

# Can Text Simplification Help to Increase the Acceptance of E-Participation?

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## Abstract

This study investigated the effect of text simplification (with and without artificial intelligence support) and the role of participants (author or reader) on the acceptance of e-participation processes. Therefore, a near-realistic experimental study with 276 participants was conducted simulating a participatory budgeting process. The results of our study show, on the one hand, that text simplification and the role of participants has no direct influence on the intention to use e-participation. Although a higher level of participation cannot be achieved by text simplification, our results also show that no negative consequences for usage intention can be expected from text simplification. On the other hand, the results show that people with reading and writing difficulties prefer text simplification for proposals in e-participation.

**Keywords:** text simplification, technology acceptance, participatory budgeting

## 1. Introduction

In light of current developments, such as the increasing complexity of public decision-making processes, the growing pluralization of society, or the increasing loss of trust in the competence of public decision-makers, digital forms of citizen participation are becoming an important component of government action (Panopoulou et al., 2014). Citizens are able to influence decisions or processes by submitting ideas, voting, and in a variety of other ways. One of the key success factors and goals of these online deliberative platforms is to engage a diverse group of citizens and achieve high levels of participation.

However, for certain groups, such as migrants or people with reading disabilities, the complexity of the procedures and texts can be a major barrier to participation (Zepic et al., 2017). In contrast, the simpler the platform texts, the easier they are to understand for people with and without reading difficulties (Gutermuth, 2019).

Moreover, legal requirements for inclusion ensure that accessibility is a central requirement and challenge for processes and procedures in the public sector (Ferri and Favalli, 2018). According to the recommendations of the European Standard for Digital Accessibility (European Telecommunications Standards Institute, 2021), public authorities should provide readable and understandable content (e.g., in plain language) on their websites to make them accessible to people with reading and writing deficits, e.g., people with cognitive limitations, low literacy skills or low language skills in a foreign language.

However, on many government websites, only a summary of the standard website is provided in plain language, and other related websites, such as those of citizen participation projects, are often written only in standard language (Asghari et al., 2023), which is difficult to read for people with reading and writing deficits. As a result, having plain language on online deliberative platforms is critical for both goal attainment and legal purposes.

Here, some natural language processing tasks (supported by artificial intelligence) could improve the accessibility for people with reading and writing difficulties in civic participation projects: For example, automatic grammar error or spelling correction (see Bryant et al. 2023) could make participants with low literacy skills more confident while publishing their proposals, text summarization (see El-Kassas et al. 2021) could help to reduce the content of the projects, so that people with reading deficits are not overwhelmed with the amount of data, or text simplification (see Alva-Manchego et al. 2020) could enhance the readability and comprehensibility of texts of citizen participation projects, with the result that people with reading deficits could understand the content and overall enable more people to participate in a project. This may facilitate their participation and improve the use of these platforms and thus their acceptance and success.

However, there is a lack of empirical studies dealing with the possible effects of text simplification in online deliberation processes such as e-participation.

Therefore, in our near-realistic experimental study, we first exploratively investigate attitudes towards a natural language processing (NLP) task,

i.e. text simplification, in the context of a citizen participation project, i.e. participatory budgeting. Second, we analyze the concrete causal effect of text simplification on the acceptance of a citizen participation project and thus on the intention to participate in a citizen participation project.

In doing so, the study contributes to the discourse on the use of NLP in deliberative processes and increases knowledge about the possible effects of its use. On a practical level, the study helps to gain insight into the use of NLP and evaluate whether it can facilitate the control and revision of proposals in digital collaboration processes and reduce the costs of the processes.

In the remainder of this paper, we first outline some theoretical background and develop our hypotheses. We then present our research design before presenting the results of the readability study and the experimental study.

## 2. Theoretical Background & Related Work

### 2.1. E-participation

E-participation is the digitized form of citizen participation. In the fields of open government and e-government, e-participation has been widely discussed as an option for the growing demand for innovative methods to involve citizens and their opinions in the decision-making processes of public authorities (Simonofski et al., 2017).

Examples of e-participation include participatory budgeting, where citizens can vote on a set budget, or consultative procedures, where citizens can submit proposals for specific construction projects. While the use of information and communication technologies offers a number of opportunities to make processes more inclusive, e-participation is also usually associated with a number of technology-related challenges for certain groups of the population. Among other things, e-participation has the potential to open up new target groups by overcoming spatial and temporal limitations, whereas the participation of senior citizens or technology-skeptical citizens may decrease. However, since e-participation is also intended to make a significant contribution to optimizing democratic processes, accessibility is a key factor in ensuring that e-participation is accepted and used by the public.

### 2.2. Factors for Acceptance of e-participation

A multitude of potential influencing factors for acceptance of e-participation can be identified. For example, Naranjo Zolotov et al. (2018) found *per-*

*ceived usefulness* to be one of the most predictive factors for the intention to use e-participation. *perceived ease of use* in turn is a major factor for perceived usefulness of e-participation.

The ease of use of e-participation platforms in terms of accessibility depends on the usability, perceptibility, operability, as well as the comprehensibility and readability (Vollenwyder et al., 2018).

