

ANALYSIS OF PHYSICAL ACCESSIBILITY OF URBAN SPACE FACILITIES FOR VULNERABLE GROUPS: UNIVERSAL DESIGN PRINCIPLES IN TEGAL CITY

Aulia Kartika Putri¹
Suranto²

^{1,2}Universitas Muhammadiyah Yogyakarta
Jl. Ring Road Selatan, Geblagan, Tamantirto, Kec. Kasihan, Kabupaten Bantul, Daerah Istimewa Yogyakarta

Correspondence Email: auliakartikaputri07@gmail.com

ABSTRACT

Physical accessibility to public facilities is a fundamental component in the realization of an inclusive city, particularly for vulnerable groups such as persons with disabilities and the elderly. This study aims to examine the contribution of Universal Design principles—comprising seven variables: Equitable Use, Flexibility in Use, Simple and Intuitive Use, Perceptible Information, Tolerance for Error, Low Physical Effort, and Size and Space for Approach and Use—to the physical accessibility of public spaces in Tegal City. Using a quantitative approach, data were collected through a survey of 139 respondents and analyzed using Structural Equation Modeling (SEM) with SmartPLS. The findings reveal that only three variables—Flexibility in Use, Perceptible Information, and Low Physical Effort—have a significant effect on physical accessibility. The R-square value of 0.697 indicates that the model explains 69.7% of the variance in accessibility. These results contribute theoretically to localized Universal Design studies and offer practical insights for policymakers. Future research is encouraged to adopt mixed methods and involve broader user groups to enhance inclusivity.

Keywords: Physical Accessibility, Urban Space, Vulnerable Groups.

INTRODUCTION

The formation of government is based on the principle of reducing and avoiding individual conflicts of interest, thereby ensuring a fair distribution of influence and the formation of collective entities (Bredekamp, 2020). Facilities that support people with disabilities are important (Harahap et al., 2020). The activeness of the community, especially people with disabilities, in fulfilling their needs must be fulfilled both as individuals and as part of citizens (Propiona, 2021). The fulfilment of the rights and obligations of Indonesian citizens is entitled to be obtained fairly without exception (Mayarni et al., 2021). There are no limitations or exceptions in obtaining rights as human beings (Rahayu & Dewi, 2013).

Regulations related to accessibility in Indonesia have been established, namely the Minister of Public Works Regulation Number 30/PRT/M/2006 of 2006 concerning Technical Guidelines for Facilities and Accessibility in Buildings and the Environment and the Minister of Public Works Regulation Number 468/KPTS/1998 concerning Technical Requirements for Accessibility in Public Buildings and the Environment. The level of physical accessibility can be measured by the absence of physical barriers for users of public spaces, such as ramps, sidewalks, and other supporting facilities (Ilmiajayanti & Dewi, 2015; Syafi'ie, 2014).

Accessibility is defined as the convenience provided to all people to realise equality of opportunity in all aspects of life and livelihood, including for people with disabilities (Zainudin et al., 2024). It aims to provide equality for people with disabilities. In accordance with Law No. 8/2016 on Persons with Disabilities, it is stipulated that individuals with disabilities are entitled to equal rights and opportunities in all areas of life and livelihood. In addition, they are guaranteed accessibility to ensure their independence.

Law No. 25 of 2009 on Public Services also stipulates that the goal of providing transparency and guidance in public services for all citizens, including people with special needs, namely people with disabilities, must be realised. Law No. 28 of 2002 on Buildings stipulates that accessibility requirements must be met in all public buildings that are accessible and used by the general public, including those used by people with disabilities.

People with disabilities are part of Indonesian society who are entitled to equal position, rights, obligations and roles (Baturangka et al., 2019). People with disabilities should not be isolated, let alone too differentiated from society in general (Surwanti & Puspitosari, 2021). Their limitations are indeed prominent and it is difficult to equalise performance with normal people (Winarni et al., 2021).

Tegal City is one of the cities in Central Java which is located in the middle between Tegal Regency and Brebes Regency in the western part of Central Java Province. The total population in Tegal City recorded in 2023 was 292,788 people. The large number of people recorded in the Population and Civil Registry Office of Tegal City certainly consists of various groups. One of them was the disabled group. Disability groups use public facilities the same as humans in general (Hasanah, 2017). Therefore, it is necessary to provide facilities and infrastructure that can support people with disabilities to access public services (Mumpuni & Zainudin, 2018).

The development of popular culture inevitably creates two main elements: people and space. According to Bourdieu (1993), the formation of cultural space is accompanied by the emergence of agents. The humans involved in creating discourses and the spaces in which those discourses are concentrated are the main focus. In principle, the area under discussion is designated as urban space (Bourdieu, 1994). Lefebvre (2008) argues that space is a landscape that transcends geographical boundaries (Lefebvre, 1991). Lefebvre also argues that in this domain, objective and subjective discourses are intertwined. This explanation suggests that urban space can be interpreted as everyday space, characterised by specific attributes that are inseparable from its own discourse (Rizkidarajat et al., 2024).

By looking at the notion of urban space as an everyday space for the community, it is necessary to study the analysis of accessibility in Tegal City based on Universal design principles. The formulation of the problem proposed in this research is how the implementation of universal design principles on physical accessibility in Tegal City? And to what extent do the seven principles of *Universal Design* affect the level of physical accessibility of public spaces in Tegal City for vulnerable groups?

This research aims to analyse the physical accessibility of urban spaces in Tegal City based on the seven principles of universal design proposed by Ronald Mace. The 7 principles

contained in the universal design principles include: *Equitable Use, Flexibility in Use, Simple and Intuitive, Perceptible Information, Tolerance for Error, Low Physical Effort, Size and Space for Approach and Use*. This research uses SMART PLS analysis tools in processing data and visualising data obtained from questionnaire results. The results of this study are expected to be able to provide theoretical contributions in the development of public service quality, especially in physical services and practical recommendations for physical accessibility for the community, especially the disabled community.

