happens in this area might draw visitors' attention. Vehicle movements in George Town (Penang Island) have no obstruction or difficulty as the areas are highly connected. Pedestrian movements, on the other hand, especially persons with disabilities, face the opposite situation (Mok, 2016). Mobility Accessibility Penang (MAP) (a project initiated by the Society of the Disabled Persons Penang in 2000) claims incomplete and unsuitable aid in the transportation system available in Penang for persons with disabilities (Mobility Assistance Penang, n.d.). This situation is evidenced by the notion of easing the physical mobility for persons with disabilities as announced by the Economic Planning Unit of Penang and the United Nations Development Programme; Penang has yet to offer practical accessibility and transport facilities for persons with disabilities (United Nations Development Programme, 2018).

The provision of accessibility facilities for persons with disabilities involves various parties, including local authorities, non-government organizations, and associations related to persons with disabilities. These agencies are vital and responsible for providing easy access to persons with disabilities. Therefore, the Social

Network Theory has been employed since it is a method for comprehending multi-organizational interactions by examining full organisational relationship structures and their impact on the output of organisations. This study will look into the roles played by local governments, non-governmental organisations, and disability-related associations in the field of accessibility for persons with disabilities.

Therefore, this research is expected to generate indicators to enhance the current Universal Design practice by incorporating the Social Networks Theory. In other words, it seeks to determine the current level of perceived accessibility and apply the principles of Universal Design in the external built environment in the George Town areas. In addition, this research is planned with the intention of improving urban design, may have implications for the management of physical mobility for individuals with disabilities. Easy physical mobility for persons with disabilities not only benefits the local community in the sense that it addresses the objectives of safe mobility and effective transport set out in the New Urban Agenda, the National Transformation Program 2050, and the United Nations Development Programme, but also contributes to the enhancement and promotion of the urban area as a people-friendly destination.

1.2 Problem Statement

An urban area is a very important and visible physical product that humankind has created in order to survive, as well as the most significant structure directing and surrounding human lives (Baris & Uslu, 2009). What makes up an urban area is not only the built environment (buildings, fixed service areas, streets, and alleys), but also the social environment, which shapes social life and relationships between persons in

a city or town. Since the people in urban areas are heterogeneous in terms of age, gender, and physical conditions, it is critical to design urban areas that cater to people regardless of their characteristics and physical abilities. Persons with disabilities, however, are unable to access large portions of cities and their buildings (Baris & Uslu, 2009). In 2006, Malaysia signed the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and committed to adopting and enacting legislation to ensure the equality of persons with disabilities. The adaptation of the Incheon Strategy "Make the Right Real" into the Malaysia Action Plan for People with Disabilities 2016 – 2022 has also encouraged the development of persons with disabilities in Malaysia (Kementerian Pembangunan Wanita, 2016). However, Persons with disabilities such as wheelchair users, hearing and visually-impaired persons, and other differently positioned people face many obstacles. At the same time, they are prevented from fully expressing their rights and engaging in social, professional life and cultural on an equal basis with others because they are confined to a built environment.

The built environment has been provided, but not fully implemented by considering the safety, convenience, and balance of needs (Bhat et al., 2000; Sawadsri, 2010). The provision of built environment facilities for the use of persons with impairments does not consider Universal Design principles. Improper implementation causes persons with disabilities to have some problems and barriers while using these facilities. It includes obstacles on the sidewalk such as uneven surfaces, inappropriate street furniture, improperly laid textured pavement blocks, unfriendly pedestrian

crossing for disabled persons, lack of a drop-off curb, inability to read the signboard, and others (Gallagher, Hart, O'Brien, Stevenson, & Jackson, 2011; Jenkins, Yuen, & Vogtle, 2015; Rosenberg, Huang, Simonovich, & Belza, 2013).

