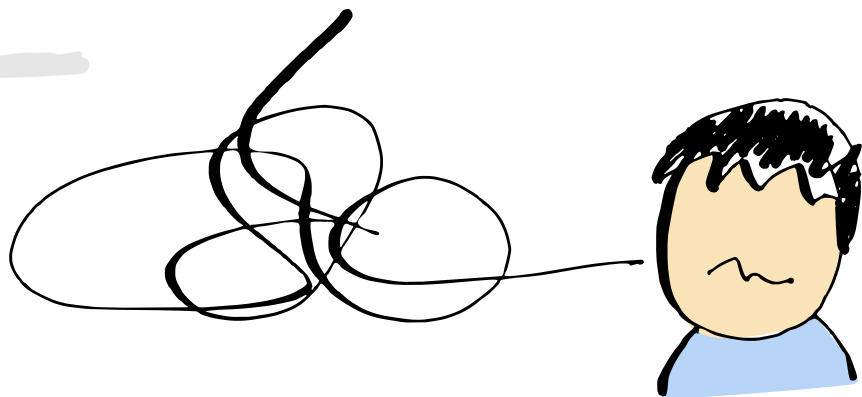








**Access Barriers  
to Digital Screens  
in Museums toolkit**



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**'Access Barriers to Digital Screens in Museums' is a toolkit aimed at Digital Designers in the Museum sector who seek to be more committed to the universal needs of access that visitors face.**

This toolkit was written by Designer specialized on Museum digital content, Raül Leiva as part of a Museum Accessibility research project for MA Museums, Galleries and Contemporary Culture at the University of Westminster.

The most widespread model on Accessibility is the Medical Model of Disability, which says that people experience access problems due to their condition or differences. In the last decades appeared a new focus called The Social Model of Disability and, in contrast, it promotes the idea that people are disabled by the barriers created by society, not by their impairment or difference.

**The approach of the toolkit is based on the Social Model of Disability and its main purpose is to give visibility to the barriers that Museum visitors may face when trying to access the Digital Screens located in their galleries.**

The barriers that have been identified are classified as follows:

- Attitudinal
- Organizational
- Physical
- Communicational

By creating awareness of these barriers, Museum Digital Designers can decide which are the best solutions to mitigate them. Furthermore, understanding these barriers and applying solutions to them is beneficial for the vast majority of museum visitors, this is what is known as the "curb cut effect".<sup>1</sup>

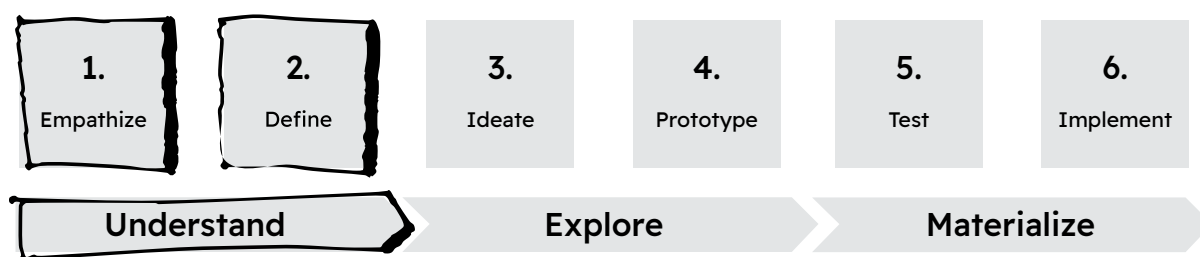
<sup>1</sup><https://hearmeoutcc.com/curb-cut-effect-deafness/>



# How to use this toolkit



- The design-thinking framework<sup>2</sup> follows an overall flow for the development process of a design project. This toolkit is particularly applicable in phases 1 and 2.