The information overload on e-participation platforms can hinder the usability. Romberg and Escher (2023) summarized research on how to approach this problem using NLP methods. Following them, AI or NLP tools have been proposed to identify double proposals (see e.g., Yang et al. 2006), group proposals with topic modeling strategies (see e.g., Hagen et al. 2015), summarize the proposals for a shorter and faster readable overview (see e.g., Arana-Catania et al. 2021), or produce in-depth analysis (e.g., identification of argumentation structures in the proposals; see e.g., Liebeck et al. 2016).

### 2.3. Text Simplification & Plain Language & People with Reading and Writing Difficulties

In Terms of accessibility, the importance of the comprehensibility of the procedures, contents, and outcomes becomes apparent in the course of the discussion on diversity and equal opportunities for all citizens. For this purpose, it is necessary that every citizen is able to understand the procedural steps and contributions. For people with reading and writing deficits in the language of the e-participation project, the use of plain language is a key requirement to be able to comprehend the project. In this respect, on the one hand, the use of digital processes can actually help accessibility with respect to overcome language barriers. On the other hand, the digital approach (compared to a face-to-face approach) can also be a hindrance, e.g. people with insufficient computer skills may not be able to use sophisticated e-participation platforms (Zepic et al., 2017).

In general, Gutermuth (2019) has already shown that simplifying the instructions of citizen participation processes can help different groups of people to understand the instructions better. They measured the reading speed, the recall of the content, the eye movements during reading and much more of an instruction of a citizen participation project in Easy German (“Leichte Sprache”), Plain German (“Einfache Sprache”) and standard language by elderly people, people with immigrant background, people with cognitive impairment and a control group (students). The study discovered that all groups i) read the text faster when it was simpler, ii) had a better understanding of the easier versions

and iii) recalled the simpler text more effectively. The simpler the version, the more strong the effect. Therefore simple texts seem to be helpful for a wide range of people.

Although texts such as the instruction of the procedure can already be simplified and reviewed in advance (as shown by [Gutermuth 2019](#)), a simplification of the submitted citizen contributions' (hereafter proposals) requires a disproportionately higher effort. Considering the amount of content produced in citizen participation projects, a trained translator might be overwhelmed during the manual simplification process of the majority of proposals. However, automatic simplification of texts is a potential solution to reduce this effort. Text simplification (TS) is an NLP task that aims to automatically make complex texts more accessible by editing their wording and syntax, while preserving the original meaning of the text ([Alva-Manchego et al., 2020](#)).

In contrast to the previous study, [Johnson et al. \(2015\)](#) analyze the effect of the language of participants (and not the instructors) in online communities. [Johnson et al. \(2015\)](#) show that participants in an online community have a greater influence on other participants when their vocabulary is simpler, more readable and has a positive sentiment. In order to give all participants the opportunity to write more clearly and to read more readable texts, the simplification of these texts seems to be a relevant option.

However, depending on individual preferences, people without reading and writing deficits may perceive easy-to-read texts as less favorable and may be less satisfied with these texts than with standard texts ([Karreman et al., 2007](#); [Schmutz et al., 2019](#)). [Vollenwyder et al. \(2018\)](#) extend the research of [Karreman et al. \(2007\)](#); [Schmutz et al. \(2019\)](#) by investigating whether these unwanted side-effects of people without reading and writing deficits can be overcome when the original (standard) text and the simplified version are presented in parallel. And indeed their results show that the positive effects of the simplified texts for the people with reading and writing deficits still remain, while the negative impact of people without reading and writing deficits disappears as they can still read the original content.

### 3. Hypotheses Building

Following the research previously presented, we are now building our hypothesis for our study.

The work of [Gutermuth \(2019\)](#) has already shown that instructions in standard German are difficult to read in online deliberation processes. In contrast to the instructions, the proposals are user-generated texts. This means that they are written

by citizens and are not proofread before publication, hence, they might contain a high amount of ungrammatical sentences, and out-of-vocabulary words ([Baldwin et al., 2013](#)), which are difficult to process for people with reading deficits. [Friess et al. \(2017\)](#) also argue that the proposals of deliberation processes are also more difficult to understand than other (user-generated) texts because they contain many specific terminologies, emotions, arguments, and references to other proposals.

Further, the participants who write proposals in online deliberation processes are often academics ([Schäfer and Schoen, 2013](#)) who tend to write long and complex sentences. On the other hand, highly informal language with numerous errors and unusual features, which is common in digital participation processes ([Parycek et al., 2014](#)), can make the text also difficult to understand. Following this, we build H1:

**H1:** Proposals of online e-participation processes are difficult to read.

Following the previous named characteristics of proposals of deliberation processes, people need the following skills to understand the proposals, e.g., comprehension of complex argumentation, comprehension of specific terminology (including regional and technical terms), comprehension of cohesive texts (e.g., reciprocal content and argumentation), and comprehension of sentences with complex structures (e.g., long sentences with many clauses) ([Stodden, 2021](#)). Following the self-assessment grid of the Common European Framework of Reference for Languages (CEFR) ([Council of Europe, 2020](#)) the acquisition of these skills corresponds to a CEFR level of B2. [Bock \(2015\)](#) also argues that people with reading and writing deficits have only limited access to political participation because they have fewer communication capabilities, e.g., the skills mentioned above. Hence, we state:

**H2:** People with reading and writing deficits perceive proposals as more difficult to comprehend than people without these deficits.

