Surveillance on Tactile-Based Media Accessibility Levels for the Visually Impaired in Bandung Train Stations

Fariz Fadhlillah[a],
[a]Tactogram Laboratory, Indonesia
frzfadhlil@gmail.com

Keywords:

tactile-based media, orientation and mobility system, accessibility levels, visually impaired people; train stations; *media berbasis taktil; sistem orientasi mobilitas; level aksesibilitas; tunanetra; stasiun kereta api*

Abstract

This paper intended to survey tactile-based media accessibility levels for the visually impaired in train stations incorporated in Operational Region II Bandung. Data were collected by observations and interviews with 30 people with visually impaired. Data analysis used mix methods. Research objects included context as an orientation and mobility (OM) system as stated in Regulation of the Minister of Transportation of the Republic of Indonesia Number 36 of 2019 concerning Minimum Service Standards for Transporting People by Train and Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14 of 2017 concerning the Requirements for Building Facilities Convenience. The result showed that operability affects a user's neural abilities to access tactile-based spatial information. Generally, the visually impaired did not receive good minimum services at the station since the universal design principles have not yet applied to design tactile-based accessibility standards.

Tulisan ini bertujuan untuk mensurvei tingkat aksesibilitas media berbasis taktil bagi tunanetra di stasiun-stasiun kereta api yang tergabung dalam Daerah Operasional II Bandung. Pengumpulan data dilakukan dengan observasi dan wawancara terhadap 30 orang tunanetra. Analisis data menggunakan metode campuran. Obyek penelitian meliputi konteks sebagai sistem orientasi dan mobilitas (OM) sebagaimana tertuang dalam Peraturan Menteri Perhubungan Republik Indonesia Nomor 36 Tahun 2019 tentang Standar Pelayanan Minimum Angkutan Orang dengan Kereta Api dan Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomor 14 Tahun 2017 tentang Persyaratan Kemudahan Bangunan Gedung. Hasil penelitian menunjukkan bahwa operabilitas memengaruhi kemampuan saraf pengguna untuk mengakses informasi spasial berbasis taktil. Umumnya, tunanetra belum mendapatkan pelayanan minimal yang baik di stasiun sejak prinsip desain universal belum diterapkan pada desain standar aksesibilitas berbasis taktilminimal yang baik di stasiun sejak prinsip desain universal belum diterapkan pada desain standar aksesibilitas berbasis taktil.

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A. Introduction

People with visual impairment access spatial and temporal information by touch (M. A. Heller & Walk, 2011, pp. 435–454). Every touched object gets processed by mechanoreceptors with different perceptual impacts (Abraira & Ginty, 2013, pp. 618–639). Therefore, the accessibility of tactile-based media containing spatial information assists the orientation ability and mobility of the visually impaired (Chanana et al., 2017).

The World Health Organization (WHO) reported the number of people with visual impairment reach 2.2 billion in 2019 (WHO, 2019). It urges inclusive public spaces to grow more massively. Public space is frequently defined as a necessity that is meant to be enjoyed by everyone and is considered one of the most crucial public health assets that contribute tremendously to people's physical, social, and psychological well-being (Jian et al., 2021). In particular, the train has the potential to become the ideal daily transportation for the blind in Bandung. It is because of the locations of each station connecting strategic points in the city and the departure schedule is on time (Kereta Api Kita, 2019). However, few specific references discuss tactile-based design systems as orientation and mobility media for the visually impaired in public spaces, especially train station. On the other hand, inclusive technology studies usually are more developed in electronic-based and artificial sensory-based areas (Murgante & Borruso, 2015, pp. 13–35). It indicates that they are still too segmented for developing countries like Indonesia.

Due to vision loss, people with visual impairment rely heavily on accessible tactile-based tools (M. Heller & Ballesteros, 2012). Assistive technology divisions can be classified into electric-based and non-electrical-based (Jacobson, 2017, pp. 29–57). In terms of modernization context, non-electric-based technology can be mentioned as primitive technology (Heidegger, 1977, pp. 3–35). Tactile-based tools using primitive technology have advantages compared to auditory-based ones. Those are highly durable, simple to use, do not require complicated technology, are energy savers, more economical, and have a low risk for technical error. Subsequently, the advantages get idealized to support the visually impaired activities to-from-in train stations as stated in the Regulation of the Minister of Transportation of the Republic of Indonesia Number 36 of 2019 concerning Minimum Service Standards for Transporting People by Train.