- Each chapter provides a brief summary of the type of barrier, followed by a list of the barriers that have been detected for that classification.
- Some barriers contain extra information (such as facts, examples, etc.) indicated with this symbol ⓘ.
- Each page has a link (☰) to the table of contents located at the bottom left.
- Throughout the body of the text, references are included as footnotes. The bibliography provides further reading suggestions of useful books and publications. There is a QR code to facilitate access to these links in the printed versions.

<sup>2</sup><https://www.nngroup.com/articles/design-thinking/>



**“Kindness is the language  
which the deaf can hear and  
the blind can see.”**

Mark Twain

# Attitudinal barriers

This is the main barrier to consider since it is the one that can help understand the need to apply solutions to the set of barriers that will be shown in this toolkit. In fact, this toolkit aims to create awareness in order to facilitate empathy with people who suffer from barriers.

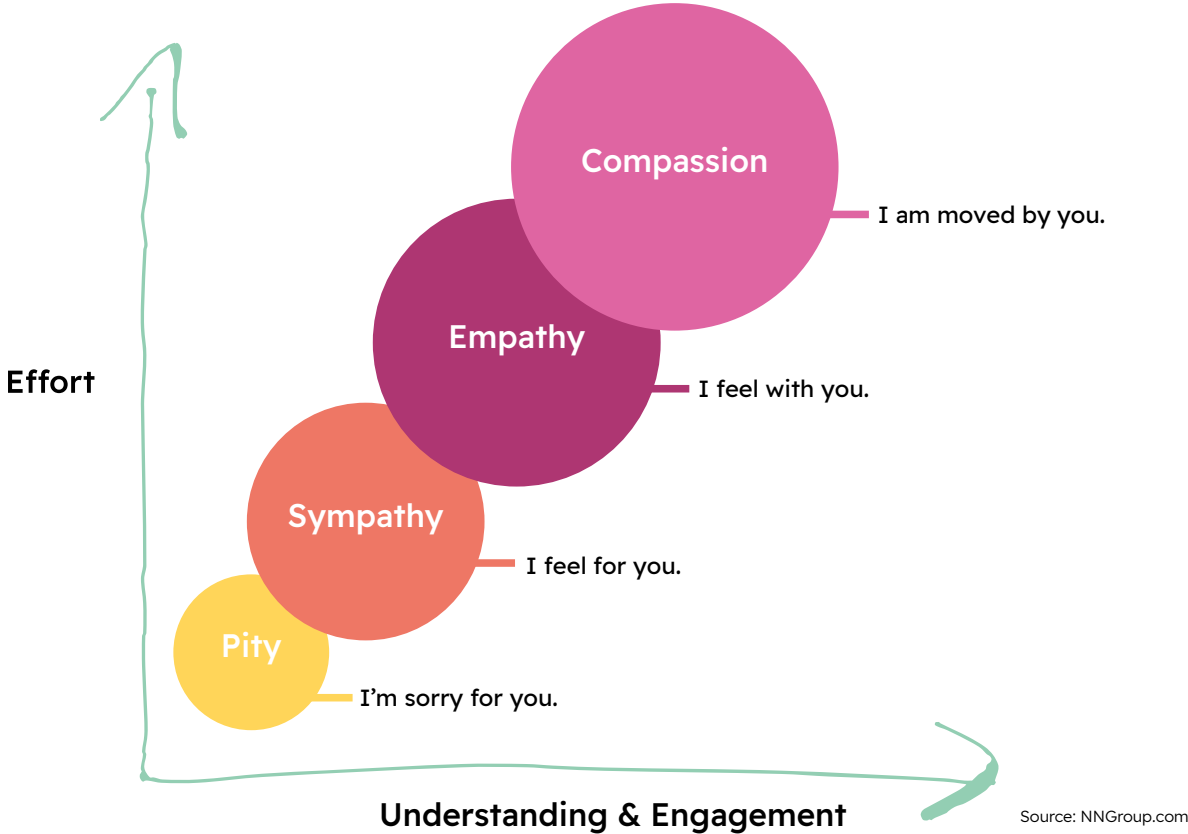
## Lack of empathy

Empathy and sympathy are often confused. While sympathy is the acknowledgment of the suffering of others, empathy goes one step further and is more complex in nature: **empathy is the ability to fully understand, mirror, then share another person's expressions, needs, and motivations.**<sup>3</sup>

In UX design, empathy makes it possible to understand users' frustrations, but also their hopes, fears, capabilities, limitations and goals.