There are several ways in which NLP can be used to help people with reading and writing deficits, such as correcting grammatical errors while writing proposals, text summarization to condense related proposals, translation into a language the reader is more familiar with to understand a proposal in more detail, or automatic text simplification to make a text in the same language as the proposal more readable. In particular, people with reading and writing disabilities could benefit from these techniques by being more certain

that they have understood a text correctly or by feeling less overwhelmed by the volume of proposals. Therefore, we postulate:

**H3:** People with reading and writing deficits expect a higher effect/benefit through the support of NLP tasks on on-line deliberation platforms than people without these deficits, e.g., automatic text simplification, automatic text summarization, or machine translation.

In general, participation requires time and cognitive resources. Simplified texts could improve comprehension and thus reduce the effort required. Simplified texts also improve participation opportunities for population groups such as people with reading and writing difficulties. This creates inclusion, increases equal opportunities and improves the quality of procedures. Finally, simplified texts ensure that proposals are understood and positively received by more citizens, which supports the voting process of participatory budgeting. Therefore, we conclude:

**H4:** The simplification of proposals has an influence on the acceptance of e-participation processes.

However, the quality of current automatic text simplification approaches in research are not ready for their usage in production. At their current state, professional post-editing by trained translators on the automatic simplified texts is mandatory (Deilen et al., 2023). A high amount of (factual) errors (Devaraj et al., 2022) and insufficient quality of the automatic simplified texts (Alva-Manchego et al., 2020) could be perceived by the readers similar as for other NLG tasks. Accordingly, it can be assumed that participants trust automatic text simplification less than manual text simplification. At the same time, automatic text simplification allows for faster, more immediate, more objective and more consistent simplification compared to simplification by a professional. Thus, participants may prefer the ability to simplify their proposals directly and anonymously, while there may be reservations about the impracticality of manual simplification, for example, in terms of paying attention to different contributions and the attention with which they are edited. Similarly, there is an increase in technology scepticism, which reduces the acceptance of automatic simplification. These factors have not yet been studied, so we postulate:

**H5:** The influence of text simplification on the acceptance of e-participation processes is moderated by the type of simplification (none, manual, or automatic).

Furthermore, differences in the influence of textual simplification are to be expected depending on the role assumed. Citizens have the possibility to participate actively by writing proposals or to participate passively as readers.

On the one hand, the automatically simplified version of a text may be perceived differently by the people who wrote it. They may see the simplification as a chance for their proposals to be understood by more people with different backgrounds and thus have a wider reach. Or they may perceive the simplification as a technology-induced intrusion into their carefully crafted proposal and reject it because their own writing style has changed and they can no longer identify with their own text.

On the other hand, people who didn't write the proposal and are just reading it might welcome the simplification shown, since they have the option of reading either the original or the more readable simplified version of it. Therefore, we state as follows:

**H6:** The influence of text simplification on the acceptance of e-participation is moderated by the role of the participants (reader or author).

## 4. Pre-Assumption – Readability Study

### 4.1. Methodology

To answer hypothesis H1, we have conducted a readability study on proposals of deliberative on-line participation processes. First, we have downloaded the data of online participation processes using the web crawler published in (Grawe, 2018)<sup>1</sup>. The resulting dataset contains overall 7,295 proposals of 11 processes (see Table 1a).

As metric to assess the readability of of the proposals, we use the German adaptation by Amstad (1978) of the Flesch Reading Ease (FRE) (Flesch, 1948) readability formula which was originally designed for English. In both languages, the score is dependent on the number of sentences, the number of words per sentence, the number of syllables per word and some language-wise constants. The formula for German FRE (Amstad, 1978) is:

$$FRE_{DE} = 180 - \frac{\#word}{\#sentences} - (58.5 * \frac{\#syllables}{\#words}) \quad (1)$$

According to this, FRE is mostly suitable for calculating the readability of documents or paragraphs. FRE is given on a scale mostly ranging

<sup>1</sup>The code of the web crawler is available at <https://github.com/PGrawe/OnlineParticipationDatasets>

between 0 and 100, where 0 is very difficult and 100 is very simple. We measured the readability with FRE (Amstad, 1978) of the Python package *textstat*<sup>2</sup>.

However, readability metrics such as FRE have been criticized in previous work, hence, we extend our evaluation with additional linguistic metrics such as proposed in Tanprasert and Kauchak (2021). Specifically, we measure the average number of sentences per proposal, the average sentence length in words, the average word length in syllables, the average familiarity of words (measured by the average position of words in a frequency table), and the average complexity of the sentence structure (measured by the parse tree height) using SpaCy (Montani et al., 2023) and Stanza (Qi et al., 2020). For all but FRE, the lower the value, the easier it is to understand the text.

To estimate the complexity of the proposals, we can compare them with reference texts, e.g., news articles in standard German, news simplified for people with German skills following CEFR level B1, and level A2 (Council of Europe, 2020) of the APA-LHA corpus (Spring et al. (2021); see first three lines in Table 1b) or Wikipedia texts in standard German and simplified for non-native speakers of the TCDE19 corpus (Naderi et al. (2019); see last two lines in Table 1b).

## 4.2. Results

On average each proposal contains 4.82 ( $STD = 4.08$ ) sentences with a maximum outlier of 9.65 sentences (see “bonn2017”) and a minimum outlier of 3.92 sentences (see “raddialog-bonn”). The average sentence length is 19.42 ( $STD = 7.63$ ) and the average word length in syllables is 1.82 ( $STD = 0.22$ , see Table 1a). Hence, the proposals are rather long and require discourse comprehension.

