# Designing User Interfaces to Enhance Understandability of AI Tools for Low literacy Users

Overcoming shame in seeking help with governmental letters

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## Over 19000 low–literate individuals in Eindhoven

Roughly **2.5 million individuals** in the Netherlands are low literate[7]. In Eindhoven only, **19,000 residents struggle** with the **basic skills of literacy, numeracy, and digital skills**[3]. This limits their ability to fully participate in society. This group is formed of two sub-categories, **NT1** which are **native Dutch speakers** and **NT2** which are **migrants living in the Netherlands**.

**Current intervention** focuses on helping the **younger individual**s in this target group, leaving a **significant gap in support** for adults **aged 18 to 40**. These individuals often experience **daily struggle** with **understanding official documents, managing health and finding employment**. This group usually feels **shame** and **fear of stigmatization** when **asking for help**. This possesses a **large obstacle** for them to act on their struggles and improve. This can lead to **social withdrawal**, further amplifying their difficulties[3].

This study's goal is to create an **understanding of how to bridge the gap between low literacy individuals and society within the specific case of understanding governmental letters**.

## Potential of AI user interfaces to overcome shame of asking for help

Through **interviews** with experts from the NT1 group that are or were individuals with low literacy, we identified that **one of the daily issues** this group faces is to **determine the kind of governmental letter they are receiving**. This leads them to **avoid dealing with the letters** resulting in **missed deadlines, large fines and heightened stress**. As mentioned before, these individuals also face the **obstacle of shame**, which **prevents** them to **ask for help** about the identification of the governmental letters. These **letters pile** up and become **large issues** that are **difficult to resolve**.

Previous studies, investigate the **value of adaptive Artificial Intelligence** (AI), such as empathetic virtual assistance for Hospitals, that allow low-literacy users to process information at their own pace [1]. However, these solutions also **require greater empathy** [6], as they are meant for a vulnerable group. This area is still being explored; AI often struggles to replicate human warmth. Furthermore, the **user interface (UI) design for accessibility** areas proposes **guidelines** to follow when designing for low-literacy individuals [2, 4]. Studies suggest **prioritizing auditory cues, icons, and simple navigation**. In addition, there is also an enquiry for evolving interfaces [5] that adapts to the proficiency of the user. Being both accessible but also allowing growth.

However, a **combination of these two areas of research remains in an early stage of exploration**. This study sees a **gap in the existing literature**, suggesting that there is a connection to be leveraged between accessible UI design and AI tools for low-literacy users. Therefore, **this study inquires on how user interfaces (UI) can optimize Artificial tools to help low-literacy adults overcome feelings of shame when seeking assistance with governmental letters.**

[1]        Timothy W. Bickmore, Laura M. Pfeifer, and Brian W. Jack. 2009. Taking the time to care: empowering low health literacy hospital patients with virtual nurse agents. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, April 04, 2009. ACM, Boston MA USA, 1265–1274. https://doi.org/10.1145/1518701.1518891

[2]        Beenish M. Chaudry, Kay H. Connelly, Katie A. Siek, and Janet L. Welch. 2012. Mobile interface design for low-literacy populations. *In Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium*, January 28, 2012. ACM, Miami Florida USA, 91–100. https://doi.org/10.1145/2110363.2110377

[3]        Jéssica Goss and Walter Baets. 2024. 'Met Mij': From User to Human. *From User to Human* (June 2024), 36–51.

[4]        Matthew Paul Huenerfauth. 2002. Developing Design Recommendations for Computer Interfaces Accessible to Illiterate Users. (August 2002).

[5]        Ali Saif, Mohammad Taha Zakir, Agha Ali Raza, and Mustafa Naseem. 2024. EvolveUI: User Interfaces that Evolve with User Proficiency. In *Proceedings of the 7th ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies*, July 08, 2024. ACM, New Delhi India, 230–237. https://doi.org/10.1145/3674829.3675078

[6]        Ramya Srinivasan and Beatriz San Miguel González. 2022. The role of empathy for artificial intelligence accountability. *Journal of Responsible Technology 9*, (April 2022), 100021. https://doi.org/10.1016/j.jrt.2021.100021

[7]        Feiten en cijfers | Stichting Lezen en Schrijven. Retrieved November 1, 2024 from https://www.lezenenschrijven.nl/voor-gemeenten/feiten-en-cijfers

## A prototype for enquiry: The letter sorter

The **research artefact** (Figure 2) was **made to enquire** about our main question: on how user interfaces (UI) can optimize Artificial tools to help low-literacy adults overcome feelings of shame when seeking assistance with governmental letters.