RESEARCH METHOD

Ensure that the work is replicable based on the specified specifications. The manuscript provides a concise and easily understandable presentation of the study's technical material. Consequently, readers can conduct research using the approaches that have been done. Specifications for materials and equipment are essential. The study must include the presentation of study approaches or techniques, as well as the data analysis method.

A quantitative technique is used in this study (Latief et al., 2024). Survey data gathering techniques are used in this study (Yaacob et al., 2021). A standardised questionnaire was used in the survey to directly gather primary data from participants (Noor et al., 2024). A sample of Tegal City residents with disabilities who were registered with the Tegal Bahari Disability Organisation participated in the survey.

For analysis and assessment, the researcher took two categories as vulnerable groups, namely Older People and People with Disabilities, with four categories of disability selected, namely blindness, deafness, physical disabilities that use a cane, and physical disabilities that use a wheelchair. Speech impairment and intellectual disability were not selected as research variables because most individuals with speech impairment also had hearing impairment, so hearing impairment and speech impairment were considered equivalent. In addition, individuals with intellectual disabilities mostly participated in indoor activities due to safety reasons.

The distribution of the questionnaire was done through Google Forms. Evaluation of each statement was done using a Likert scale of 1-5 (1 = strongly disagree to 5 = strongly agree). The survey was conducted on respondents with disabilities in Tegal City who were obtained based on *purposive sampling* technique.

Data analysis techniques were carried out using smart pls, namely validity, reliability, and hypothesis tests to ensure that the research instrument has a high level of accuracy and consistency. In addition, hypothesis testing is used to test research assumptions and determine whether there is a significant relationship between the variables studied. The R-square test is also used to determine the extent to which the independent variable can explain the dependent variable in this study.

Research Variables and Indicators

To support the analysis in this study, the researcher identified the main variables and their indicators that were compiled based on the *Universal Design* theoretical framework.

These variables were used to measure the level of physical accessibility of public spaces for vulnerable groups in Tegal City. An explanation of the operational definition of each variable and the indicators used can be seen in Table 1 below:

Table 1. Type of Leaders and Respondent's Satisfaction Rating

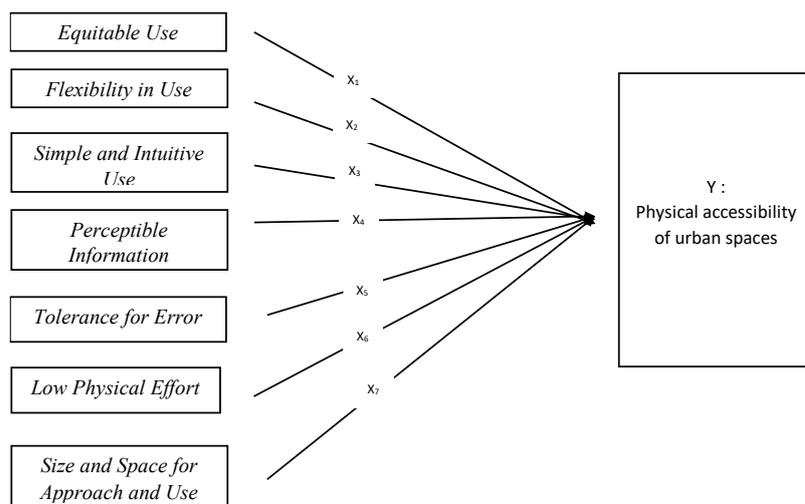
No.	Variable	Definition	Indicator	Source
1	Physical Accessibility of Urban Space (Y)	The ability of all individuals, regardless of age, physical ability, or disability, to easily and conveniently access, utilise, and navigate urban spaces.	Accessibility and Flexibility of Use Safety and Comfort Simplicity and Readability of Design Integration within the Wider Environment	(IWARSSON & STÄHL, 2003)
2.	<i>Equitable Use</i> (X ₁)	Having a design with universal usability and adaptable to meet the needs of individuals with varying levels of ability.	Availability of disabled-friendly facilities Ease of Access for Various Assistive Devices No Physical Barriers in Public Spaces	(Connell et al., 1996)
3	<i>Flexibility in Use</i> (X ₂)	The design is inclusive, designed to accommodate different types of users and individual abilities.	Clarity of Design and Navigation Ease of Access Without External Assistance Simplicity in Use	
4	<i>Simple and Intuitive Use</i> (X ₃)	The implementation of a simple design is analysed in relation to the user experience and functional capabilities.	Ease of Understanding Facility Functions Minimisation of Design Complexity Uniformity and Consistency of Design	
5	<i>Perceptible Information</i> (X ₄)	The design product is equipped with supporting information that is important to the user, with information that is adjusted to the user's ability.	Clarity of Visual Information Availability of Information in Various Formats Strategic and Easy Access Information Placement	(Masruroh et al., 2015)
6	<i>Tolerance for Error</i> (X ₅)	Minimising harm and adverse consequences of intentional or unintentional actions.	Safety from Potential Physical Hazards Reduction of Consequences of User Error Design that Accommodates User Variations	
7	<i>Low Physical Effort</i> (X ₆)	Design is developed to ensure efficient and comfortable use, while minimising the potential for accidents to occur.	Ease of Facility Operation Distance and Obstacle Minimisation Ergonomics in Facility Use	(Harahap et al., 2020)

No.	Variable	Definition	Indicator	Source
8	<i>Size and Space for Approach and Use (X₇)</i>	Space utilisation in the design is done by considering the user's posture, size, and movement.	Availability of Adequate Movement Space Accessibility for Various Body Sizes and Postures Layout that Facilitates Access	

RESEARCH FRAMEWORK

To illustrate the relationship between variables in this research, a framework was developed that illustrates the logical flow between the principles of Universal Design and the physical accessibility of public spaces for vulnerable groups in Tegal City. This framework became the basis for hypothesis formulation and empirical testing in the research. The framework is presented in Figure 1 below:

Figure 1. Thinking Framework Physical accessibility of urban space



Research Hypothesis

- H₁** : Equality of access has a positive and significant effect on the physical accessibility of urban space in Tegal city.
- H₂** : Ease of use has a positive and significant effect on the physical accessibility of urban space in Tegal city.
- H₃** : Simplicity of access has a positive and significant effect on the physical accessibility of urban space in Tegal city.
- H₄** : Clarity of information has a positive and significant effect on the physical accessibility of urban space in Tegal city.
- H₅** : Tolerance of Error has a positive and significant effect on the physical accessibility of urban space in Tegal city.

