BEAT – a Matrix-based Tool for Analyzing and Assessing Accessibility

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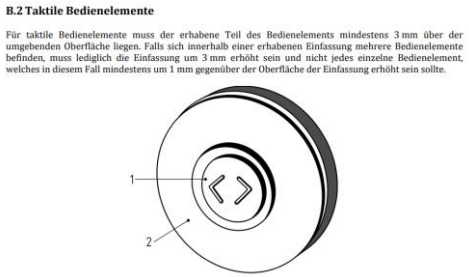
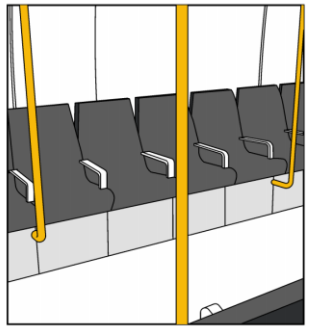
DLR

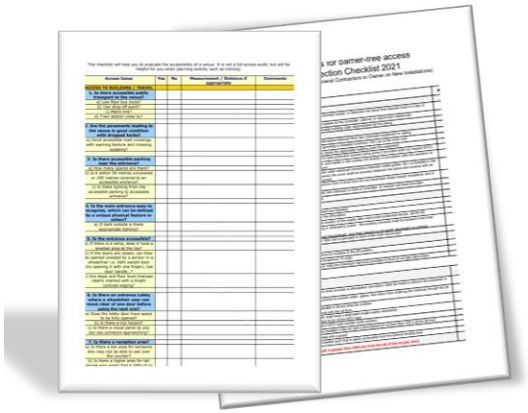
Research needs



DIN EN 16584-2: Information



DIN EN 16584-1:2017-03: Contrasts



Accessibility checklists

U-Shift concept, source: DLR

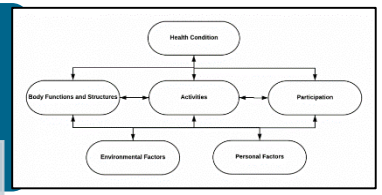
Standards and checklists have weaknesses:

1. Missing holistic, systemic approach across the entire travel chain
2. Risk of over-simplification of restrictions without taking specific functional restrictions into account
3. Prospective assessment of future vehicle concepts and mobility services is not possible

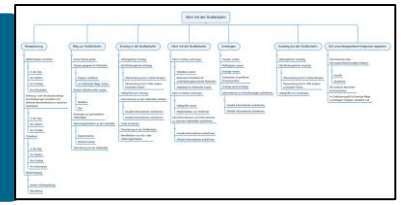
To develop a novel recording and analysis tool to support transport planners and policy makers to assess accessibility of transport systems and urban infrastructure

Methodological approach

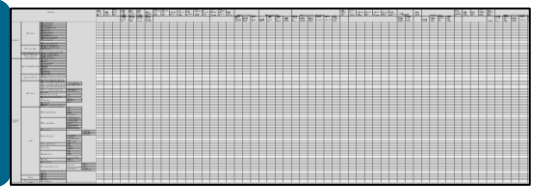
Step 1: Identification of bio-psycho-social aspects of disabilities by the ICF classification of WHO



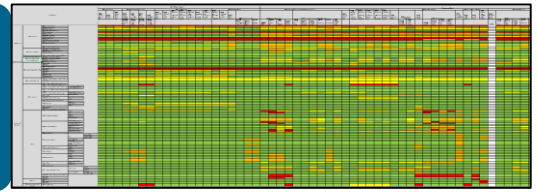
Step 2: Sequencing of entire travel chain by hierarchical task analysis (Stanton, 2006)