However, based on this values and following FRE, the complexity of the texts can be described as “on average” ( $FRE = 42.71$ ,  $STD = 17.91$ ). The process called “koeln2016” contains in comparison the most simple proposals considering a balance of sentence length, word length and number of sentences, whereas the process called “bonn2017” contains the most complex proposals.

Comparing the statistics of the proposals with the statistics of the reference corpora, the sentences of the proposals are shorter than the original news and Wikipedia texts, which is typical for user-generated content. However, the proposal sentences are on average still longer than the simplified sentences. Further, the words in the proposals are on average shorter than in the standard

name	N	S	SL↓	WL↓	FRE↑	Fam.↓	Struc.↓
badgodesberg	551	5.81	19.29	1.85	39.38	5.64	4.74
bonn2015	330	7.22	19.81	1.88	37.9	5.69	4.87
bonn2017	55	9.65	21.31	1.86	37.55	5.7	4.9
bonn2019	232	6.04	19.57	1.83	41.7	5.6	4.81
bonn2021	545	5.72	18.34	1.86	39.78	5.67	4.73
koeln2013	591	4.49	19.69	1.87	39.19	5.73	4.88
koeln2015	630	5.36	19.54	1.88	38.24	5.75	4.85
koeln2016	821	4.12	19.17	1.84	43.2	5.71	4.81
koeln2017	744	4.38	18.87	1.84	42.01	5.71	4.73
nahverkehrsplan- ulm	498	5.75	20.33	1.67	49.54	5.51	4.74
raddialog-bonn	2,298	3.92	19.57	1.78	45.82	5.65	4.7
all	7,295	4.82	19.42	1.82	42.71	5.67	4.76

(a) Overview of statistics per online participation process.

name	N	S	SL↓	WL↓	FRE↑	Fam.↓	Struc.↓
APA-LHA-OR	500	—	20.48	1.93	43.70	5.74	5.66
APA-LHA-B1	500	—	12.82	1.83	62.60	5.47	4.36
APA-LHA-A2	500	—	11.27	1.78	69.55	5.30	4.01
TCDE19-OR	250	—	25.75	2.08	28.1	5.96	6.79
TCDE19-B2	250	—	14.17	1.9	51.2	5.65	4.58

(b) Overview of statistics per reference corpus. OR = standard language, B1 and A2 = simplified language

Table 1: Overview of statistics per online participation process and reference corpora. N = number of proposals, S = number of sentences, SL = sentence length, WL = word length in syllables, FRE = Flesch Reading Ease, Fam. = Familiarity.

and simplified reference texts (except APA-LHA-A2), but as expected the words are on average more infrequent (or unfamiliar) in the proposals than in the simplified texts. In terms of structural complexity, the proposals are more nested than the simplified texts, although the proposals often do not contain complete sentences.

Overall, in line with the findings of Stodden (2021) and Bock (2015), the proposal texts appear to be difficult to understand for non-native speakers. Consequently, they may also be complex to understand for native speakers with reading difficulties. Therefore, we can confirm H1.

## 5. Experiment

To test the hypotheses H2 to H6, a randomized scenario-based experiment was conducted, using a 2 × 3 between-subject design with simplification style (no simplification or manual simplification or automatic simplification) and participant role (reader or author).

### 5.1. Pre-study

In order to be able to compare *no simplification* with *simplification*, we conducted a pre-study to find a complex and simplified version of the same proposal. In this pre-study, we evaluated seven different texts manually simplified into plain language (by a person trained on writing plain language) regarding their comprehensibility. All versions of the proposals can be found in Appendix A.

<sup>2</sup><https://github.com/textstat/textstat>

In order to verify the assumed readability, we asked participants to rate how comprehensible each of the variants of the following proposal is for them<sup>3</sup>. The scale ranges from 1 (very difficult to comprehend) to 7 (very easy to comprehend).

Overall, 21 German adults have participated in the pre-study<sup>4</sup>. The full results of the study are provided in [Appendix A](#). Although version A was intended to be the most complex version, the participants have scored version B with the lowest simplicity score ( $M = 4.62$ ,  $STD = 1.56$ ,  $N = 21$ ). Version G was scored with the highest simplicity score ( $M = 5.86$ ,  $STD = 1.24$ ,  $N = 21$ ). Version G compared to version B shows significantly higher simplicity scores,  $t(20) = 2.86$ ,  $p < .01$ . The effect size following Cohen (1992) is  $r = .54$  and corresponds to a strong effect. Therefore, in the following study, version G will be used as the simplified version and version B as the complex, non-simplified version.

## 5.2. Research Design

Due to the high importance of information and communication technologies for the implementation of e-participation, information system (IS) theories such as Davis' technology acceptance model (Davis, 1985) can be used to analyze user acceptance (Naranjo-Zolotov et al., 2019). The technology acceptance model is based on the theory of planned behavior and postulates that the use of a technology is closely related to its usage intention. The usage intention, in turn, is influenced by the perceived usefulness as well as the attitude toward using, which in turn is influenced by the perceived ease of use as well as the perceived usefulness. Accordingly, we used participants' usage intention as the dependent variable to examine the influence of text simplification on the acceptance of e-participation.

We simulated a participatory budgeting system in German language using the open source platform *adhocracy+* by liquid democracy e.V.<sup>5</sup>. To equalize participants' experience with the platform and reduce unintended side effects, we simulate participation in the e-participation process by showing screenshots of each step of the process in an online survey.