According to the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14 of 2017 concerning the Requirements for Building Facilities Convenience, every public building must provide infrastructure and facilities to provide convenience for visitors. It regulates the provision of facilities and accessibility considering horizontal relationships, vertical relationships, and evacuation means. Designing accessibility used seven universal design principles

approach i.e. buildings and facilities design can be used for all without adaptation or special treatment (Preiser & Smith, 2010, p. 4.3-4. 12).

The research gap in this study concentrated on how to design informative and inclusive tactile-based media as an effort to cope with funding problems in growing massively inclusive public spaces for developing countries. In general, the existing research object condition was not universal and inclusive yet since its design still requires declarative guidance dependency to be used by the users with visual impairment. The design of spatial information using a universal design is ideally supported by data on the user's neural access capabilities since somaesthetics consists of three stages: analytical, pragmatic, and practical (Shusterman, 2006, pp. 1–21). Since the balance of spatial accessibility and social inclusion is urgent (Lopes et al., 2019, pp. 356–368), the universal design must adopt the decision maker's thinking in building media and proposing strategic tools. Tacit knowledge is the design process manifestation for a spread inclusive mindset rather than just functional media.

This study at least generated four implications. First, as input for consideration of updating national policies for tactile media accessibility standards in public space in Indonesia. Second, as concrete project advices for Indonesian Railways (PT. Kereta Api Indonesia) to improve their environmental inclusiveness. Third, urging people to study tactile-based science as a basic requirement in developing economic-based assistive technology. Fourth, the findings are used personally by the author for further research to improve a tactile pictogram design or 'Tactogram' as a universal technology for OM.

Literature Review

The importance of accessibility in supporting visually impaired activities in public spaces such as train stations the two previous laws is its consideration. However, it was found that the universal design approach is not yet implemented in detail and thoroughly on the integration standards and guidelines for designing tactile media with high accessible value for the visually impaired.

According to Regulation of the Minister of Transportation of the Republic of Indonesia Number 36 of 2019 concerning Minimum Service Standards for Transporting People by Train, minimum service provided to users and visitors while in the station and on the train. Those services are safety, security, reliability, comfort, convenience, and equality. It is stated in chapter 1 concerning the general provisions article 1 number 10 that providing services must be accompanied by a guideline in the implementation guidelines. Technical services are accessible facilities, accessible infrastructure, and trained personnel. This rule gets made to provide quality, fast, easy, affordable, and measurable services. According to chapter 4 concerning the supervision article 16 number 3, people have the right to give oral or written advice

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and input on services to the minister and or through the director-general. Overall, providing tactile-based media services for users with special needs can be provided at all stations next to no detailed technical explanation of the standard criteria for accessibility.

The tactile-based media standard in the regulations concerned six instruments. Those are safety (providing tactile paving and signage as space navigation), security (providing easy-to-read graphic media containing information related to security breaches), reliability (providing media information related to ticket sales, top-ups, operating schedules, and an easy-to-read map of the rail service network), comfort (providing priority rooms such as seats and toilets for visitors with special needs), convenience (In the form of proportional visual communication signs, it is necessary to provide information services related to station profiles and transportation integration), and equality (providing special facilities to support the ease of activities of users with special needs).

The above standards and guidelines are complemented by 'Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14 of 2017 concerning the Requirements for Building Facilities Convenience. In chapter 2 article 6 states that the adequate space size is determined based on the need for movement, equipment dimensions, and circulation. Only tactile paving, braille signs, and signage are mentioned in the regulation as tactile-based media to support visually impaired activities in the building.

It is stated in chapter 3 article 15 that tactile paving facilitates circulation for the blind. It gets divided into corduroy patterns to show the direction and blister patterns to warn against changes in the environmental situation. The design and provision of guidelines must consider three things, namely:

1. Connectivity and continuity between spaces & buildings.

2. Safety, convenience, and easy usage.

3. Placement in corridors, pedestrians, and open spaces.

Then it is implicitly stated that the function of braille sign is to convey verbal information by applying it to the main media such as doors, signage, and train facilities. However, the standards that affect its accessibility and aesthetics values get not explained in detail.

Still in the same regulation, as referred to in the third part of chapter 3 article 49 number 1, signage is a verbal, visual, or tactile sign then gets applied on the environment, floor, or road. Signage must meet informative criteria and get easily recognized

by all visitors. Placement of signage get prioritized on: barrier-free placement, systematic with the environment, good lighting, it does not interfere with circulation, pedestrian directions and paths, toilet, payphone, disabled parking, facility & place name, and ATM.