Step 3: Combination in two-dimensional matrix

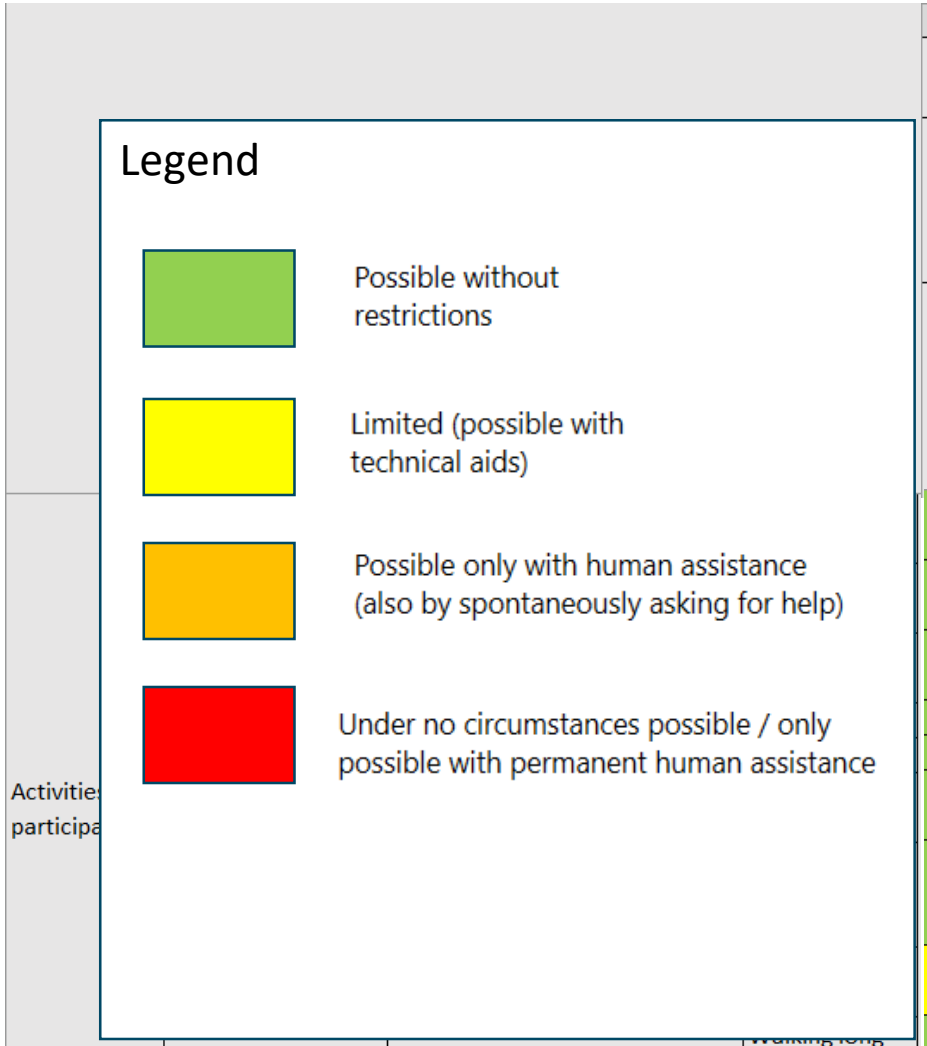


Step 4: Assessment of matrix‘ cells in terms of need for assistance



Step 5: Validation by persons with disabilities

Two-dimensional matrix



										2. Transit from bus stop to train station
				1.2 Getting off the bus			2.1 To leave the bus stop			2.2 Wa
				1.2.3 To make the way through the bus to the door	1.2.4 To actuate door opener	1.2.5 To get off the bus	2.1.1 To orientate oneself	2.1.2 Route planning	2.1.3 Leaving the bus stop	2.2.1 To cross the metro tracks and bus lane
						1.2.5.1 Get off the low-floor bus at the ground-level stop	1.2.5.2 Overcoming height differences on the way out	2.1.1.1 With the help of smartphone	2.1.1.2 With the help of local knowledge	2.1.1.3 By asking other people
Activities participa				1	1	1	1	2	1	1	1	1	1
				1	1	1	1	2	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1
				2	1	2	3	1	1	1	1	2	2
			distances	1	1	1	1	1	1	1	1	2	2
			Moving around unspecified	3	1	3	3	1	1	1	1	1	1

Benefits of matrix-based approach of BEAT

Independent and objective tool for various stakeholders (e.g. transport planners, authorithies, policy makers) for assessing accessibility