**“Empathy allows us to dig deep into our understanding of the user and create solutions that will not only solve a need but effectively improve our users' lives by removing unnecessary pain or friction”**

Sarah Gibbons, Nielsen Norman Group<sup>3</sup>



<sup>3</sup><https://www.nngroup.com/articles/sympathy-vs-empathy-ux/>



# Organizational barriers

Policies, procedures, or practices that unfairly discriminate may prevent visitors from accessing the museum's galleries and, therefore, from accessing digital screens.

## Economical barriers

- Free or affordable access not available.
- Entrance fee creates the perception that a Museum is not for all audiences.
  - ① **Did you know...** people in the lowest income bracket see entrance fees as nearly five times as much of a barrier as people in the highest income bracket.<sup>4</sup>

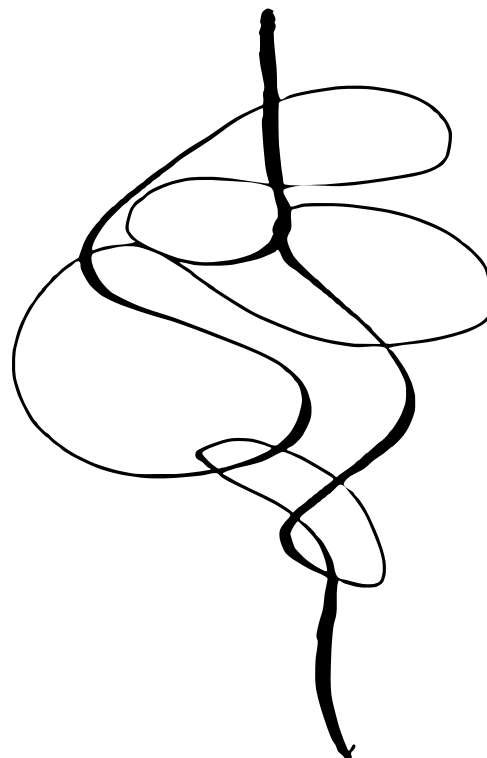
**In 2017/18, 31% of the 13 million people with disabilities in the UK lived in poverty – around 4 million people. By contrast, the poverty rate among the non-disabled population was 20% in 2017/18.<sup>5</sup>**

## Management barriers

- Crowded spaces
  - ① Too many people in a space can cause barriers to different groups of people. For example: those who use wheelchairs may find their way blocked, those who are deaf will find it difficult to communicate in noisy environments, those who are neurodivergent may find it difficult to be in that environment because it is overwhelming, etc.
- Bring Your Own Device (BYOD)
  - ① Not everyone owns their own technology devices and proposing BYOD policies without alternative options can create a barrier.

## External communication

- Lack of information on accessibility to the space.
  - ① People without disabilities are probably not aware of the degree of preparation and planning required for people with disabilities to access a social or leisure experience.<sup>6</sup>