Following, our  $2 \times 3$  between-subject design, the participants have been grouped in six different scenarios wrt. simplification style (no simplification,

<sup>3</sup>The statement we asked the participants to rate was: "Bitte geben Sie an, wie verständlich die folgenden Varianten des Vorschlags für Sie sind." (engl.: "Please indicate how comprehensible the following variants of the proposal are for you.")

<sup>4</sup>All participants have voluntarily participated in the study.

<sup>5</sup><https://github.com/liqd/adhocracy-plus>

manual simplification or automatic simplification) and participant role (reader or author) (see [Table 2](#)). All participants first read the instructions of a participatory budgeting system (almost realistic).<sup>6</sup> One group (called "authors") was simulated to write their own proposal and then read their published proposal. Another group (called "readers") first saw an overview of proposals and then read a published proposal of someone else (the same proposal as for the first group). For both groups, the proposals were shown in three different versions to account for the different simplification styles. Some participants saw no simplification of the proposal (see [Figure 1a](#)), and some a split screen in which the original text and the simplified text were shown side by side (see [Figure 1b](#)), following the findings by [Vollenwyder et al. \(2018\)](#). At the end of the simplified text, it is indicated whether the text was simplified by an employee of a translation office or by an automatic text simplification system (see "Hinweis" in [Figure 1b](#)).

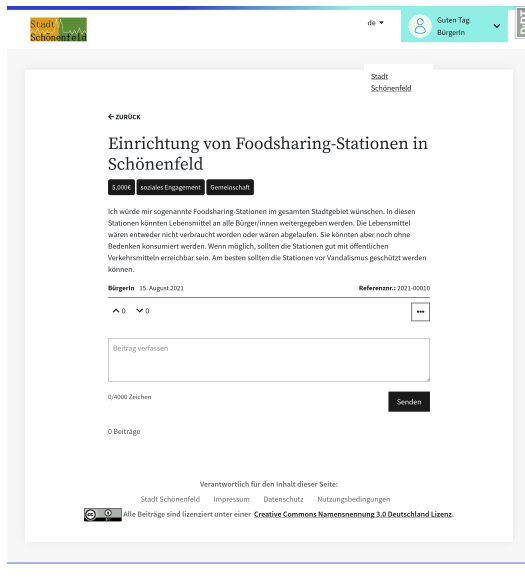
We selected the text rated as most complex in the pre-study as the original (i.e., version B) and the text rated as most simple as the simplified text of the proposal (i.e., version G). This simplified text was used for both the manual and automatic simplification because we wanted to reduce the confounding variable that the different simplification transformations might cause. Further, for the same reasons, we focus on the text of one proposal and do not alter between different proposals. Participants should focus only on the translator and not on the translation, its content, or its quality.

After the simulation the participants answered a questionnaire on a 5 point Likert-scale on the following categories: demographic information, language barriers (own), acceptance of the participatory budgeting ([Saura et al., 2020](#)), perceived comprehension ([Milne and Culnan, 2004](#)), usage experience with other participatory budgeting processes (own), and NLP applications in participatory budgeting (own).

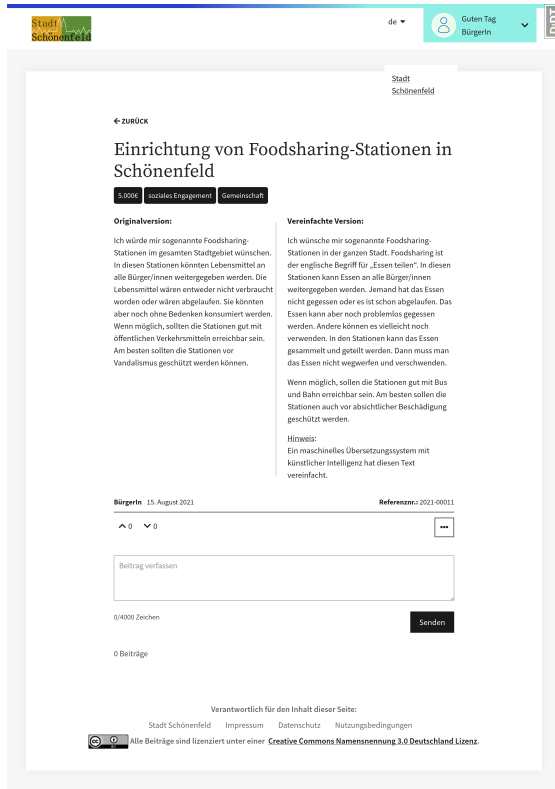
The whole study was conducted on German by Germans via the online platform Unipark<sup>7</sup>. The design of two different settings is visualized in [Figure 1](#).

<sup>6</sup>The experiment is almost or nearly realistic as we provide the participants with step-by-step screenshots of the e-participation system, while they could not interact directly with the real system. To guide and control the usage of the system regarding our study design would have required an in-person experiment. The participants number in an monitored, in-person experiment would have been expected to be much lower than for the nearly realistic approach. In addition, it would be more difficult to control for confounding variables that may influence the usage intention.

<sup>7</sup><https://www.unipark.com/>



(a) Only standard text.



(b) Side-by-side view of standard and plain text.

Figure 1: Two screenshots of the platform.