Holistic approach that takes the complexity of travel chains and wide range of impairments into account

Replicability and comparability of results for measuring and quantifiying effects of changes

Next steps

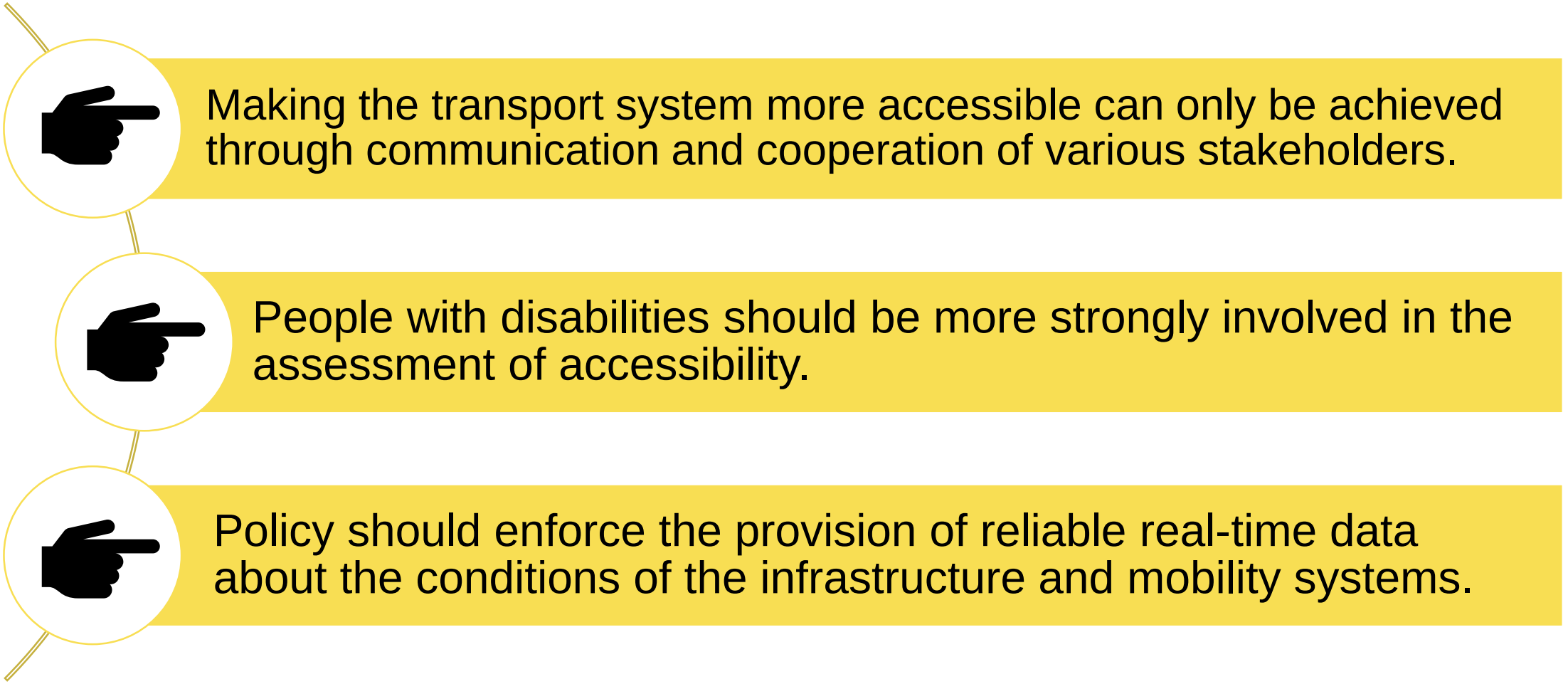
Integration of user data by proving a survey-based platform for facilitating crowdsourcing and citizen science

Extension of tool by further use cases (e.g. futuristic mobility concepts)

Open-access publication of software

BEAT can be used for a systematic evaluation of design measures with regard to their suitability for increasing accessibility

Recommendations for policy makers, transport authorities and transport planners



Making the transport system more accessible can only be achieved through communication and cooperation of various stakeholders.