The main requirements related to signage applications include having a minimum distance of 1cm in Latin letters in the media for braille sign applications, preferably graphics are international symbols that are embossed, and applying certain methods (such as differences in texture, contrast, etc.). Other technical requirements detail color, typography, and scalability.

B. Methods

The research strategy used grounded theory. This paper intended to survey tactile-based media accessibility levels for the visually impaired in Bandung train stations incorporated in Operational Region II Bandung gained from interviews. The research objects were those mentioned in the two mentioned regulations above, namely: tactile paving, braille sign, signage, map, information board, and ticket.

Studies on disability should ideally rely on surveillance and public health data (Andresen, 2011). To ensure optimum service provision and utilization must carefully weigh the characteristics and self-expressed needs of the visually impaired (Cherry et al., 1991, pp. 99–23). Concerning the issue of immediate implications for the general public is the cost associated with rehabilitation and social service systems designed for persons with visual impairments, their study indicated the importance of setting up an adaptive assessment model based on the phenomenon context.

Theory-developing comes with constructs linked together by propositions that have an underlying, coherent logic and related assumptions (Davis et al., 2007). Access levels in Web Content Accessibility Guidelines (WCAG) was used as a basic model to assess research objects in this study (W3C, 2016). The level consists of four instruments that then were adapted according to access method for the tactile media by touch and vision left. Those are perceivable (Interface can get read by the user's touch and partial sight capabilities with or without assistive devices), operable (Identification and navigation technology through the interface can get followed by the user), understandable (Information and technology objectives can get accessed according to the user's cognitive capacity), and robust (Technology integration and adaptability in supporting user activities to-from-in public space). The assessment model development using this theory has three considerations. First, it has a simple categorical and hierarchical-based measurement system. Second, web and research objects have a similar context as interface. Third, assessment model for primitive-based tactile technology as an orientation and mobility system for the visually

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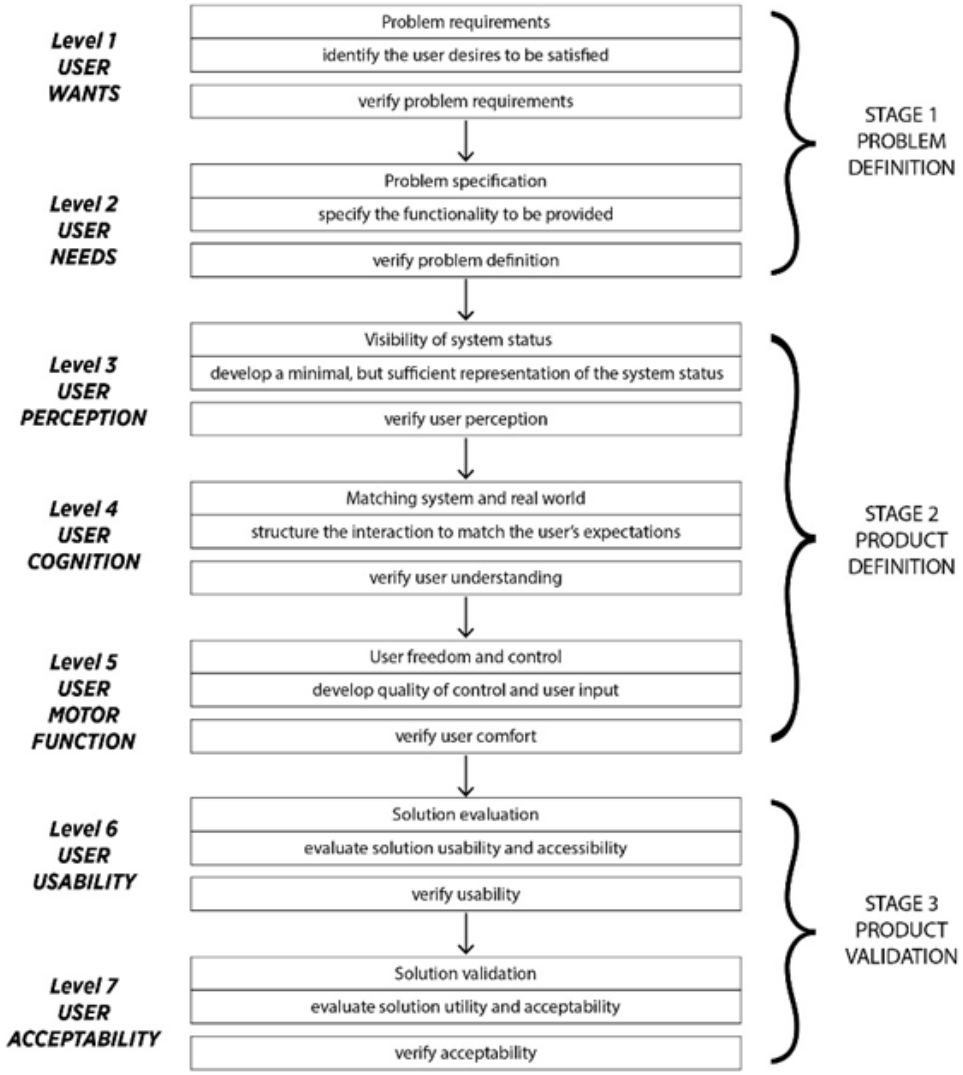
impaired in public space is rare.