- H₆** : Usage that is not burdensome has a positive and significant effect on the physical accessibility of urban space in the city of Tegal
- H₇** : Space availability has a positive and significant effect on the physical accessibility of urban space in Tegal city.

Validity and Reliability Test

Based on respondents' remarks, this study computes and assesses data using the Structural Equation Modelling (SEM)-Partial Least Square (PLS) Type 4 (Smart PLS 4) approach. Through a battery of tests, this study assesses the data's validity, reliability, and hypothesis testing (Silaparasetti et al., 2017). Two phases of SEM-PLS analysis were carried out. A thorough assessment of the measurement model, sometimes referred to as the outer model, is the first step in this procedure. concept validity is the next step in the procedure, which seeks to guarantee that the measured items appropriately reflect the intended latent concept (Sujono et al., 2024). To continue the evaluation process, two aspects must be considered (Memon & Rahman, 2014)

- a. Firstly, the indicator loadings should exceed 0.708.
- b. Secondly, Cronbach's alpha is a suitable substitute for construct dependability, which should be between 0.70 and 0.95.
- c. Thirdly, convergent validity should be considered. The AVE should be no less than 0.50.
- d. Discriminative Validity: The minimum acceptable AVE value is 0.50.

Data validity is determined through the application of Pearson Product Moment correlation. Statements were considered valid if the calculated r value was greater than the r value in the table at the 5% significance level. Data reliability was evaluated through the application of Cronbach's Alpha, with the classification of α values greater than 0.7 as reliable.

RESULT AND DISCUSSION

Result

Vulnerable Groups (Disability and Older People)

Vulnerable groups refer to individuals or groups of people who have a higher risk of limited access, social marginalisation, and difficulties in participating equally in public life (Ismanto et al., 2022). In the context of physical accessibility in *urban spaces*, two groups that are particularly vulnerable are people with disabilities and the elderly. Both groups often face physical, social, and structural barriers in using public facilities due to mobility, sensory, cognitive, and endurance limitations. They not only need barrier-free spaces, but also spaces that are able to support independence, comfort, and safety in their daily activities (Muzwardi Ady, Husein Rahmawati, 2016).

People with disabilities cover a wide range, such as physical, sensory (visual, hearing, speech), intellectual, mental, and multiple disabilities (Khofifah Mulyani et al., 2022). As defined in Law No. 8/2016, disability is a long-term limitation that can hinder full and effective participation in society. Their needs in public spaces are very diverse, ranging

from easy access, unhindered movement, easy to receive information, to the use of facilities with minimal physical effort. Meanwhile, the elderly also experience a natural decline in body functions, such as decreased visual acuity, hearing, muscle strength, and reflex speed, which makes them more vulnerable to the risk of accidents or fatigue in using public facilities. According to Harahap et al. (2020), space design that is not responsive to the needs of older people can exacerbate their dependency and significantly reduce their quality of life (Harahap et al., 2020).

Both people with disabilities and the elderly have the same rights to access public spaces freely, independently, and with dignity (Kurniawan et al., 2017). Therefore, the principles of inclusivity in urban planning should consider the specific needs of these two groups. When physical accessibility is not met, they are forced to rely on others or even forced to avoid public spaces altogether, which ultimately narrows their social participation in society. Research focusing on these vulnerable groups is important as it can form the basis for equitable, inclusive and human rights-based development policy-making (Murwaningsih & Wedjajati, 2021). By understanding their characteristics and needs, urban planners and policy makers can design spaces that can truly be used by all equally and sustainably (Gawlak et al., 2021).

Physical Accessibility of Urban Spaces for Vulnerable Groups

Physical accessibility is a key concept in planning inclusive and equitable public spaces, especially for vulnerable groups such as people with disabilities, the elderly, children, and other groups with limited mobility (Nielsen, 2023). In the context of urban space, physical accessibility not only means the ability to enter or use a facility, but also includes the ease of movement, safety, comfort, and independence of users in accessing various elements of the city, such as parks, sidewalks, bus stops, waiting rooms, public toilets, and public service buildings (Widanan et al., 2018). According to Iwarsson & Ståhl (2003), accessibility refers to the relationship between individual capacities and environmental demands; thus, an "accessible" space is one that minimises barriers and optimises the fit between the environment and individual needs (IWARSSON & STÅHL, 2003).

Vulnerable groups have a diversity of physical and sensory needs that conventional design approaches cannot always accommodate everyone (Gawlak et al., 2021). Therefore, various regulations and frameworks have been developed to ensure equal access, such as Law No. 8/2016 on Persons with Disabilities in Indonesia, as well as *Universal Design* principles designed to ensure facilities can be used by as many people as possible without requiring special adaptations. Urban spaces that are not designed to be accessible can create social exclusion, activity limitations, and dependency on others, which in turn exacerbates social inequality. Therefore, urban planning needs to pay attention to technical dimensions such as pavement width, ramp slope, facility height, visual/auditory information systems, and space circulation, to suit the various needs of users (Muhammadiyah & Selao, 2024).