## 5.3. Results & Discussion

### 5.3.1. Participants

To reach the participants, study announcements were posted on various digital and analog channels such as Reddit. As an incentive, 5 Amazon gift cards were raffled. Crowdworkers were also

Scenario	Simplification	Participant
1	none	reader
2	none	author
3	manual	reader
4	manual	author
5	automatic	reader
6	automatic	author

Table 2: Overview of all groups of the experiment.

recruited via the service provider respondi<sup>8</sup> to increase the sample size. 332 participants took part in the study between 2nd December 2021 and 9th March 2022.<sup>9</sup> After data cleaning (failed attention check), data of 276 participants could be evaluated. Overall, 60.87% of the participants are female, 38.04% male and 1.09% non-binary. 77.17% are native German speakers, 10.86% are on an expert level, 10.5% in middle level and 1.42% on beginner level. 51.09% have a Bachelor degree or higher, and 28.26% finished A-level. The average age is 38.29. 86.96% never participated in a participatory budgeting process.

Overall 25% of the participants face at least sometimes language barriers in their daily life. Furthermore, 28.99% have either low German skills, often face reading problems, are older than 65 years, or have low educational achievements. In the following we describe this group of overall 79 people as *people with reading and writing deficits* who require texts in plain language.

### 5.3.2. Attitudes Toward Readability (H2)

When combining all items regarding perceived comprehension, on average all participants rather agree that participatory budgeting proposals are overall easy to understand ( $M = 3.68$ ,  $STD = 0.66$ ). However, the assumption previous made (i.e., H2) that people with reading and writing deficits perceive proposals as more difficult to comprehend ( $N = 79$ ,  $M = 3.46$ ,  $STD = 0.68$ ) than people without these deficits ( $N = 196$ ,  $M = 3.77$ ,  $STD = 0.63$ ,  $t(274) = 3.60$ ,  $p < .01$ ) can be confirmed.

More specific, people with reading or writing deficits, perceive significantly more confusing terms in the proposals ( $N = 79$ ,  $M = 2.49$ ,  $STD = 1.02$ ,  $p < .01$ ,  $U = 5625$ ,  $r = .22$ ) and are significantly more likely to perceive the proposals as too long to be useful ( $N = 79$ ,  $M = 2.89$ ,

<sup>8</sup><https://www.respondi.com>

<sup>9</sup>Although the study was conducted prior to the artificial intelligence hype caused by the development of ChatGPT, our results remain relevant. There is no clear indication that the use of AI tools in everyday life in Germany has changed between 2022 and 2024 (MeMo:KI, 2024).

$STD = 0.89$ ,  $t(274) = -3.20$ ,  $p < .01$ ,  $r = .2$ ) in comparison to people without these deficits ( $N = 196$ ,  $M_{terms} = 2.00$ ,  $STD_{terms} = 0.85$ ,  $M_{length} = 2.51$ ,  $STD_{length} = 0.89$ ). However both groups do not perceive significant comprehension differences in the structure of the proposals ( $M_{without} = 3.85$ ,  $M_{with} = 3.67$ ,  $p > .05$ ). See Figure 2 for a graphical overview of the results.

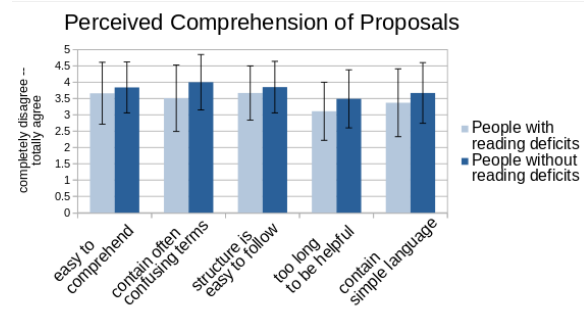


Figure 2: Mean (and standard deviation) values of people with and without reading deficits regarding perceived comprehension of proposals.

### 5.3.3. Attitudes Toward Text Simplification and Related NLP Tasks (H3)

Furthermore, we compared how comfortable both groups feel with automatic simplification, automatic summarization and automatic translation (all supported by artificial intelligence).

People with reading and writing deficits feel more comfortable with automatic simplification ( $N = 79$ ;  $M = 3.52$ ,  $STD = 1.14$ ) than people without these deficits ( $N = 196$ ,  $M = 3.19$ ,  $STD = 1.02$ ,  $p < 0.05$ ,  $t(274) = -2.30$ ,  $r = .13$ ). Whereas people with reading and writing deficits feel less comfortable with automatic translation ( $N = 79$ ,  $M = 3.43$ ,  $STD = 1.13$ ) than people without these deficits ( $N = 196$ ,  $M = 3.78$ ,  $STD = 0.89$ ,  $p < .01$ ,  $U = 6449.5$ ,  $r = .13$ ). No significant difference exist between their answers regarding automatic summarization ( $M_{with} = 3.46$ ,  $STD_{with} = 1.05$ ,  $M_{without} = 3.39$ ,  $STD_{without} = 1.02$ ,  $p > 0.1$ ). See Figure 3 for a graphical overview of the results.

In summary, both groups have same acceptance of text summarization, but people with reading and writing deficits feel more comfortable with machine simplification whereas people without these deficits feel more comfortable with machine translation.