People with disabilities should be more strongly involved in the assessment of accessibility.

Policy should enforce the provision of reliable real-time data about the conditions of the infrastructure and mobility systems.

References

- Grippenkoven, J. & König, A. (2022). Mobility for everyone - a matrix-based approach to ensure accessibility of public transport. In: 2022 AHFE International Conference, 60, Seiten 272-278. AHFE Open Access. AHFE (2022) International Conference, 24.-28. Juli 2022, New York, USA
- Stanton, N. A. (2006). Hierarchical task analysis: Developments, applications, and extensions. Applied ergonomics, 37(1), 55-79.

Thanks for your interest!

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Welcome to BEAT

BEAT is a tool for recording and analysis of accessibility related conditions in traffic

Start analysis

Imprint

DLR

BEAT is a software for recording, analyzing and evaluating infrastructures regarding their accessibility.

Through a survey and evaluation function, users have the opportunity to give feedback to planners and operators of transport infrastructure and to support them in increasing accessibility.

BEAT is also intended to serve as a source of information for people with disabilities in order to identify possible barriers in advance of a trip.

For this purpose, a large number of functional limitations were selected from the WHO classifications, which are considered potentially challenging in the context of mobility in public transport.

Please select one of the portals below:

- To the survey portal ○
- To the information portal ◉
- To the operator portal ○

To the mainsite | Continue to the portal

There are numerous individual steps on a journey. This begins with leaving your own apartment or the house in which you live.

BEAT is intended to provide the opportunity to find out in advance about the accessibility of a bus ride to the train station, the arrival and stay at the train station, as well as getting on the train and the subsequent journey.

The three modules 'Public transport (Citybus)', 'Braunschweig Central Station' and 'Long-distance rail passenger transport (Train)' are available.

Please select a means of transport or a location for which You would like to receive information about its accessibility:

- ÖPNV (Citybus) ○
- Braunschweig Central Station ◉
- SPFV (Train) ○

To the portal selection

To the detail selection





Please select the type of impairment: Body functions

Please refine your selection: Voice and speech functions

Please make an additional selection: Production of voice and tones

Please enter the type of impairment for which you would like an assessment in the selection menu on the left.

The selection takes place in several stages.

You can make changes at any time during your selection.

The evaluation is carried out after the selection has been completed by pressing the “Start evaluation” button.

To module selection

Start evaluation

Braunschweig Central Station - Overall accessibility score

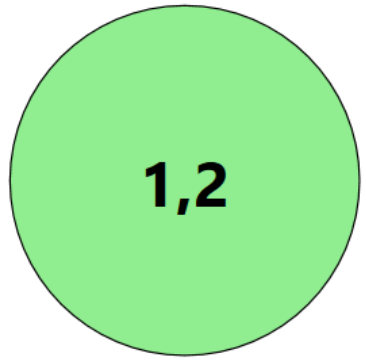
Chosen impairment: Body functions > Voice and speech functions > Production of voice and tones

The three biggest obstacles include the travel steps:

1. Arrival at bus stop > 1.1 Arrival at train station by bus > 1.1.2 To communicate stop request > 1.1.2.1 Verbally

2. Transit from bus stop to train station > 2.1 To leave the bus stop > 2.1.1 To orientate oneself > 2.1.1.3 By asking other people

3. Arrive at the train station > 3.1 Orientation in the train station > 3.1.2 Orientation > 3.1.2.3 By asking other people



Overall index of all travel steps i

48	9	0	1

Number of travel steps per level of accessibility

1. Arrive at the bus stop
2. Transit from bus stop to train station
3. Arrive at the train station
4. Stay in the train station
5. Getting around the train station
6. Waiting on the platform
7. Transfer to the train

Back to selection

Legend:

1,0-1,4	Possible without restrictions	1,5-2,4	Limited (possible with technical aids)	2,5-3,4	Possible only with human assistance (also by spontaneously asking for help)	3,5-4,0	Under no circumstances possible / only possible with permanent human assistance