Previous studies also confirm that low physical accessibility in public spaces can be one of the main obstacles to social participation of vulnerable groups in everyday life

(Bonnell et al., 2021; Masruroh et al., 2015). A strong implementation of the principle of accessibility will have an impact on improving the quality of life, independence, and the right to space for all citizens. Thus, physical accessibility is not just a technical issue in infrastructure development, but a fundamental aspect of social justice and human rights in modern urban settings.

Principle of Universal Design

The Principles of Universal Design were developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers, led by Ronald Mace of North Carolina State University (IWARSSON & STÅHL, 2003). The purpose of these principles is to guide environmental, product, and communication design (Connell & Sanford, 1999). The Centre for Universal Design at NCSU asserts that universal design principles can be applied in the evaluation of existing designs, the guidance of the design process, and the education of designers and consumers about the characteristics of more useful products and environments. The basic principles of universal design are as follows (Masruroh et al., 2015):

1. Can be used by everyone (Equitable Use)
The principle of *Equitable Use* (Connell et al., 1996), emphasises that design should be useful and accessible to all people, regardless of differences in ability. For this reason, the design must provide the same or equal means for every user, not cause stigma, and not give preferential treatment to certain groups. In addition, privacy, security and safety aspects must be guaranteed equally, and the design needs to be attractive to all.
2. Flexibility in Use
The principle of *Flexibility in Use* (Connell et al., 1996), emphasises that design should be able to accommodate a variety of individual needs and abilities. The design should ideally allow for more than one way of use, be usable by both right- and left-handed users, and remain functional even when used in unconventional or unexpected ways.
3. Design that is Simple and Intuitive Use
The principle of *Simple and Intuitive Use* (Connell et al., 1996), emphasises that the design should be easily understood by everyone, regardless of the user's experience, knowledge or ability. The design needs to be clearly and intuitively organised, adapted to the user's basic abilities, and support different fonts and language levels. Important information should be placed in strategic areas, and evaluations should be conducted to ensure ease of use is maintained.
4. Perceptible information
The *Perceptible Information* principle (Masruroh et al., 2015), emphasises the importance of conveying information that is clear, easy to understand, and adapted to the diverse abilities of users. Important information should be presented through various forms such as text, images, and textures, and differentiated with sufficient

contrast from the surrounding background. Design elements should be easily recognisable and provide clear instructions. In addition, a variety of delivery methods are required to keep information accessible to users with sensory impairments.

5. Tolerance for Error

The principle of *Tolerance for Error* (Masruroh et al., 2015), aims to reduce the risk of harm and negative impacts due to user errors, whether intentional or not. The design should strategically organise elements-from the most frequently used to isolating or protecting potentially dangerous parts. It is also important to provide clear warnings of risks, provide safety markers in case of feature failure, and prevent lapses in vigilance during use.

6. Low Physical Effort

The principle of *Low Physical Effort* (Harahap et al., 2020), emphasises that designs should enable efficient, comfortable and safe use with minimal physical effort. Users should be able to operate the design in a natural body position, using natural movements, and without the need to perform repetitive or laborious actions.

7. Size and Space for Approach and Use

The principle of *Size and Space for Approach and Use* (Harahap et al., 2020), emphasises the importance of providing space that is appropriate to the user's posture, body size and movement. The design should have clear shapes and boundaries, be comfortable to use in both sitting and standing positions, and be able to accommodate variations in hand and grip sizes. In addition, the design needs to fulfil minimum space standards to be optimally accessible to all users

Characteristics of respondents

In this study, researchers used several criteria taken from respondents to suit the needs of the study. Among them are the type of vulnerable group, type of disability, age, and last education.

Table 2. Characteristics of Respondent Data

Characteristics	Category	Number	Percentage
Vulnerable Group	Parents	53	38 %
	Disability	86	62 %
Type of Disability	Physical/Disability	49	57 %
	Deaf	22	26 %
	Blind	4	5 %
	Intellectual	9	10 %
	Other	2	2 %
Age	18-25 years old	18	13 %
	26 - 40 years old	43	31 %
	>40 Years	24	17 %
	>50 Years	54	39 %
Last Education	PRIMARY SCHOOL	10	7 %
	JUNIOR HIGH SCHOOL	20	14 %
	SMA/SMK	63	45 %
	D1/D2/D3	12	9 %
	D4 / S1 / S2	34	25 %

Source: Respondent data results from questionnaire

From the results above, it is known that the number of respondents is dominated by vulnerable groups of disabilities as many as 86 respondents and with the type of disability Daksa, namely 49 respondents. Then for the age range of respondents is over 50 years old as many as 54 respondents and a range of 26-40 years as many as 43 respondents. Then for the last education of the respondents, the majority of them had a high school / vocational high school education as many as 63 people. From these categories of respondents, it is very much in line with what is expected because it is able to become a benchmark in providing opinions about this research and is really considered to have a direct impact according to the statements in the questionnaire distributed.

Validity Test

The validity test refers to the extent to which the instrument accurately measures the intended variable (Setiawan & Arisanti, 2024). convergent data terms for validity testing The decision follows a rule of thumb, indicating that an outer loading value of ≥ 0.50 is acceptable, with a preference for values ≥ 0.7 . If the resulting outer loading value is less than 0.50, the indicator is deemed invalid and should be excluded from the research instrument (Sekaran, U. & Bougie, 2016).

A convergent validity test is conducted on all variable indicators to ensure that the research instrument accurately measures the intended construct. This test evaluates the degree to which these indicators represent the assessed constructs. Figure 2 below illustrates the outer loading values of each indicator.