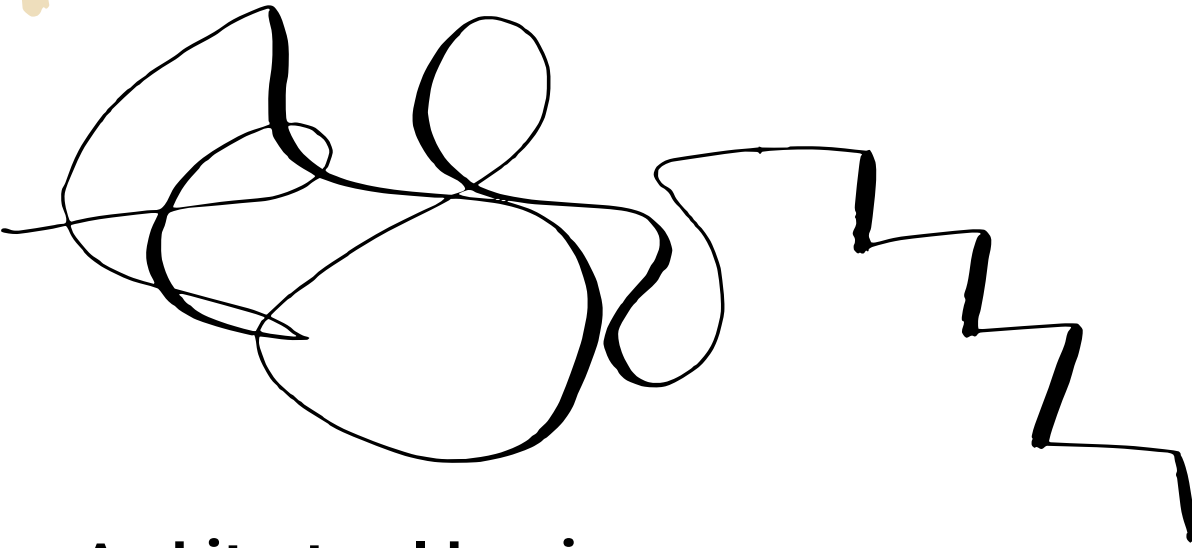


<sup>4</sup> <https://www.jstor.org/stable/41810648>

<sup>5</sup> <https://www.disabilityrightsuk.org/news/2020/february/nearly-half-everyone-poverty-either-disabled-person-or-lives-disabled-person>

<sup>6</sup> Swain, J. et al. (2014). *Disabling Barriers - Enabling Environments*. London: Sage (p. 216)





## Architectural barriers

Characteristics of buildings or spaces, such as the configuration of the space and environmental conditions, can create barriers for certain people. These barriers directly affect the digital screens installed in these spaces since the visitor may have difficulty, for example, in reaching the physical location of the screen.

### Space configuration

- Sidewalks and doorways.
  - ① If they are too narrow for a wheelchair, scooter, or walker.<sup>7</sup>
- Desks.
  - ① If they are too high for a person who is using a wheelchair, or other mobility devices.<sup>7</sup>
- Touch screen height.<sup>9</sup>
- Doors.
  - ① If they are too heavy or doorknobs that are difficult to grip.<sup>7</sup>

**“One can imagine the accessible route as a ‘red carpet’ that begins where a visitor arrives and that allows them to get to every place they need to go (...). Of course, it is not visibly shown on the floor, but it could be”**