### 5.3.4. Influence of Text Simplification on the Usage Intention (H4, H5, H6)

Next, we computed a two-way ANOVA to analyze the role of participation and differences of text simplification style (see Table 3). The analysis shows

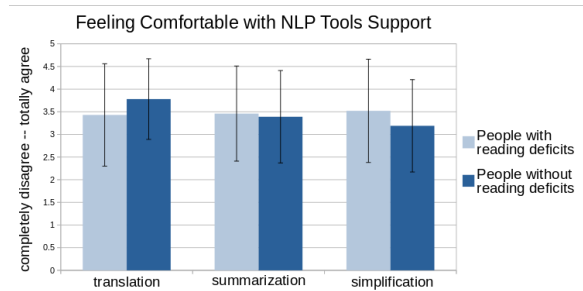


Figure 3: Mean (and standard deviation values) of people with and without reading deficits regarding support of NLP tools in e-participation processes.

Source	SS	df	MS	F	p	$\eta_p^2$
Corrected Model	1,507	5	0.301	0.500	0.776	0.009
Intercept	4037.845	1	4037.845	6696.051	0.000	0.961
TS-Type	0.578	2	0.289	0.479	0.620	0.004
Role	0.123	1	0.123	0.204	0.652	0.001
TS-Type * Role	0.763	2	0.381	0.632	0.532	0.005
Error	162.815	270	0.603			
Total	4206.200	276				
Corrected Total	164.322	275				

Table 3: ANOVA summary table for usage intention considering text simplification type (none, manual, or automatic) and participant role (author or reader).  $SS$  = Sum of Squares,  $df$  = degrees of freedom,  $MS$  = Mean Square,  $F$  = F value,  $p$  = p value,  $\eta_p^2$  = Partial Eta Squared.

that there is no significant difference in the usage intention to the role of participation (author, reader;  $F(1, 270) = 0.479$ ,  $p > .05$ ; see line 4 in Table 3) or the types of text simplification (none, manual, automatic;  $F(2, 270) = 0.204$ ,  $p > .05$ ; see line 3 in Table 3). The interaction effect of role of participation and style of simplification on the usage intention is also not significant ( $F(2, 270) = 0.632$ ,  $p > .05$ ; see line 5 in Table 3). The usage intention therefore does not depend on the role of participation or the text simplification style. Overall, none of our hypotheses (H4, H5, and H6) could be confirmed. Since no significant effects could be detected, no post hoc-tests are necessary.

So we can transfer the results of Vollenwyder et al. (2018) also to e-participation: no unintended side-effect exists for participants without reading and writing difficulties when reading proposals in standard language and plain language side-by-side. Furthermore, we can extend these findings: the support of artificial intelligence (assuming the output of automatic text simplification systems are comparable to manual simplifications) does not negatively (or positively) influence the acceptance of e-participation, whether or not the participants wrote or only read the proposal.



## 6. Conclusion

In this study, we showed the need for simplification of proposals in deliberative citizen participation processes and investigated the effect of text simplification (with and without artificial intelligence support) on the acceptance of open participation processes, such as participatory budgeting. In conclusion, all results are summarized in Table 4.

H	Question	Section	Result
H1	Are proposals difficult to comprehend?	4	✓
H2	Are proposals more difficult to comprehend for people with reading difficulties than for others?	5.3.2	✓
H3	Do individuals with reading/writing difficulties expect greater benefit from simplification compared to other people?	5.3.3	✓
H4	Does the simplification of proposals have an impact on the acceptance of e-participation processes?	5.3.4	x
H5	Does the style of simplification influence e-participation acceptance?	5.3.4	x
H6	Does the role of participants influence e-participation acceptance?	5.3.4	x

Table 4: Overview of results per hypothesis.

In more detail, the results of our study show, on the one hand, that the proposals of e-participation process are difficult to comprehend (see H1), and even more difficult to comprehend for people with reading problems and for others (see H2). Further, we showed that (especially) people with reading problems welcome the assistance of NLP tools in e-participation processes, e.g., automatic text simplification, or text summarization, to overcome this issue (see H3).

On the other hand, we found that text simplification has no direct influence on the intention to use e-participation (H4). We could not find a significant effect for participants who would write or read a simplified proposal (see H6). Further, neither manual nor automatic simplification seem to have an effect on its usage intention (see H5). Although a higher level of participation cannot be achieved by text simplification, our results also show that text simplification does not have a negative influence on the intention to use e-participation. Thus, website providers do not have to fear unwanted side effects for participants without reading and writing problems. Accordingly, participants are not bothered by the simplification of their texts or those of other citizens.

Furthermore, people with reading and writing difficulties prefer text simplification for proposals in e-participation over their automatic translation or summarization. Hence, adding automatic text simplification systems to e-participation processes can be a meaningful contribution by making it easier for many people to understand complex proposals.

## 7. Limitations & Future Work

Unfortunately, the number of participants with reading and writing deficits in our experiment was comparatively small, which may be due to similar reasons as the low participation rate in online participation processes, e.g., this target group is difficult to reach. Due to the small number of participants with reading and writing deficits in this study, no highly reliable or causal statements can be made, but they do provide initial indications of the importance of text simplification in the context of e-participation.

Furthermore, the idiosyncrasies of the proposal text might have an effect of the results, in future work, the study could be repeated with alternating simplification of different proposals.