Figure 2. Data Validity Test Graph

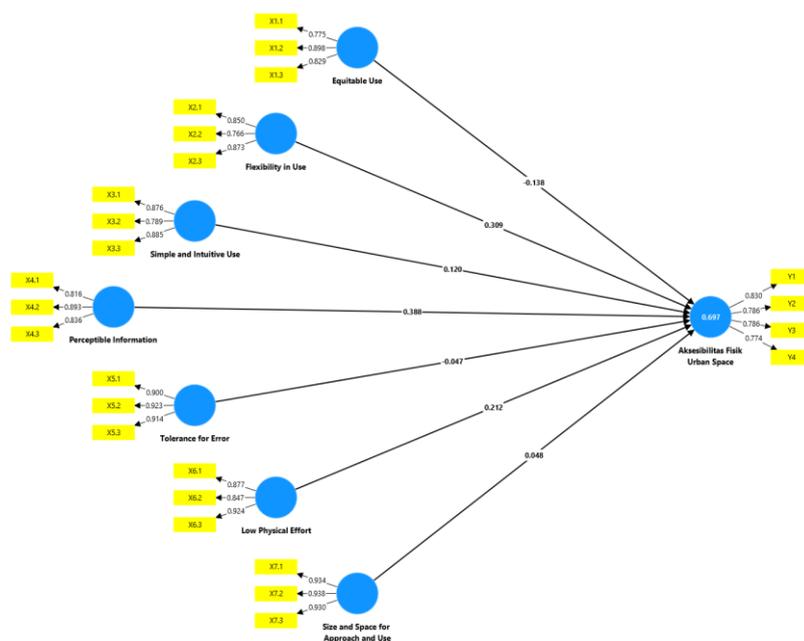


Figure 2 shows that each indicator has an *Outer loading* value above 0.5 with a description so that from this figure it can be said that all indicators in this study are valid. The following is the *outer loading* value found:

Table 3. Outer Loading value for validity test

Indicator	Outer Loading Value
Equitable use	X1.1 0.775
	X1.2 0.898
	X1.3 0.829
Flexibility in Use	X2.1 0.850
	X2.2 0.766
	X2.3 0.873
Simple and Intuitive Use	X3.1 0.692
	X3.2 0.565
	X3.3 0.741
Perceptible Information	X4.1 0.816
	X4.2 0.893
	X4.3 0.836
Tolerance for Error	X5.1 0.709
	X5.2 0.727
	X5.3 0.764
Low Physical Effort	X6.1 0.741
	X6.2 0.714
	X6.3 0.817
Size and Space for Approach and Use	X7.1 0.819
	X7.2 0.766
	X7.3 0.760

Source: Manage validity test data by SmartPLS

A high validity score signifies that the indicators reliably and precisely reflect the quality of each variable. This indicates that these variables are executed with high quality. The indicators employed in this study possess adequate validity with an external load value of 0.5.

Reliability Test

A variable is said to be reliable if the composite reliability value or Cronbach's Alpha reaches a value above 0.500 (Latan & Ghazali, 2018). Cronbach's Alpha coefficient interprets the correlation between the scale created with all existing indicator scales with confidence in the level of constraint (Setiawan & Arisanti, 2024). To see the results of the reliability test in this study, the results of the reliability test are shown in table 4.

Table 4. Cronbach's Alpha value

	Cronbach's alpha
Physical Accessibility_Urban Space	0.805
Equitable Use	0.786
Flexibility in Use	0.776
Simple and Intuitive Use	0.809
Perceptible Information	0.806

Tolerance for Error	0.899
Low Physical Effort	0.859
Size and Space for Approach and Use	0.927

Source: processing Reability Test Data by SmartPLS

Table 4 shows that all indicators tested well in the reliability test. It can be seen that the largest Cronbach's Alpha value is in the Tolerance for error indicator or tolerance of an error with a value of 0.899. but the Flexibility in use indicator or ease of use has the lowest value of 0.766, even so this indicator still passes the reliability test because it has a value above 0.500.

Hypothesis Test

The importance of the estimated parameters offers valuable insights into the connections among the variables under investigation (Tukan et al., 2024). Hypothesis testing is conducted using a sample bootstrapping method. The hypothesis is accepted if the t-test value exceeds 1.96 and the P-value is below 0.05. If the calculated t-test value is less than 1.96, the research hypothesis is rejected (Ghozali, 2016). The hypothesis test conducted in this study is shown in table 5.

Table 5. Hypothesis Test

	T statistics (O/STDEV)	P values
Equitable Use -> Physical Accessibility of Urban Space	1.522	0.128
Flexibility in Use -> Physical Accessibility of Urban Space	3.914	0.000
Simple and Intuitive Use -> Physical Accessibility of Urban Space	1.026	0.305
Perceptible Information -> Physical Accessibility of Urban Space	3.823	0.000
Tolerance for Error -> Physical Accessibility of Urban Space	0.375	0.708
Low Physical Effort -> Physical Accessibility of Urban Space	2.191	0.029
Size and Space for Approach and Use -> Physical Accessibility of Urban Space	0.382	0.702

Source: data processing of hypothesis testing by SmartPLS

Table 5 shows that there are several rejections of the hypothesis of this research. For indicators Flexibility in use, perceptible information and low physical effort have a t-Test value above 1.96 and the P-value has a value below 0.05, so these 3 indicators are accepted or the hypothesis is positive, sustainable, and supports the theory (IWARSSON & STÅHL, 2003), regarding the physical accessibility of urban space. Moreover, regarding the indicators of equitable use, simplicity and intuitiveness of use, tolerance for error, and size and spatial considerations for approach and use, it is indicated that the hypothesis exerts a negative and insignificant influence on the physical accessibility of urban space, as evidenced by a t-Test value below 1.96 and a P-value exceeding 0.05.

R-Square

The coefficient of determination quantifies the extent to which variable X contributes to variable Y (Setiawan & Arisanti, 2024). The coefficient of determination is indicated by Rsquare where the results of the Rsquare value are used to determine how much the dependent variable is influenced by the independent variables. Hair et al. assert that a R square value of 0.75 falls inside the strong group, 0.50 is classified as moderate, and 0.25 is designated as weak (Hair et. al, 2011). Measurement of the R-Square value in this study was carried out by weighing the value limits according to the provisions shown in table 6.