In Penang, the Economic Planning Unit of Penang and the United Nations Development Programme statement related to persons with disabilities having limited accessibility to places and ease of physical mobility (United Nations Development Programme, 2018). The claim is further supported by echoing the Mobility Assistance Penang (MAP) (a project initiated by the Society of the Disabled Persons Penang in 2020), the transport system for persons with disabilities is incomplete. A tourist shared her experiences while moving and utilising George Town's outdoor built environment. Low quality, high steepness and lack of curb ramps prohibit confidence for impaired persons and wheelchair users from leaving the footpaths or crossing the road, and non-level access and gaps between platforms infrastructure have been listed as frequent problems while travelling around the George Town city (I Wheel Travel, 2019). In addition, the problem of the lack of facilities for wheelchair users was voiced by the persons with disabilities community from the Utara Hebat group from Perlis, Kedah and Penang (Astro Awani, 2018). Among them, the lack of access to places of focus such as mosques, stadiums and banks is the biggest issue and challenge for this community. Figures 1.1, 1.2, 1.3, and 1.4 portray conditions and issues in George Town that make it difficult and dangerous for people with disabilities to move from one location to another. Based on the statement, the urban design concerning accessibility for persons with disabilities in George Town urgently needs improvement

and enhancement. The accessibility for physical mobility would not only assist Penang in illustrating the ‘Malaysia Hospitality’ slogan, but also play a critical role in attracting the growing domestic tourism sector (Tan, 2017). According to Rahim et al. (2014), we must consider a sustainable design for accessibility in all aspects of our physical development in order to make our cities world-class.



Figure 1.1 Obstruction on sidewalks



Figure 1.2 Lack of drop curb



Figure 1.3 Lack of proper sidewalk



Figure 1.4 No audio and symbol for crossing

All stakeholders, especially the government, private sector, and professionals, are responsible for making urban areas more accessible to the general public. They are expected to be the first to propose the concept of an accessible built environment in order to ensure full involvement from all levels of the community without prejudice. In both developed and developing countries, many acts and legislations have been enacted to protect the rights of persons with disabilities. The government's affirmative support for ensuring equal rights for all residents is demonstrated by the establishment

of such standards, norms, and legislations. These acts and legislations also act as a guide for professionals planning and designing their work. Since the requirements to meet the Malaysian Standard (MS) are defined in the Uniform Building (Amendment) By-Laws (UBBL) 1991, all public buildings must provide accessibility and facilities for persons with disabilities. The aim of establishing this standard is to establish an environment that encourages the independent functioning of disabled people in their daily lives. Conversely, according to Soltani et al. (2012), Malaysia is still lagging behind in terms of providing equal access and facilities for this group due to the failure to adhere to the Universal Design principles.

There is an abundance of research and discussion about detecting and removing barriers to achieve a barrier-free environment taking place all around the world these days. There are several cracks and deficiencies within the previously captured research regarding accessibility for persons with disabilities. For instance, some studies generally discuss Universal Design implementation, barriers in heritage buildings, shopping malls and public buildings, and barriers in built environment and transportation areas for persons with disabilities (Table 1.1). Research into the built environment for the disabled and barrier-free environment is being conducted from a variety of perspectives, including identifying barriers, exploring impacts and interaction between disabled people and the environment, and understanding environmental development, social support, and handicaps. Nevertheless, the scope of research to date has been small; generally, the study is limited on the needs of certain particular users, such as visually-impaired people or wheelchairs users. Some

researches are highly restricted, dealing with creating barrier-free public areas or public buildings and specific locations such as government buildings, shopping malls, mosques, universities, transportation terminals, institutions and others.

However, very little research has been done on developing accessible built environment for persons with disabilities in an urban area, such as the study conducted by Ja' Afar et al. (2017) and Esfandfard, Wahab and Amat (2018). However, the study only focuses on the element of sidewalk and urban public space rather than urban area as a whole without incorporating the Social Network Theory. Social Network Theory can describe the social relations among local authorities, non-governmental organizations and associations based on the social network when providing accessibility facilities for persons with disabilities. The built environment plays an important role in connecting people and places; therefore, this study sought to determine the current level of accessibility perceived by persons with disabilities in the George Town areas. This current study, which was carried out with the intention of improving urban design, may have implications for the management of physical mobility for individuals with disabilities.