The object is a **letter sorter tool powered with an AI** (Figure 1) that helps identify and sort the governmental letters received. It is constituted of a wooden MDF structure and equipped with a Wizard of OZ AI, as well as three distinct pockets. The researchers were highly interested to see the reaction of the users when using the different features.
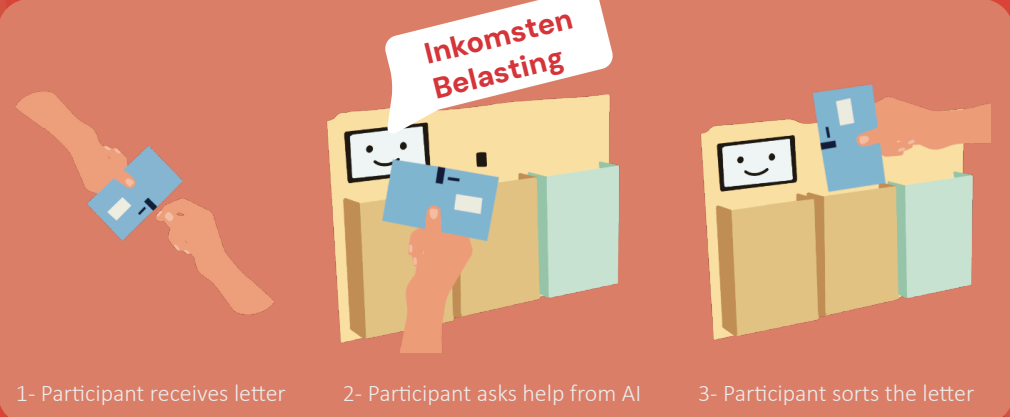
The researchers opted to simulate the AI tool using a Microsoft Teams call that was disguised to feel like an artificial intelligence assistant for the letter sorter. This simulation was equipped with two distinct audio-based UIs and two different screen UIs:

• **Procedural Approach:** Offers step-by-step guidance.

• **Guiding Approach:** Provides open-ended assistance.



Sealed with a visible counter, indicating the number of unread letters inside and utilizing an Arduino Uno with an ultrasonic sensor to track changes.

Transparent, providing users with a full view of letter contents and quantity.

Fully sealed, fully, hidden letters.

Figure 1: Explenation Prototype: The letter sorter

These pockets are also meant for different types of letters from the government:

• **Algemeen**- General
• **Inkomsten Belasting** – Income Tax
• **Aanslagen** – Tax Assessments

## Deployment scenario:



1- Participant receives letter

2- Participant asks help from AI

3- Participant sorts the letter

## Data Collection Methods

For this case study the researchers opted to enquire with their artefact the feelings and reactions of **NT2 participants**, when receiving and organizing governmental letters. The choice of recruiting individuals from NT2 instead of NT1, was due to time constraints. **Qualitative data** was gathered through **surveys and observations** (Figure 3), including a pre-deployment questionnaire to capture initial attitudes, a 30-minute deployment session where participants interacted with a simulated AI system (Wizard of Oz method), and a post-deployment questionnaire to assess changes in perception and experience. Observational data were collected during the deployment to capture emotional and behavioural responses in real time.
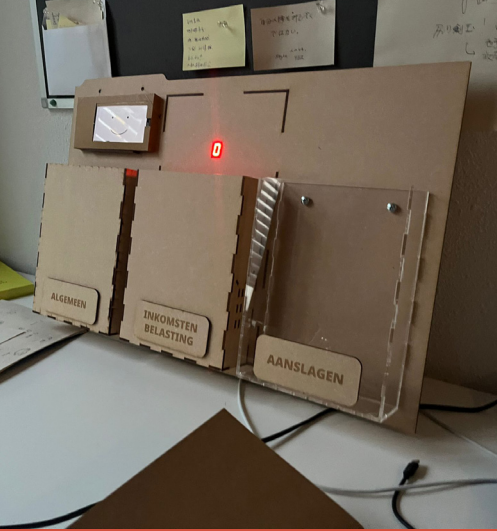


Figure 2: Deployment of the Prototype

Figure 3: Observation Room for the deployment of the Prototype.

## Analysis

Using **thematic analysis**, the survey results and observational data were systematically coded to reveal recurring patterns and themes. The findings from the qualitative data showed that the **UI intonation approach had effect on the perceived clarity, ease of use, and emotional impact**. Furthermore, the **pockets also proved to influence the participants**. Physical interactions with the artefact, such as transparent pockets, were associated with increased task engagement, though closed pockets sometimes alleviated stress by concealing letter contents.

*"Allows me to categorise letters in a very intuitive way"*

*"To my surprise, I felt more assured when the sorter bot tell me what the letter are. I first thought google translate can do exact the thing."*

*"I first didn't felt it is necessary, but the experience to have an AI assistant like that is actually quite fun."*

The **study faced limitations** that may **have impacted results**. Design variations in the pockets introduced potential bias, while the middle pocket's limited counter function caused confusion. Additionally, Dutch labels pronounced with an English accent may have affected interactions. Using simulated letters simplified categorization, potentially reducing authenticity. Separating participants into procedural and guiding groups restricted direct comparisons. Including NT2 participants with limited Dutch familiarity may have also reduced relevance for NT1 users, suggesting future studies prioritize NT1 or more integrated NT2 participants. Semi-structured interviews could also yield deeper insights than questionnaires alone.

## Conclusion

The **study shows the potential of UI design in creating supportive, shame reducing experiences for AI tools** meant for low-literacy individuals. Participants appreciated audio cues and visual elements but occasionally found the AI's guidance intrusive, suggesting a need for balance. However, **due to the study's limitations** it is **difficult to make a conclusion with specific guidelines** on how to design UIs for AI tools to help low-literacy adults overcome feelings of shame when seeking assistance with governmental letters. Nevertheless, **this study does expose the design complexities** and provide examples to what should be changed and improved in further attempts to understand how user interfaces (UI) can optimize Artificial tools to help low-literacy adults overcome feelings of shame when seeking assistance with governmental letters.

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