Table 6. Test Results of the Coefficient of Determination

	R-square	R-square adjusted
Physical Accessibility_ Urban Space	0.697	0.681

Source: data processing of determination test by SmartPLS

Table 6 shows that the rsquare value of the physical accessibility variable of urban space is 0.697 where this value falls into the moderate category because the value is less than 0.75 and above 0.50. This value also shows that there is an appropriate contribution from variable x to variable Y (physical accessibility of urban space).

Discussion

The results of hypothesis testing in this study showed that of the seven *Universal Design* principles tested, only three variables significantly influenced the physical accessibility of public spaces in Tegal City, namely *Flexibility in Use* ($t = 3.914$; $p = 0.000$), *Perceptible Information* ($t = 3.823$; $p = 0.000$), and *Low Physical Effort* ($t = 2.191$; $p = 0.029$). Meanwhile, the other four principles, namely *Equitable Use*, *Simple and Intuitive Use*, *Tolerance for Error*, and *Size and Space for Approach and Use* did not show a statistically significant effect.

This finding is in line with the research of Harahap et al. (2020), which shows that public facilities designed with physical convenience and flexibility in mind greatly contribute to the comfort of users with disabilities (Harahap et al., 2020). In addition, Masruroh et al. (2015) also emphasised the importance of clear and easy-to-understand information as a key component in supporting the accessibility of public spaces (Masruroh et al., 2015).

On the other hand, the results showing that the principles of *Equitable Use* and *Tolerance for Error* have no significant effect contradict the findings of Gawlak et al. (2021), which state that equal and safe design is an important requirement in inclusive urban planning (Gawlak et al., 2021). This indicates that the implementation of these principles in Tegal may not have been optimal or directly felt by users (Bonnell et al., 2021; Prihatmini et al., 2019).

Furthermore, the insignificance of the *Size and Space for Approach and Use* principle also differs from Muhammadiyah and Selao's (2024) study, which asserts that layout and movement space are very important for users of assistive devices (Muhammadiyah &

Selao, 2024). Most likely, this is due to the lack of facilities that meet the dimensions and comfort standards for various body postures at the research site (Harahap et al., 2020).

Thus, it can be concluded that the success of physical accessibility in public spaces is more determined by ease of use, effective information delivery, and physical efficiency, rather than other aspects that have not been fully implemented in Tegal City. These findings emphasise the importance of a design approach that is not only standardised, but also contextualised and participatory

CONCLUSION

This research provides a theoretical contribution in expanding the understanding of the application of *Universal Design* principles in the context of physical accessibility of urban spaces, especially in medium-sized cities such as Tegal City. By testing seven universal design principles against the perceptions of vulnerable groups, this research confirms that flexibility of use, accessible information, and minimal physical effort are significant key factors in supporting the accessibility of public spaces. Theoretically, the findings support the idea that not all universal design principles have the same impact in certain local contexts, so contextual adaptation in the implementation of these principles is important. This research also demonstrates how quantitative approaches can be used to assess the extent to which public facilities reflect inclusivity in practice.

Practically, the results of this study provide important implications for policy makers and urban planners to evaluate and improve public facilities that do not fulfil the principles of fairness of use, ease of understanding, adequate space for movement, and safety for users. There needs to be a more detailed and standardised technical policy regarding the application of universal design in public facilities, as well as the active involvement of the disability community in spatial planning. The limitations of this study lie in the scope of respondents who only came from the formal disability community, limited types of disabilities, and a completely quantitative method. Therefore, future research is recommended to use a *mixed-method* approach to dig deeper into the user experience, as well as expand the study area and other vulnerable groups such as children and pregnant women to obtain a more comprehensive picture of accessibility.

REFERENCES

- Baturangka, T., Kaawoan, J. ., & Singkoh, F. (2019). Peran Dinas Sosial Kota Manado Dalam Pemberdayaan Masyarakat Penyandang Disabilitas. *Jurnal Eksekutif*, 3(3), 1–9.
- Bonnell, K., Michalovic, E., Koch, J., Pagé, V., Ramsay, J., Gainforth, H. L., Lamontagne, M. E., & Sweet, S. N. (2021). Physical activity for individuals living with a physical disability in Quebec: Issues and opportunities of access. *Disability and Health Journal*, 14(3). <https://doi.org/10.1016/j.dhjo.2021.101089>
- Bourdieu, P. (1994). The Field of Cultural Production. In *Columbia University Press*. Columbia University Press. <https://cup.columbia.edu/book/the-field-of-cultural-production/9780231082877/>
- Bredenkamp, H. (2020). *Leviathan: Body politic as visual strategy in the work of Thomas Hobbes*. De Gruyter. <https://doi.org/10.1515/9783110681413>