Table 1.1 Previous researches on persons with disabilities

Authors/Year	Research Title	Research Scope
Tokuda (2001)	Road Transport Barriers encountered By People with Travel Difficulties in Japan.	To study specific encounters by people with travel difficulties in Japan.
Ikaputra & Sholihah (2001)	Mobility for All: Towards Barrier-Free Environment in Yogyakarta, Indonesia.	To evaluate the accessibility of persons with disabilities (PWDs) in the transportation area.
Bromley, Matthews, & Thomas (2007)	City Centre Accessibility for Wheelchair Users: The consumer perspective and the Planning Implications.	To help explain the difficulties currently experienced by wheelchair users when shopping in the city centre.
Gallagher et al. (2011)	Mobility and Access to Transport Issues As Experienced By People With Vision Impairment Living In Urban And Rural Ireland.	To explore mobility and access to transport issues by urban and rural dwelling people with vision impairment in Ireland.
Ezanee et al. (2011)	Disabled Facilities in Shopping Malls: Malaysian Perspective	To identify the level of satisfaction on present facilities provided in shopping malls in Klang Valley, Malaysia.
Soltani et al. (2012)	Accessibility for Disabled in Public Transportation Terminal	To identify and highlight accessibility in approaching the spaces in the transport terminals.
Kamarudin, Hashim, Mahmood, Ariff, & Ismail (2012)	The Implementation of the Malaysian Standard Code of Practice on Access for Disabled Persons by Local Authority	To measure the local authority awareness in providing access and facilities for the PWDs and their knowledge in implementing the Malaysian Standard.
Padzi & Ibrahim (2012)	Accessibility of Visually Impaired Passengers at Urban Railway Stations in the Klang Valley	To investigate the accessibility of visually impaired passengers with regards to the interior design of Kelana Jaya Line LRT station.
Rosenberg et al. (2013)	Outdoor Built Environment Barriers and Facilitators to Activity Among Midlife and Older Adults with Mobility Disabilities.	To better understand how the built environment impacts neighbourhood-based physical activity among midlife and older adults with mobility disabilities.

Authors/Year	Research Title	Research Scope
Jenkins, Yuen, & Vogtle (2015)	Experience of Multisensory Environments in Public Space Among People with Visual Impairment.	To explore the role of sensory characteristics embedded in the built environment and whether they support or hinder people with visual impairment in their use of public spaces.
Bashiti & Rahim (2015)	A Study on The Accessibility in Shopping Malls for People with Disabilities (PWDs) in Malaysia.	To evaluate accessibility in the facilities used by people with disabilities (PWDs) in shopping malls.
Lid & Solvang (2016)	(Dis)Ability and The Experience of The Accessibility in The Urban Environment.	To study the interaction between sight loss and wheelchair users and environmental factors.
Ja' Afar et al. (2017)	Sidewalk Accessibility at Melaka's Traditional Streets for People with Disabilities (PWDs).	To evaluate the accessibility level of the sidewalk along Jalan Hang Jebat, Melaka to PWDs.
Wu & Li (2017)	Using Community Planning Method to Improve Effect of Urban Barrier-Free Transportation System	To find out some community planning methods to improve the barrier-free bus and metro transportation system in China.
Esfandfard, Wahab, & Amat (2018)	Universal Design in Urban Public Spaces for People with Disability. Case Study of Tehran, Iran.	To find the solution for increasing interaction of people with disabilities in urban public space through the Universal Design approach.
Soltani et al. (2018)	Disabled Children in Public Playgrounds: A pilot study.	To investigate the status of infrastructure and design of proper public playgrounds in Malaysia.
Rahim & Abdullah (2009)	Accessible built environment for the elderly and disabled in Malaysia: Hotels as case studies	To focus on the issue of accessibility for the elderly and disabled people in accessing hotels and resorts in Malaysia.

1.3 Research Objectives

The purpose of this research is to develop indicators that will help to improve the current Universal Design practice in the built environment. The followings are some additional research objectives that have been developed in an effort to achieve the research goal:

- i. To investigate whether the provision of accessibility facilities for persons with disabilities is in line with Universal Design principles and the extent of accessibility in George Town.
- ii. To study the accessibility issues experienced by person with disabilities.
- iii. To recommend accessibility indicators to be included in the current Universal Design practice to enhance the accessibility of persons with disabilities in George Town.

1.4 Research Questions

The following research questions have been established in order to fulfil the aforementioned research objectives:

- i. Which Universal Design principles are employed in the provision of accessibility facilities for persons with disabilities in George Town?
- ii. What are the accessibility issues experienced by persons with disabilities in George Town?
- iii. What are the accessibility indicators should be recommended to be included in the current Universal Design practice to enhance the accessibility in George Town?