The study structure used a 7-level design approach (Figure 1). The approach had been developed for interface designers and had been demonstrated to provide a practical framework for the designer to implement universal access (Keates et al., 2002). This theory application produced three schemes: problem definition, product definition, and product validation. This structure got chosen for two reasons. First, the development services optimization for users with special needs goes from universal design as regulated in the regulations. Second, the discussed variables in the theoretical content cover complete human ergonomics: anthropometric, biomechanics, perception, and cognition (Tosi, 2020b, 2020a, 2020c, 2020d).

Figure 1
The 7-level Design Approach



Data collection used different techniques. First, field observations supported by regulation standards were conducted at the problem definition stage. The observation locations were train stations incorporated in Operational Region II Bandung: Bandung Station-South Entrance, Ciroyom Station, Andir Station, Cimindi Station, Cikudapateuh Station, Kiaracondong Station, and Gedebage Station. Second, interviews with 30 visually impaired were conducted at the product definition and product validation stages. This number is sufficient statistical data for research using a grounded theory strategy (Creswell & Creswell, 2018). The criteria respondents were train users and registered as members of the national visually impaired organization which familiarized and actively advocates for two regulations in Bandung. Table 1 presents the profile of respondents. Figure 2 presents the detailed study structure.

Table 1
Respondents Profile

	N°	%
Gender		
Male	21	70
Female	9	30
Age		
Adolescence (13-18 years)	2	6.6
Adult (19-59 years)	25	83.3
Senior Adult (60 years and above)	3	10
Vision Health Status		
Low Vision		
Wild (acuity 6/12 to 6/18)	2	6.6
Moderate (acuity 6/18 to 6/60)	5	16.6
Severe (acuity 6/60 to 3/60)	12	40
Totally Blind (acuity worse than 3/60)	11	36.6
Blindness Cause		
Congenitally	26	86.6
Disease	3	10
Accident	1	3.3
Education		
Primary School	18	60
Bachelor	11	36.6
Doctor	1	3.3
Job		
Student	2	6.6
Work	25	83.3
Self Employed	3	10
Organization		
Persatuan Tunanetra Indonesia (Pertuni)	18	60
Ikatan Tunanetra Muslim Indonesia (ITMI)	12	40
Train Usage		
Daily	1	3.3
Per Week	8	26.6
Per Month	7	23.3
Per Months	14	46.6

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Figure 2
Structure of Study

Using the seven universal design principles as a fundamental (Preiser & Smith, 2010, p. 4.3-4.12), mixed methods were used as an analysis technique to merge data in revealing results. The principles are equitable use, flexibility in use, simple & intuitive, perceptible information, tolerance for error, low physical effort and size & space for approach and use. Furthermore, qualitative analysis was conducted by integrating the previous analysis findings to reveal four outcomes consisting of:

- Assessing accessibility levels.

To inform exposures to low-level accessibility on tactile-based media was likely to cause the visually impaired disabled.

- Evaluate the problem-solving concepts.

To inform the technologies selection that should be avoided in designing tactile-based media.

- Defining minimum standards.

To inform policies and planning concerning a more inclusive public space through tactile-based media design.

- Stimulating inclusive researches.

To generate updates on hypothesis and methodology in designing tactile-based media for all.