- Connell, B. R., & Sanford, J. A. (1999). Research Implications of Universal Design. In *Enabling Environments* (pp. 35–57). Springer US. https://doi.org/10.1007/978-1-4615-4841-6_3
- Connell, B. R., Sanford, J. A., Connell, B. R., & Sanford, J. A. (1996). *Research Implications of Universal Design*. 35–57.
- Gawlak, A., Matuszewska, M., & Ptak, A. (2021). Inclusiveness of urban space and tools for the assessment of the quality of urban life—a critical approach. *International Journal of Environmental Research and Public Health*, 18(9), 4519. <https://doi.org/10.3390/ijerph18094519>
- Ghozali, I. (2016). *Aplikasi Analisis Multivariate Dengan Program IBM SPSS 23*. Edisi 8. Semarang: Badan Penerbit Universitas Diponegoro.
- Hair et. al. (2011). *Multivariate Data Analysis (7th ed.* New Jersey: Pearson Prentice Hall.
- Harahap, R. M., Gambiro, H., & Adiputra, Y. (2020). Implementasi Fasilitas Interior Perpustakaan berdasarkan Prinsip Universal Design di Universitas Mercu Buana. *Jurnal Desain*, 7(3), 281. <https://doi.org/10.30998/jd.v7i3.6351>
- Hasanah, B. (2017). Pelayanan Aksesibilitas Jalan Umum (Jalur Pedestrian) Bagi Penyandang Disabilitas (Studi Kasus Di Kota Serang). *IJTIMAIYA: Journal of Social Science Teaching*, 1(1), 60–78. <https://doi.org/10.21043/ji.v1i1.3101>
- Ilmijayanti, F., & Dewi, D. I. K. (2015). Presepsi Pengguna Taman Tekamtik Kota Bandung Terhadap Aksesibilitas dan Pemanfaatannya. In *Ruang* (Vol. 1, Issue 1).
- Ismanto, E., Wahyudhi, I., & Melfinna. (2022). Hambatan Dalam Pembangunan Inklusif Penyandang Disabilitas. *Bekasi Development Innovation Journal*, 1(1), 75–89. <https://bdijournal.bekasikab.go.id/index.php/bdi/article/view/11%0Ahttps://bdijournal.bekasikab.go.id/index.php/bdi/article/download/11/6>
- IWARSSON, S., & STÅHL, A. (2003). Accessibility, usability and universal design—positioning and definition of concepts describing person-environment relationships. *Disability and Rehabilitation*, 25(2), 57–66. <https://doi.org/10.1080/dre.25.2.57.66>
- Khofifah Mulyani, Muhammad Sahrul, & Alfian Ramdoni. (2022). Ragam Diskriminasi Penyandang Disabilitas Fisik Tunggal Dalam Dunia Kerja. *KHIDMAT SOSIAL: Journal of Social Work and Social Services*, 3(1), hlm. 11-20. <https://jurnal.umj.ac.id/index.php/khidmatsosial/article/view/14448>
- Kurniawan, H., Ikaputra, & Forestyana, S. (2017). Perancangan Aksesibilitas Untuk Fasilitas Publik. In *Gadjah Mada University Press*. Gadjah Mada University Press.
- Latan, H., & Ghozali, I. (2012). *Partial Least Square: Konsep, Teknik dan Aplikasi SmartPLS 2.0*. Badan Penerbit Universitas Diponegoro.
- Latief, F., Mus, A. R., Amang, B., Hasan, S., & Mahmud, A. (2024). Applying Technology Acceptance Model Theory on Distributing Electronic Money the Role of Intention Power. *Journal of Ecohumanism*, 3(4), 541–552. <https://doi.org/10.62754/joe.v3i4.3583>
- Lefebvre, H. (1991). The Production of Space. In *A Reflexive Reading of Urban Space* (p. 461). Basil Blackwell Oxford UK & Cambridge USA. <https://iberian-connections.yale.edu/wp-content/uploads/2020/04/The-production-of-space-by-Henri-Lefebvre-translated-by-Donald-Nicholson-Smith.pdf>
- Masruroh, F., Mauliani, L., & Anisa. (2015). Kajian Prinsip Universal Design Yang Mengakomodasi Aksesibilitas Difabel Studi Kasus Taman Menteng. *Seminar Nasional Sains Dan Teknologi Fakultas Teknik Universitas Muhammadiyah Jakarta*, November, 1–11. <https://jurnal.umj.ac.id/index.php/semnastek/article/view/470>
- Mayarni, M., Meilani, N. L., & ... (2021). Kualitas Pelayanan Publik Bagi Kaum Difabel. *Jurnal Kebijakan Publik*, 9(1), 11–18. <https://jkip.ejournal.unri.ac.id/index.php/JKP/article/view/6008%0Ahttps://jkip.ejournal.unri.ac.id/index.php/jkip/article/download/6008/5529>
- Memon, A. H., & Rahman, I. A. (2014). SEM-PLS Analysis of Inhibiting Factors of Cost Performance for Large Construction Projects in Malaysia: Perspective of Clients and