Jim Terry, Evan Terry Associates<sup>8</sup>

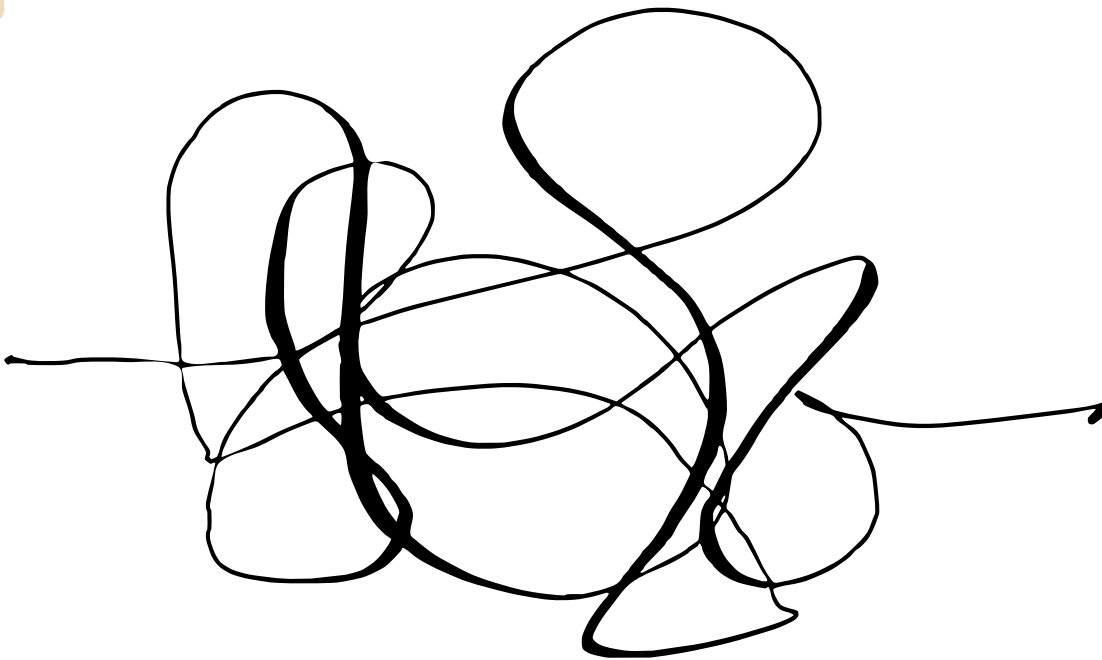
<sup>7</sup> <https://accessiblecampus.ca/understanding-accessibility/what-are-the-barriers/>

<sup>8</sup> [https://link.springer.com/chapter/10.1007/978-3-030-18541-1\\_26](https://link.springer.com/chapter/10.1007/978-3-030-18541-1_26)

<sup>9</sup> <https://www.ada-compliance.com/ada-compliance/308-reach-ranges>







## Environmental barriers

Environmental conditions can create barriers to the senses of sight and hearing, but also problems with mood, stress and the ability to concentrate.

- Poor lighting.
- Sunlight.
  - ① Sunlight can make the screen of the display hard to read. When a touch screen is added to the display, the ability to properly see the display image becomes increasingly difficult.<sup>11</sup>
- Noise.<sup>12</sup>
  - ① It makes the message less accurate, less productive, and unclear.
- Odors.
  - ① If visitors don't expect a certain smell in a particular situation, they can feel uncomfortable.<sup>13</sup>
- Temperature.
  - ① Visitors can feel uncomfortable if the temperature of a place is too high or low.<sup>14</sup>

**Did you know...** the eye needs between 20 and 30 minutes to adapt from a bright space to a dark space.<sup>10</sup>

<sup>10</sup> <https://www.scientificamerican.com/article/experts-eyes-adjust-to-darkness/>

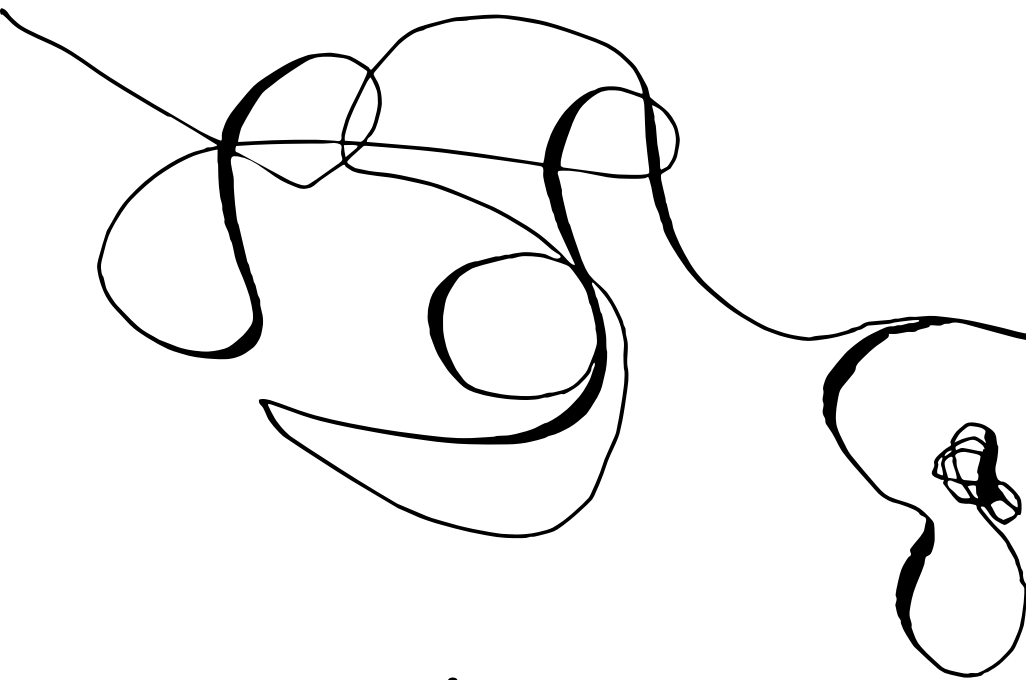
<sup>11</sup> <https://crystal-display.com/what-affects-sunlight-readability/>