1.5 Research Scope

The scope of this research would focus on the Universal Design practice on the accessibility of built environment related to persons with disabilities. Universal Design relates to products and the environment; hence, the focus will be the design aspects of the environment in relation to the physical built environment. This study would concentrate on the two categories of design requirement in Universal Design as coined by the Australian Government (2013). First was the sensory that included the tactile warnings, guideways, and information. Second was the outdoor environment, including obstructions, street furniture, signage, drop curbs, sidewalk, parking space, and pedestrian crossing. The provision of accessibility for persons with disabilities in George Town would examine the inclusiveness of all designs according to the Malaysia Standard Code of Practice for Access Disabled Persons Outside Building (MS 1331:2003).

In addition to the seven (7) categories stipulated by the Ministry of Women, Family, and Community Development (hearing, vision, speech, physical, learning difficulties, mental, and various multiple disabilities), the scope of the category of persons with disabilities includes only persons with physical disabilities and mobility issues, including wheelchair or cane users, and walking-impaired and vision-impaired individuals. The selection of this group as the primary subject is because they are often negatively influenced by the barriers in the external built environment (refers to accessibility) compared to other categories such as speech impaired, mental disabilities and learning difficulties. This study used both qualitative and quantitative approaches

to analyse the data collected. Therefore, the structured interview and questionnaire survey method were chosen because they were appropriate for the study targeting the organization's officers and persons with disabilities as respondents.

1.6 Significance of Research

Urban design is crucial when it comes to complementing the movement of people/goods and urban form. In the past decades, urban design is positively associated with the sustainable development concept and the incorporation of Universal Design. Besides the notion of creating a platform for socioeconomic uplifting, the New Urban Agenda has also clarified the significance of reflecting "...our understanding of how the shape and form of urban development influence the health of city residents" (World Health Organization, 2016). In other words, the New Urban Agenda has announced, among others, its strategy in utilizing urbanization and urban design as the platform to address the accessibility and physical mobility gap between healthy persons and persons with disabilities (United Nations, 2017).

Mobility Assistance Penang (MAP) (a project initiated by the Society of the Disabled Persons Penang in 2020) claims that the aid transportation system for persons with disabilities is incomplete, clearly indicating that the urban design in relation to accessibility for persons with disabilities in George Town is in urgent need of improvement. This further supports the United Nations Development Programme and the Economic Planning Unit of Penang statement related to the limited choices faced by the persons with disabilities on the accessibility to places and ease of physical mobility. Furthermore, the World Health Organization (WHO) emphasises the

importance of equal opportunity to physical mobility as follows: “Those who plan, design, build, and govern cities have significant influence over the basic ingredients of a healthy life, including access to decent housing, clean water and air, safe transportation and mobility, nutritious food, an opportunity for physical activity, and protection from the elements” (World Health Organization, 2016). From the perspective of the tourism industry, accessibility and physical mobility for persons with disabilities would not only illustrate Penang’s ‘Malaysia Hospitality’ slogan, but also play a critical role in attracting the growing domestic tourism sector (Tan, 2017).

Therefore, providing persons with disabilities with ease of movement and equal accessibility to public facilities, amenities, buildings, and services are fundamental. Moreover, sound and reliable data on accessibility and physical mobility management for persons with disabilities are crucial “...for planning disabilities inclusive policies, programs, and strategies in Malaysia” (Ahmad et al., 2017). More importantly, the provision of accessibility for persons with disabilities is in line with the National Transformation 2050 to deal with the “ageing nation trend” in Malaysia, which is projected to take place in 2035 (Jufitri Joha, 2016).

1.7 Operational Definition

The operational definition clarifies the most important concepts in the context of the study to avoid misconceptions during the research and data collection. Various fields of literature and disciplines can be used to investigate the integration of accessibility for persons with disabilities. The terminologies and current state of knowledge applied in this study are listed below:

Table 1.2 Operational Definitions

Terms	Definitions	Operational Definitions
Accessibility	The ability of a person or a group of people in a specific location to participate in a specific activity or set of activities (Hansen, 1959).	The ease or difficulty of movement of a person with disabilities (wheelchair user, elderly, and visually and hearing-impaired person) in reaching services, activities, and destinations.
Mobility	People's ability to travel from one location to another using transportation or mobility technologies (Kellerman, 2012).	The ability of a person with Disabilities (wheelchair user, elderly, and visually and hearing-impaired person) to move from place to place, generally by walking, but occasionally by using another medium.
Persons with disabilities	Those who have long-term physical, mental, intellectual or sensory impairments that interact with various barriers and hinder their full and effective participation in society (Person with Disabilities Act 2008 (Act 685), 2008).	It is focused on the four most common: physical impairments (wheelchair & cane users, dwarf, cerebral palsy), the elderly, and visually and hearing-impaired person.
Universal Design	The design of product and environment to be useful by all people, to a greater extent possible, without the need for adaption or specialized design (North Carolina State University, 1997).	The design helps increase the accessibility and usability of the built environment to the greatest extent possible for people of all ages and abilities while avoiding specialised features or design that focuses solely on persons with disabilities or the elderly.
Built Environment	All types of buildings (residential, commercial, and industrial), urban space, infrastructures (above and below ground), and landscape between and around buildings (Bolton et al., 2018).	It refers to the outside environment in urban areas, concentrating on sidewalk, junctions and road crossing, curb ramps, taxi stand and bus stop, and guiding block.

1.8 Thesis Structure

Overall, this study has five chapters. This chapter (Chapter 1) discusses the introduction to the study conducted. The discussion in this section introduces the study, pointing out the reasons behind this study's current conduct and the researcher's attention. Then, the thesis is organized into four chapters.

Chapter 2 presents the current literature on the characteristics of persons with disabilities, the needs of persons with disabilities for physical mobility, the standards for universal design concepts and principles, the standards for the design of accessibility for persons with disabilities, and the regulations applicable for persons with disabilities. A concise summary is provided at the end of this chapter.

Chapter 3 illustrates the approach used in this report by explaining the nature of the study and the sampling technique. It also provides data collection methods and tools, including the inventory checklist, instrument tests, and questionnaire. The primary data were obtained from data collection instruments through questionnaires, thorough interviews, and inventories. The secondary data were collected from available documents, such as journals, articles and laws and regulations documents.

Chapter 4 shows the results of the interview and survey. All the information was gathered to determine some of the findings of the research. The results of the analysis are arranged based on research questions. An overview of the critical findings of this study is provided at the end of this chapter.

Chapter 5 summarizes the research's key findings and discusses them based on the research context. This chapter also highlights how some recommendations are

formed based on the findings of this research. There are also recommendations for future research and the findings summarized at the end of the chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter aims to show how each body of literature and each concept are essential to the study's emphasis, and indicative of overlapping areas. The purpose of this study was to look at the accessibility indicator of built environment for people with disabilities in George Town. As a result, the following four major concerns are discussed in this chapter: disabilities, mobility and accessibility, Universal Design, and Social Network Theory. This chapter begins with an overview of disabled people: the definition, types of persons with disabilities, and acts related to disabled people in Malaysia. Secondly, it discusses the understanding of mobility. This section looks at the concept of mobility and indicators of physical mobility for persons with disabilities. The third section focuses on the concept of accessibility, indicators, and measurement of accessibility for persons with disabilities. The fourth section provides insights into the concept of Social Network Theory. The discussion in this section provides research gaps and a theoretical framework that relates to all the indicators and measurements of mobility and accessibility for persons with disabilities.

2.2 Persons with Disabilities

This section is intended to explain disability using its specific definition. Other matters include the categories of the persons with disabilities, their rights to access the physical environment, the acts related to persons with disabilities in Malaysia.

2.2.1 Definition of Persons with Disabilities

The use of standard terms and definitions establishes a foundation for mutual understanding. The concept of disability is complex, and its interpretation is influenced by historical, social, legal, and philosophical considerations, among other factors. Persons with disabilities are defined as individuals who have physical, intellectual, and mental disabilities that limit their ability to participate in a normal way and prevent them from fully participating in the community's way of life. In addition, people become disabled when their needs are not met by society, whether intentionally or unintentionally, in terms of social and infrastructure development (Ezanee et al., 2011). Thus, disability is more than just a health issue. It is a complex phenomenon that represents the relationship between an individual's bodily characteristics and the characteristics of the society in which they live (World Health Organization, 2017). Each disability group and other organizations may have their definitions of persons with disabilities. Table 2.1 shows the definition of persons with disabilities set out by the World Health Organization, United States, United Kingdom, Canada, and Malaysia.