- Consultants. *The Scientific World Journal*, 2014, 1–9. <https://doi.org/10.1155/2014/165158>
- Muhammadiyah, M. J., & Selao, A. (2024). Improving Road and Sidewalk Accessibility for Persons with Disabilities: Infrastructure Challenges and Legal Compliance in Indonesia. *Advance Sustainable Science Engineering and Technology*, 7(1), 2501022. <https://doi.org/10.26877/asset.v7i1.1465>
- Mumpuni, S. D., & Zainudin, A. (2018). Aksesibilitas Penyandang Disabilitas Dalam Pelayanan Publik Di Kabupaten Tegal. *Jurnal Komunikasi Pendidikan*, 1(2). <https://doi.org/10.32585/jkp.v1i2.24>
- Murwaningsih, S., & Wedjajati, R. S. (2021). Penerimaan Masyarakat Kepada Penyandang Disabilitas:(Studi Desa Inklusi Peduli dengan Kelompok Rentan di Kalurahan Sidorejo, Kapanewon Lendah *SOSIO PROGRESIF: Media ...*, 1(1), 110. <https://jurnal.apmd.ac.id/index.php/sosioprogresif/article/view/120%0Ahttps://jurnal.apmd.ac.id/index.php/sosioprogresif/article/download/120/68>
- Muzwardi Ady, Husein Rahmawati, Z. U. (2016). Pelayanan Inklusif Untuk Penyandang Disabilitas Studi Fasilitas Dan Aksesibilitas Pariwisata Untuk Disabilitas Di Kota Yogyakarta. *Pelayanan Inklusif Untuk Penyandang Disabilitas Studi Fasilitas Dan Aksesibilitas Pariwisata Untuk Disabilitas Di Kota Yogyakarta*, 4, 83–89. https://www.researchgate.net/publication/316547852_PELAYANAN_INKLUSIF_UNTUK_PENYANDANG_DISABILITAS_STUDI_FASILITAS_DAN_AKSESIBILITAS_PARIWISATA_UNTUK_DISABILITAS_DI_KOTA_YOGYAKARTA
- Nielsen, A. F. (2023). Universal design for people with psychosocial disabilities – The effect of COVID-19. *Research in Transportation Economics*, 98. <https://doi.org/10.1016/j.retrec.2023.101280>
- Noor, T. D. F. S., Hamsal, M., Abdinagoro, S. B., & Raharjana, D. T. (2024). Community Value Co-Creation as a Catalyst for Village Tourism Sustainability: A New Paradigm. *Journal of Ecohumanism*, 3(8). <https://doi.org/10.62754/joe.v3i8.4708>
- Prihatmini, S., Tanuwijaya, F., Wildana, D. T., & Ilham, M. (2019). Pengajuan Dan Pemberian Hak Restitusi Bagi Anak Yang Menjadi Korban Kejahatan Seksual. *Rechtidee*, 14(1), 108–126. <https://doi.org/10.21107/ri.v14i1.4768>
- Propiona, J. K. (2021). Implementasi Aksesibilitas Fasilitas Publik Bagi Penyandang Disabilitas. *Jurnal Analisa Sosiologi*, 10, 1–18. <https://doi.org/10.20961/jas.v10i0.47635>
- Rahayu, S., & Dewi, U. (2013). Pelayanan Publik Bagi Pemenuhan Hak-Hak Disabilitas Di Kota Yogyakarta. *Natapraja*, 1(1). <https://doi.org/10.21831/jnp.v1i1.3194>
- Rizkidarajat, W., Mutahir, A., Hanny, I., & Correa, I. C. (2024). Urban space spatiality in Purwokerto, Jawa Tengah: Case from Gedung Soetedja. *SOSIOHUMANIORA: Jurnal Ilmiah Ilmu Sosial Dan Humaniora*, 10(1), 118–137. <https://doi.org/10.30738/sosio.v10i1.16641>
- Sekaran, U. & Bougie, R. J. (2016). *Research Methods for Business: A skill Building Approach*. 7th Edition, John Wiley & Sons Inc. New York, US.
- Setiawan, R. C., & Arisanti, P. (2024). KONSUMEN RUMAH SAKIT UMUM ISLAM MADINAH KASEMBON. *Biznesa Economica : Economic And Business Journal (JEBIZKO)*, 1(1), 142–153.
- Silaparasetti, V., Srinivasarao, G. V. R., & Khan, F. R. (2017). STRUCTURAL EQUATION MODELING ANALYSIS USING SMART PLS TO ASSESS THE OCCUPATIONAL HEALTH AND SAFETY (OHS) FACTORS ON WORKERS'BEHAVIOR. *Humanities & Social Sciences Reviews*, 5(2), 88–97. <https://doi.org/10.18510/hssr.2017.524>
- Sujono, R. I., Wibowo, A., Maula, D. I., Khodijah, A. S., Allia, N. N., Trisnawati, Q. D., & Sari, R. P. (2024). Maintaining sustainable use of the Indonesian telecommunications provider. *Jurnal Studi Komunikasi (Indonesian Journal of Communications Studies)*, 8(1), 042–052. <https://doi.org/10.25139/jsk.v8i1.6246>

- Surwanti, A., & Puspitosari, W. A. (2021). Penguatan Kader Rehabilitasi Berbasis Masyarakat Guna Mewujudkan Masyarakat Yang Inklusif. *Prosiding Seminar Nasional Program Pengabdian Masyarakat*, 19, 231–238. <https://doi.org/10.18196/ppm.32.199>
- Syafi'ie, M. (2014). Pemenuhan Aksesibilitas Bagi Penyandang Disabilitas. *Inklusi*, 1(2), 269. <https://doi.org/10.14421/ijds.010208>
- Tukan, M., Camerling, B. J., & Hozairi. (2024). ANALISIS DAMPAK PELABUHAN TERHADAP PERTUMBUHAN EKONOMI WILAYAH KEPULAUAN MALUKU MENGGUNAKAN SMARTPLS. *Jurnal Aplikasi Teknologi Informasi Dan Manajemen (JATIM)*, 5(2), 112–119.
- Widanan, I. W., Linggasani, M. A. W., & Wicaksana, G. B. A. (2018). Studi Aksesibilitas pada Ruang Terbuka Publik Terhadap Penyandang Disabilitas di Taman Kota Lumintang Denpasar. *Undagi: Jurnal Ilmiah Arsitektur*, 6(2), 60–65. <https://ejournal.warmadewa.ac.id/index.php/undagi/indexhttp://dx>.
- Winarni, L., Afni, I. N., & Wirawan, R. (2021). Collaborative Governance dalam Pemberdayaan Masyarakat Disabilitas di Desa Maron Kecamatan Garung Kabupaten Wonosobo Penyandang disabilitas di Indonesia manusia merupakan unsur utama dalam Collaborative governance merupakan salah satu strategi atau cara y. *Jurnal Litbang Provinsi Jawa Tengah*, 19(2), 137–144.
- Yaacob, N. A., Ab Latif, Z., Abdul Mutalib, A., & Ismail, Z. (2021). Farmers' Intention in Applying Food Waste as Fertilizer: Reliability and Validity Using Smart-PLS. *Asian Journal of Vocational Education and Humanities*, 2(2), 27–34. <https://doi.org/10.53797/ajvah.v2i2.5.2021>
- Zainudin, A., Sri K, D., Suwaryo, U., & Yuningsih, N. Y. (2024). Trends in social inclusion and its impact on public services: Research by CiteSpace. *Cogent Social Sciences*, 10(1). <https://doi.org/10.1080/23311886.2024.2392295>

ACKNOWLEDGEMENT

This article's research was funded by the Jusuf Kalla School of Government, Universitas Muhammadiyah Yogyakarta. The researcher wishes to convey profound appreciation to his supporters for their invaluable insights and expertise that have facilitated this research.