<sup>12</sup> <https://www.potentialunearthed.co.uk/wp-content/uploads/2017/09/overcoming-communication-barriers-noise-and-physical-barriers.pdf>

<sup>13</sup> <https://www.scientificamerican.com/article/do-scents-affect-peoples/>

<sup>14</sup> <https://www.businessstopia.net/communication/physical-barriers>





## Sensory barriers

These barriers occur when there is a mismatch between the sensory needs of users and the multimedia aspects of the digital screen.

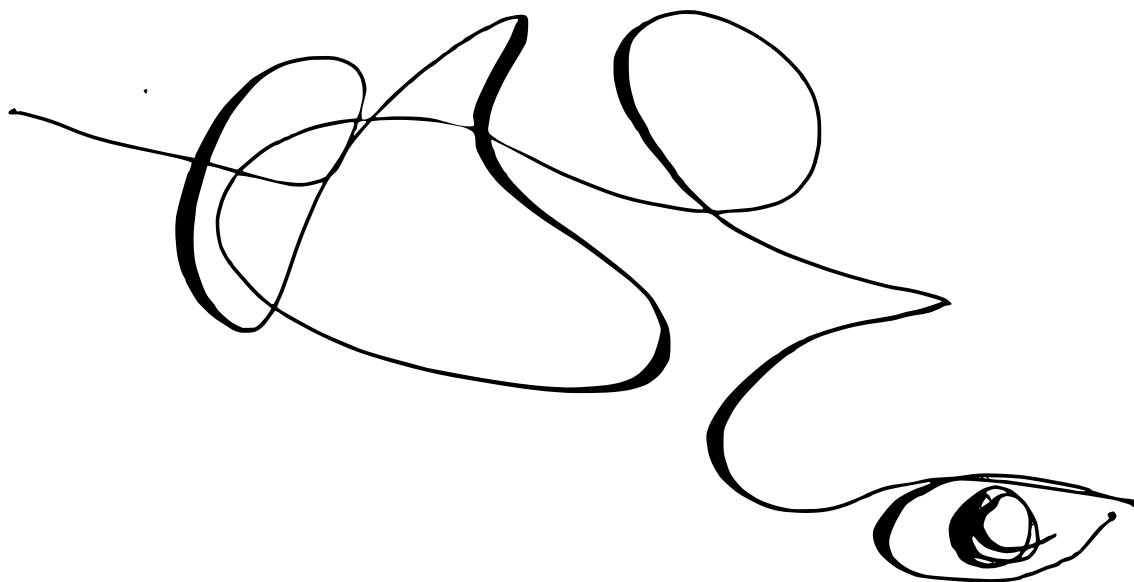
### Auditory

- Audio content without captions or transcripts.
- Media players that do not provide volume controls.
- Software that relies on interaction using voice only.
- Lack of sign language.
  - 📌 **Did you know...** lips should be visible to allow lip-reading.