In future work, we would like to conduct a qualitative field experiment with people with reading and writing deficits which might evoke less barriers as a direct contact person could be present to give further explanations similar as described in the study by Säuberli et al. (2024). Further, in this experiment, the usage of real generated simplifications of a text simplification system could be tested, which was currently not possible, because current state-of-the-art German text simplification systems do not support user-generated texts or online participation proposals. Based on the results of our study, further investigation into text simplification for proposals in deliberation processes, or for user-generated texts in general, would be worthwhile.

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## **A. Pre-study**

Version	Text	Mean	Std
A	Ich würde mir wünschen, dass im gesamten Stadtgebiet Foodsharing-Stationen aufgestellt werden, in denen nicht verbrauchte oder abgelaufene Lebensmittel, die noch ohne Bedenken konsumiert werden können, an alle Bürger/innen weitergegeben werden könnten. Die Stationen sollten nach Möglichkeit gut mit öffentlichen Verkehrsmitteln erreicht und vor Vandalismus geschützt werden können.	5.48	1.6
B	Ich würde mir sogenannte Foodsharing-Stationen im gesamten Stadtgebiet wünschen. In diesen Stationen könnten Lebensmittel an alle Bürger/innen weitergegeben werden. Die Lebensmittel wären entweder nicht verbraucht worden oder wären abgelaufen. Sie könnten aber noch ohne Bedenken konsumiert werden. Wenn möglich, sollten die Stationen gut mit öffentlichen Verkehrsmitteln erreichbar sein. Am besten sollten die Stationen vor Vandalismus geschützt werden können.	4.62	1.56
C	Ich wünsche mir sogenannte Foodsharing-Stationen im gesamten Stadtgebiet. In diesen Stationen können Lebensmittel an alle Bürger/innen weitergegeben werden. Die Lebensmittel sind entweder nicht verbraucht worden oder sind abgelaufen. Sie könnten aber noch ohne Bedenken konsumiert werden. Andere können das Essen vielleicht noch verwenden. Wenn möglich, sollen die Stationen gut mit öffentlichen Verkehrsmitteln erreichbar sein. Am besten sollen die Stationen auch vor Vandalismus geschützt werden.	5.52	1.29
D	Ich wünsche mir sogenannte Foodsharing-Stationen in der ganzen Stadt. In diesen Stationen kann Essen an alle Bürger/innen weitergegeben werden. Das Essen ist entweder nicht gegessen worden oder es ist abgelaufen. Das Essen kann aber noch problemlos gegessen werden. Andere können es vielleicht noch verwenden. Wenn möglich, sollen die Stationen gut mit Bus und Bahn erreichbar sein. Am besten sollen die Stationen auch vor absichtlicher Beschädigung geschützt werden.	5.38	1.2
E	Ich wünsche mir sogenannte Foodsharing-Stationen in der ganzen Stadt. In diesen Stationen kann Essen an alle Bürger/innen weitergegeben werden. Jemand hat das Essen nicht gegessen oder es ist schon abgelaufen. Das Essen kann aber noch problemlos gegessen werden. Andere können es vielleicht noch verwenden. Wenn möglich, sollen die Stationen gut mit Bus und Bahn erreichbar sein. Am besten sollen die Stationen auch vor absichtlicher Beschädigung geschützt werden.	5.19	1.36
F	Ich wünsche mir sogenannte Foodsharing-Stationen in der ganzen Stadt. In diesen Stationen kann Essen an alle Bürger/innen weitergegeben werden. Jemand hat das Essen nicht gegessen oder es ist schon abgelaufen. Das Essen kann aber noch problemlos gegessen werden. Andere können es vielleicht noch verwenden. In den Stationen kann das Essen gesammelt und geteilt werden. Dann muss man das Essen nicht wegwerfen und verschwenden. Wenn möglich, sollen die Stationen gut mit Bus und Bahn erreichbar sein. Am besten sollen die Stationen auch vor absichtlicher Beschädigung geschützt werden.	5.33	1.2
G	Ich wünsche mir sogenannte Foodsharing-Stationen in der ganzen Stadt. Foodsharing ist der englische Begriff für „Essen teilen“. In diesen Stationen kann Essen an alle Bürger/innen weitergegeben werden. Jemand hat das Essen nicht gegessen oder es ist schon abgelaufen. Das Essen kann aber noch problemlos gegessen werden. Andere können es vielleicht noch verwenden. In den Stationen kann das Essen gesammelt und geteilt werden. Dann muss man das Essen nicht wegwerfen und verschwenden. Wenn möglich, sollen die Stationen gut mit Bus und Bahn erreichbar sein. Am besten sollen die Stationen auch vor absichtlicher Beschädigung geschützt werden.	5.86	1.24
<b>B (translated)</b>	I would like to see so-called food sharing stations throughout the city. At these stations, food could be passed on to all citizens. The food would either not have been consumed or would have expired. However, they could still be consumed without hesitation. If possible, the stations should be easily accessible by public transportation. Ideally, the stations should be able to be protected from vandalism.		
<b>G (translated)</b>	I would like to see so-called foodsharing stations all over the city. Foodsharing is the English term for “sharing food”. At these stations, food can be passed on to all citizens. Someone has not eaten the food or it has already expired. But the food can still be eaten without any problem. Others may still be able to use it. In the stations the food can be collected and shared. Then there is no need to throw the food away and waste it. If possible, the stations should be easily accessible by bus and train. Preferably, the stations should also be protected from intentional damage.		

Table 5: Simplified variants of the proposal and its simplicity scores of the pre-study.