C. Results

1. Problem Definition

The observation got conducted until February 2022. Of the seven stations, there were only five stations in Bandung that serve the traveling activities for passengers within the city: Bandung Station-South Entrance (B), Ciroyom Station (CR), Cimindi Station (CM), Cikudapateuh Station (CK), and Kiaracondong Station (KC). The observation results are presented in Table 4 with the information "-" meaning "not in the regulations". Referring to table 3, it is found that accessibility for the visually impaired in Bandung train stations had not been fully facilitated and had not met the regulation standards. As we can see in the photo documentation, the accessibility method got still designed with vision principle so relying on other people's guidance is still an unfavorable consequence for them. As a research object that tends to get designed with the informative tactile concept, tactile paving had only got applied on the Bandung Station's outdoor. Since there were no detailed standards for the ticket, braille sign, and maps were found, the survey relied more on feedback from respondents.

Table 2
Observation Results

Research Object	Availability					Standards					System Aims	System Requirements	
	B	CR	CM	CK	KC	B	CR	CM	CK	KC	Based on Regulations	Based on Regulations	Based on Observation
Tactile Paving	✓	×	×	×	×	×	×	×	×	×	To navigate & To Identify	No Aids	Aids
Braille Sign	×	×	×	×	×	×	×	×	×	×	To identify	No Aids	×
Signage	✓	✓	✓	✓	✓	×	×	×	×	×	To identify	No Aids	Aids
Map	×	×	×	×	×	×	×	×	×	×	To identify	No Aids	×
Information Board	✓	✓	✓	✓	✓	×	×	×	×	×	To identify	No Aids	Aids
Ticket	✓	✓	✓	✓	✓	-	-	-	-	-	To identify	No Aids	Aids

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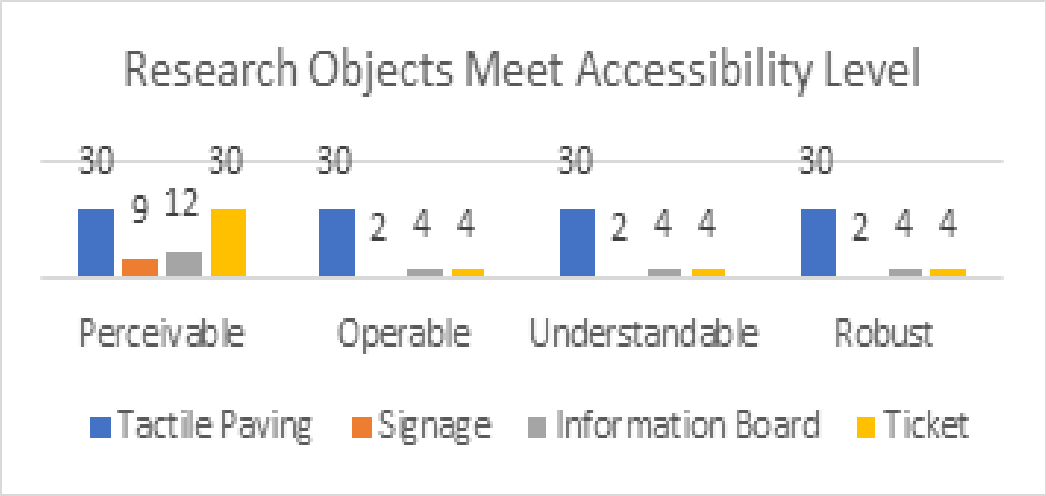
2. Product Definition

There were four research objects which are analyzed more deeply at this stage. The assessment process is carried out on without aids context. Figure 6 presents the collected quantification data through interviews.

Figure 3
Product Definition in Graph Result



There were four research objects which were analyzed more comprehensively at this stage. Based data in Table 3 indicated that research objects other than tactile paving had a weaker level of accessibility. Research objects with informative tactile features had higher perceptible values for respondents than those that have not. It could get analyzed from the tactile paving and ticket were identified by touch even though some respondents still have vision left meanwhile signage and information board got accessed by respondents who can read the texts and icons correctly. Being able to perceive did not automatically make respondents able to access a higher level of accessibility. It indicated that accessibility for the sensory system to be able to operate a media is a prerequisite. It was found a correlation between perceivable with object features, operable with reading techniques, understandable with cognitive abilities, and robust to application systems. Overall, it underlined a big issue in Table 3 which is essentially about the process of optimizing memory capabilities.