It is estimated that there are approximately 1 in 6 of the UK adult population affected by hearing loss.<sup>15</sup>

<sup>15</sup> <https://www.hearinglink.org/your-hearing/about-hearing/facts-about-deafness-hearing-loss/>





## Sensory barriers

### Visual

- Images and video that not have audio alternatives, or an audio-description track.
- Icons or text that depend on color to be understood.
  - ① Approximately 4.5% of the world population is colorblind.<sup>16</sup>
- Text and icons without sufficient contrast with the background.
  - ① Contrast ratio is set to at least 4.5:1 by the WCAG.<sup>17</sup>
- Undersized text and icons.
  - ① Minimal size for a kiosk: 4,4mm on screen.<sup>18</sup>
- Video content and animations that autostart.
  - ① Moving images distracts users, as they are eye-catching.<sup>19</sup>
  - ① Flashing images could cause death if they trigger a photo epileptic seizure.<sup>19</sup>

**There are around 350,000 people on the registers of blind and partially sighted people in the UK.<sup>20</sup>**

**Sight loss affects people of all ages, but as we get older we are increasingly likely to experience sight loss: 1 in 5 people aged 75 and over are living with sight loss.<sup>21</sup>**

<sup>16</sup> <https://www.colorblindguide.com/post/colorblind-people-population-live-counter>

<sup>17</sup> <https://webaim.org/articles/contrast/#ratio>

<sup>18</sup> <https://konstrukt.eu/accessible-kiosk-design/>

<sup>19</sup> <https://readabilityguidelines.co.uk/images/moving-images/>

<sup>20</sup> <https://www.rnib.org.uk/professionals/knowledge-and-research-hub/key-information-and-statistics/sight-loss-data-tools>

<sup>21</sup> <https://www.rnib.org.uk/professionals/knowledge-and-research-hub/research-reports/general-research/economic-impact-sight-loss>





## Sensory barriers

### Tactile

- Touch screens with no physical controllers such as keyboards.
  - ⓘ **Did you know...** there is a phenomenon called 'Zombie finger' that prevents certain people from performing touch commands on capacitive touchscreens.<sup>22</sup>
- Lack of tactile guidance: braille, tactile paving, haptic feedback, etc.

### Motor

- Touch area size.<sup>23</sup>
- Gestures / Controller Holding.
  - ⓘ Not everyone has the same skills to perform gestures on a touch screen, there are even people who cannot physically touch the device.<sup>24</sup>

<sup>22</sup> <https://nelson-miller.com/zombie-finger-an-introduction-to-this-touchscreen-phenomenon/>

<sup>23</sup> <https://material.io/components/buttons>

<sup>24</sup> <https://www.washington.edu/accesscomputing/are-touch-screens-accessible>





## Cognitive barriers

Communication is a highly complex skill which forms part of cognition.

Barriers can be created in processes like language, attention, memory and problem-solving.