Braunschweig Central Station - 3. Arrive at the train station

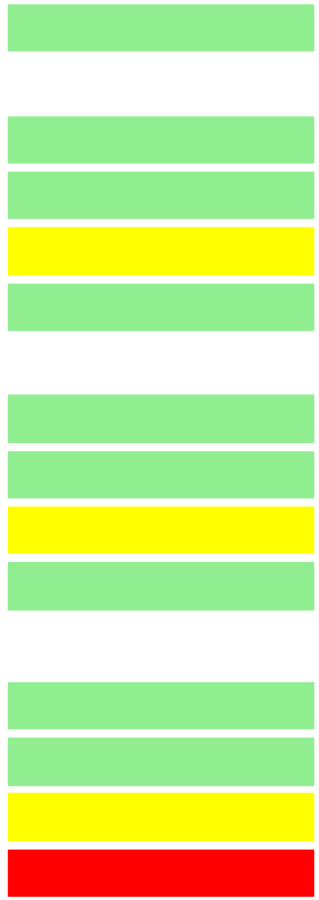
Chosen impairment: Body functions > Voice and speech functions > Production of voice and tones

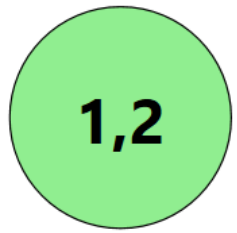
3.1 Orientation in the train station

- **3.1.1 Entering the station building**
- **3.1.2 Orientation**
  - 3.1.2.1 By smartphone
  - 3.1.2.2 Through local knowledge
  - 3.1.2.3 By asking other people
- **3.1.3 Route planning through the train station**
- **3.1.4 Check departure time and platform**
  - 3.1.4.1 By app
  - 3.1.4.2 By DB information desk
  - 3.1.4.3 By questioning other fellow travelers
  - 3.1.4.4 By dynamic departure board

3.2 To buy a ticket

- **3.2.1 By App, Internet (Websit**
- **3.2.2 By ticket machine**
- **3.2.3 by DB Travel Center**
- **3.2.4 By phone**





Index of travel step 3.1 Orientation in the train station i

Index of travel step 3.2 To buy a ticket i

To the overall result

1. Arrive at the bus stop

2. Transit from bus stop to train station

4. Stay in the train station

5. Getting around the train station

6. Waiting on the platform

7. Transfer to the train

Back to selection

Legend:

1,0-1,4	Possible without restrictions
1,5-2,4	Limited (possible with technical aids)
2,5-3,4	Possible only with human assistance (also by spontaneously asking for help)
3,5-4,0	Under no circumstances possible / only possible with permanent human assistance





Please select the type of impairment: Activities and participation

Please refine your selection: Mobility

Please make an additional selection: Fine hand use

Please make an additional selection again: Manipulating small objects

Please enter the type of impairment for which you would like an assessment in the selection menu on the left.

The selection takes place in several stages.

You can make changes at any time during your selection.

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To module selection

Start evaluation

Braunschweig Central Station - 3. Arrive at the train station

Chosen impairment: Activities and participation > Mobility > Fine hand use > Manipulating small objects

3.1 Orientation in the train station

- 3.1.1 Entering the station building
- 3.1.2 Orientation
  - 3.1.2.1 By smartphone
  - 3.1.2.2 Through local knowledge
  - 3.1.2.3 By asking other people
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- 3.1.4 Check departure time and platform
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  - 3.1.4.2 By DB information desk
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- 3.2.1 By App, Internet (Website
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- 3.2.3 by DB Travel Center
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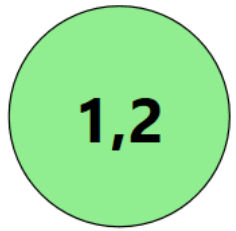
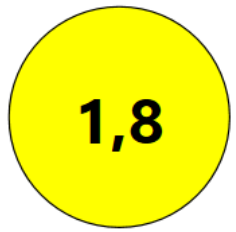


Index of travel step 3.1 Orientation in the train station i



Index of travel step 3.2 To buy a ticket i

To the overall result

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