Tabel 3
Product Definition in Detailed Reasoning Variables Saturation

	Accessibility Levels			
	Perceivable	Operable	Understandable	Robust
Tactile Paving				
Texture Discrimination	21			
Color Contrast	9			
Media Connectivity		17		
Mnemonic		13		
Semantic			24	
Visual Semiotic			6	
Ergonomic				22
Flexibility in Use				5
Multilingual Enhancement				3
Signage				
Color Contrast	7			
Symbols	2			
Mnemonic		2		
Semantic			2	
Multilingual Enhancement				2
Information Board				
Color Contrast	11			
Typography	1			
Mnemonic		4		
Verbal Semiotic			4	
Systemic Graphic Layout				4
Ticket				
Material	17			
Texture	5			
Paper Size	4			
Media Trait (Torn Paper)	2			
Typography	1			
Mnemonic		4		
Verbal Semiotic			4	
Systemic Graphic Layout				4

3. Product Validation

The product validation stage concluded that the research objects in train stations incorporated in Operational Region II Bandung were not yet accessible for the visually impaired although tactile paving was the most accessible object until observations got carried out. It confirmed generally respondents who could operate the research objects achieved the highest level of accessibility. The details interview result got presented in graphs and a table to streamline writing.

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Figure 4
Research Objects Meet System Aims

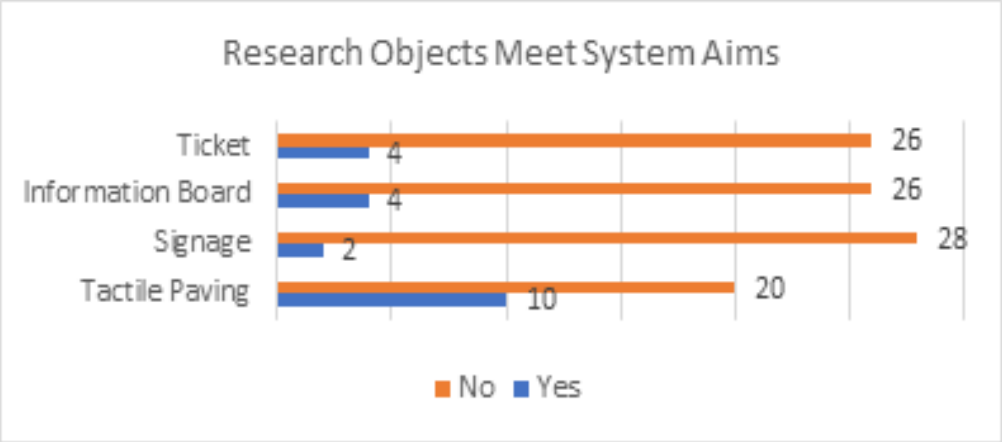

Figure 4 confirms that research objects had not met system aims. Respondents who conceived system aims those who were not sensory limited in accessing data on the research objects and vice versa. However, different data was found for 1 in 10 respondents on tactile paving saturation. This data came from the totally blind respondent as a daily train user. He revealed that as repetition occurs in the recognition process, the tactile paving became a spatial clue that aids him to identify and navigate pragmatically even though the application didn't meet the standards.

Figure 5
Research Objects Meet System Requirements

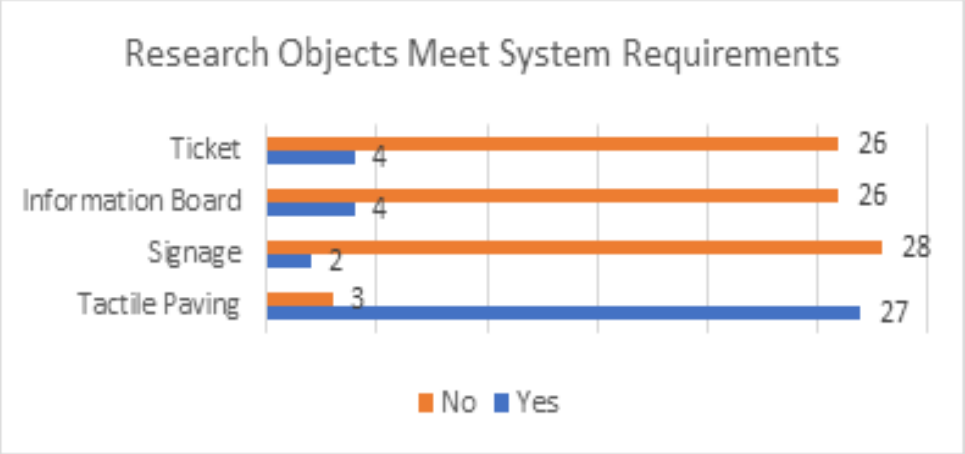

Figure 5 confirms that research objects have not met system requirements. This condition did not support the visually impaired people to carry out activities independently to-from-in train stations. It found different feedbacks too in tactile paving saturation data from the three totally blind respondents. Two out of three said the problem was that they could not recognize independently tactile paving.