### Semantic

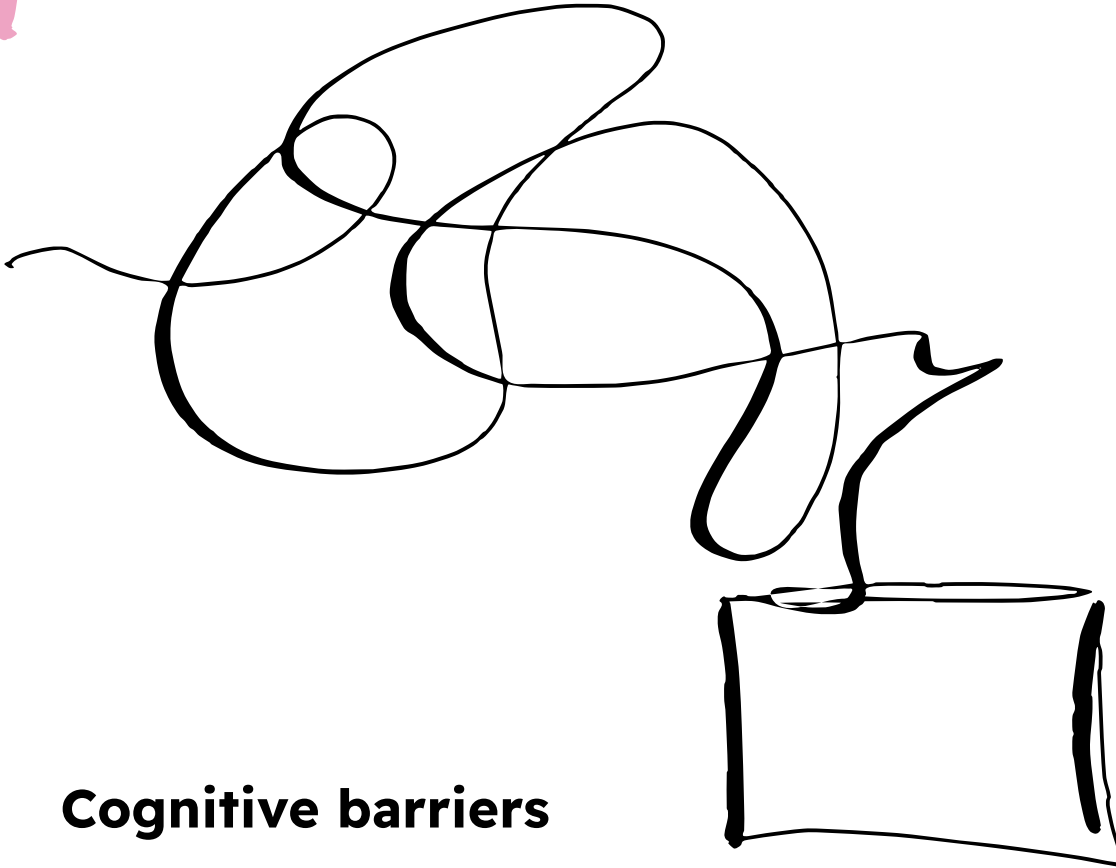
- Language.
  - ① If the content and the recipient of the content do not use the same language and words, communication is meaningless.<sup>25</sup>
- Literacy and linguistic ability.
  - ① According to the International Adult Literacy and Skills Survey in Canada, close to half of Canadians have trouble reading even the most basic type of texts.<sup>26</sup>

**“If a reader cannot understand a document, then the message of that document is not communicated”**

Heather Matsune<sup>26</sup>

<sup>25</sup> <https://www.businesstopia.net/communication/language-barriers>  
<sup>26</sup> [https://www.btb.termiuplus.gc.ca/tpv2guides/guides/favart/index-eng.html?lang=eng&lettr=indx\\_autr8MmWk0tDPK4&page=9XQTsIfEcnrI.html](https://www.btb.termiuplus.gc.ca/tpv2guides/guides/favart/index-eng.html?lang=eng&lettr=indx_autr8MmWk0tDPK4&page=9XQTsIfEcnrI.html)





## Cognitive barriers

### User interface & experience

These barriers occur when the user interface is not usable by some users.

- Type font.
  - ① A study by Thomas Bohm showed that some letters and symbols are confusing even to people without dyslexia or visual impairment.<sup>27</sup>
- Complexity of navigation.
  - ① It should be easy for the user to determine what is possible, what is interactive and what is the next action.<sup>2</sup>
- Time required for actions.
- Focus & Memory
  - ① This barrier occurs when an experience requires the user to remember information and direct their attention.<sup>28</sup>

<sup>27</sup> <https://www.boia.org/blog/best-fonts-to-use-for-website-accessibility>  
<sup>28</sup> <https://www.bbc.co.uk/accessibility/forproducts/xr/barriers/#2.1-comprehension>



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**“The role of genius is not to  
complicate the simple, but  
to simplify the complicated.”**

Criss Jami