Table 2.1 Comparison of definition of persons with disabilities

Organization	Definitions
World Health Organization	Disabilities is an umbrella term covering impairments, activity limitations, and participation restrictions . An impairment is an issue with a person's physical function or structure; an activity limitation is a problem with a person's ability to do a task or action; and a participation restriction is a problem with a person's ability to participate in life events. As a result, disability is a complicated phenomenon that reflects the relationship between a person's body and the society in which they live (World Health Organization, 2017).
Americans with Disabilities Act (ADA) (1990), United States	An individual with a physical or mental impairment significantly restricts one or more main activities in life, a record of such an impairment, and regards as having such an impairment (Americans with Disabilities Act, 2011).
Disability Discrimination Act (DDA) (1995), United Kingdom	A person with a disability has a physical or mental impairment that has an adverse effect on their ability to perform normal day-to-day activities over a substantial and long term (lasting 12 months or the rest of the person's life) (Policy Division, 1997).
The Canadian Human Rights Act (Canadian Human Rights Commission, 1983), Canada	“...any previous or existing physical or mental impairment , including disfigurement and previous or existing dependence on alcohol or drug” (Branch, 2012).
The Person with Disabilities Act 2008, Malaysia	A person with disabilities are those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers, may hinder their full and effective participation in society (Akta Orang Kurang Upaya, 2011).
The Department of Social Welfare Malaysia, Malaysia	One who is unable to self-determine to fully obtain or be part of the basic needs of an individual or is unable to live fully in society because of something that have happened since birth or later than that (Jabatan Kebajikan Masyarakat, 2016).

In society, certain standards can reflect the ability and condition of the majority of society, and a person will only be considered disabled if they cannot function or cannot do something as society does. According to the definitions provided, persons with disabilities can be defined as individuals who have physical, intellectual, or mental disabilities that limit their ability to participate in a normal way in the community's way of life including the elderly, or even pregnant women. This includes persons with disabilities are individuals who have limited movement or deficiency in doing a job considered normal for other individuals to do it such as difficulty to hear, see, move, climb and so on.

2.2.2 Categories of Persons with Disabilities

Persons with disabilities are varied and heterogeneous; stereotypical views of disabilities highlight wheelchair users and few other classic types, including visually and hearing-impaired persons (Park, Curtice, Thomson, Phillips, & Johnson, 2011). According to Johnny (1983), persons with disabilities are categorized based on disabilities into three parts: physical, mental, and various disabilities (Table 2.2). Meanwhile, the Malaysian Department of Social Welfare has classified persons with disabilities into seven categories as shown in Table 2.3.

Table 2.2 Categories of Disabilities

Categories of Disabilities	Description
Physical Disabilities	It comprises of limb deformities, and vision and hearing impairments. It can be interpreted as sensory loss or limb damage that can interfere with the functioning of a normal human limb.
Mental Disabilities	Individuals with cognitive impairment usually experience mental illness or disability in terms of development and learning that affects the way they function and the way they think.
Multiple Disabilities	It is a combination of any disabilities or all of the above.

Table 2.3 Categories of persons with disabilities by the Department of Social Welfare Malaysia

Category Disabilities	Description
Hearing	Inability to hear clearly in both ears without using a hearing aid or incapable of hearing even when using a hearing aid. Hearing impairments can be broken down into four levels: 1. Minimum 15 - <30 decibels (a child); 20 - <30 decibels (adults). 2. Moderate 30 - <60 decibels. 3. Severe 60 - <90 decibels. 4. Profound \geq 90 decibels
Vision	Blind in either eyes or blind in one eye, or vision impairment in either eyes or any other permanent visual impairment. Visual impairments can be split into: 1. Low vision: vision that is worse than 6/18 but equal to or better than 3/60, even with visual aids or a visual field that is less than 20 degrees from fixation. 2. Blindness, the vision of less than 3/60 or a visual field of less than 10 degrees from fixation. ** Less than 3/60 means Counting Fingers (CF), Hand Movement (HM), Perception of Light (PL) and No-Light Perception (NPL). Other permanent visual disturbances must be confirmed by an Ophthalmologist.