Meanwhile, one out of three difficulted to find the tactile paving location in the train station. They agreed sighted guidance in the early interaction process with tactile paving is the minimal solution. It indicated that the system requirements linked too to the rehabilitation program besides the intention to maximize the design.

Quantification of data related to deficiencies and input for improvement for research objects is presented in Table 4 in which were analyzed in three things interconnectedly. First, tactile forms are the main alternative to accommodate accessibility for the visually impaired. Second, the informative tactile feature is a must consideration to design tactile-based media. Third, strengthen previous findings that presented spatial information is understood through the verbalized process is always in demand by the visually impaired (Fadhlillah, 2018, 2020, 2021).

Tabel 4
Quantification Data on Lacks and Improvement Inputs for Research Objects

Research Object	Lacks	Improvement Inputs
Tactile Paving	• The tactile paving application didn't cover all building programs and didn't follow its design system correctly. • System hardware had not been optimally in supporting mechanoreceptor sensitivity. • Spatial information numbers were limited to two types of symbols.	• Apply tactile paving thoroughly to the building programs following the correct design system. • Choose a metal or as strong as metal material to optimize haptic feedback from the media.
Signage	• Not yet supported tactile-based accessibility system. • Not yet supported ergonomics for touch systems and low vision.	• Featured with the braille-verbal system. • Featured with the directional tactile-based system. • Optimized graphic system readability for low-vision users. • Touch area meets ergonomic factor of a blind user. • Need to be equipped with an auditory-based electric sensor.
Information Board	• Not yet supported tactile-based accessibility system. • Not yet supported ergonomics for low vision.	• Featured with the braille-verbal system. • Optimized graphic and placement system readability for low vision users.
Ticket	• Not yet supported tactile-based accessibility system. • Not yet supported ergonomics for low vision.	• Featured with the braille-verbal system. • Optimized graphic and placement system readability for low vision users.

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Other findings revealed all respondents agreed that tactile paving is the best and influences on motivation to use trains. 22 of 30 choose that signage is the worst object research, in inclusion another eight with information board. Additionally, signage was found by 19 of 30 as the most potential and it is followed by nine with information board & two with ticket. The findings confirm that research objects designed with spatial-based concepts as navigation and identification aids got more attention from the respondents. It indicates environmental signs that enhance their mobility skills get more needed in public spaces. There were three reasons for tactile paving to be the most accessible object research: simple to use, ergonomic, and recognizable for low vision users. Then, the weak graphic system for mechanoreceptors caused signage to be the worst accessible research object. The reason was the same for other research objects with poor accessibility. This weakness impacted their knowledge about the existence of signage as orientation and mobility tools in train stations. Respondents agreed that signage's potential lay in its superiority in identification, navigation, and instruction.

D. Discussions

Statistical data shows that operability affects a user's neural abilities to access tactile-based spatial information. Reciprocally, it proposes its standard for low-level accessibility media is operable. User performance parameters applied to the technology design affected the operability value (Ford et al., 2007, pp. 1–15). There are two fundamental factors in designing operable tactile-based media: design approach and tactile measurement. According to the four essences of accessibility level, designers should avoid semiotic design approaches. This perspective is supported by previous studies that show that the tactile-graphic based information that comes from personal assumption without trials didn't work for the visually impaired (Fadhlillah, 2018, 2020, 2021). On the other side, findings show a design with the concept of 'touch' to 'vision' has a lot of potential to be universal interaction because it facilitates flexible reading techniques. Then, tactile measurement can get divided into four aspects: interface, dimension, texture, and material (Okamoto et al., 2013, pp. 81–93). Table 5 presents some suggestions for the tactile measurement in designing tactile-based media.

Tabel 5
Tactile Measurement Suggestion

Aspect	Tactile Measurement Suggestion
Interface	Designers should start with developing the spatial-temporal graphic information that got known and accessed by the visually impaired as an embodied design system.
Dimension	The media size is determined based on the visually impaired scores of anthropometrics and biomechanics.
Texture	Tactile height must be easily read by the visually impaired mechanoreceptors and get processed by the lateral geniculate nucleus (LGN).
Material	Designers should prioritize material that can increase media readability with high durability as a minimum standard.

It is acknowledged that one hundred percent inclusion is rarely possible, but this should not prevent designers from striving for the ultimate through iterations of their designs over time (Bringolf, 2011). It revealed that inclusion preparation programs need to be responsible for the people concerned can work in inclusive settings and adapt to new demands in preparation practices (Alnahdi, 2020, pp. 182–193). The program includes a list of activities, action plans, and the extent to which they cover aspects of pragmatic activities. Implementing universal design should reach developing future strategic directions to shape appropriate problem-solving methods periodically (Fovet, 2020, p. 163). Three ways of talking about universal design were discerned: as guiding principle in the design process, as striving for an inclusive society, and as unifying policies into a whole (Erdtman et al., 2021, pp. 158–168). Considering the urgency of perceptual process and access method for building spatial ability, it advocates two of the seven universal design principles as inputs for updating the two mentioned regulations specifically and public space that requires research objects as spatial systems and social interaction technology. The two principles are perceptible information and flexibility in use. It suggests, this policy should get implemented in an environment organizational setting, where tactile-based media get divided into three needs. Those are assistive technology, adaptive technology, and built-in system. First, assistive technology covers accessible facilities for personal needs with or without tools manually. Second, adaptive technology provides enhancements or different ways of interacting with the technology. Third, built in system proposes a method of building in which prefabricated components are used to speed the buildings construction.

This discussion hypothesizes applied science methods with a neuroscientific approach should be appropriate in designing tactile-based media. This approach is considered capable of bridging the gap between the data access concept differences in simultaneous vision and sequential touch measurably. As a data-based theory

development asset, simplifying the workings of System Working Memory (SWM) is the objective. The theoretical organization consists of three stages: objective setting, variable mapping, and data application. Variable mapping is the correlated neural system meets its integration network. Since tactile-based media in train stations is related to the spatial-temporal information context, it has connectivity with dorsal and ventral streams (Pandya et al., 2015, pp. 46–58). Then, the data application translates numerical units on the neural working into aspects of tactile measurement.

Table 6 presents the recommendations for design and system improvements for research objects. As input for the tactogram development, the findings suggest that its future navigation and identification design function with sequential principle should be able to get read simultaneously.

Tabel 6

Recommendation for Design System Improvements

Research Object	Recommendation for Design System Improvements
Tactile Paving	• At a minimum, apply media to the space circulation that covers main building programs and facilities or in a hierarchical manner. • Use tactile paving with patch systems for inside stations to increase media adaptability.
Braille Sign	• At a minimum, apply media to the space circulation that covers main building programs and facilities or in a hierarchical manner. • Provide simple tools and materials that can make braille with high durability or maintainability.
Signage	• Provide a vertical platform for media placement systems connected to tactile paving. • Use a multilingual-based system supported by braille. • Unify information content information systems, graphic systems, and hardware systems across stations.
Map	• Provide a horizontal or a vertical platform for media placement systems in or before the entrance connected to tactile paving. • Unify information content information systems, graphic systems, and hardware systems across stations.
Information Board	• Present the content information in braille book. • Provide a horizontal or a vertical platform for media placement systems connected to tactile paving near information board.
Ticket	• Provide a tactile-based mnemonic code that represents the content information on the ticket in braille.

E. Conclusions

Accessibility level is a neural algorithm that influences the quality of cognitive processes. This study concludes that primitive-based tactile media is the basic preferences, needs, fundamentals, and appropriate mindset to provide and design touch accessibility for the visually impaired as long as it meets operable value. The complementary with auditory-based system support or artificial sensory-based technology is another scope of intentional design. Building an inclusive ecosystem based on primitive-based tactile technology is prospective in Indonesia since the five requirements for economic growth stated by Nikoloski (2016) are affordable for this technology i.e. natural resources, human resource, capital formation, technological development, and social & political factors (Nikoloski, 2016). Since the higher, the data saturation produced by the number of respondents, the better, this variable became a deficiency in this study. However, this study can be used as a reference to enrich tactile-based accessibility topics for the visually impaired in public spaces.

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