Why did I receive a parking fine? A vignette-based study into the effects of algorithmic decision-making transparency on institutional trust

Zijlstra, Jeske

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Author: Jeske Zijlstra
Student number: s3737586
Master program: International & European Governance (Public Administration)
Date: June 9, 2023
Capstone: Towards Digital Transformation and the Algorithmic Bureaucracy
Professor: H. Huang
Word count complete document: 17543
Word count excluding appendices: 13134
Number of pages: 73

Preface

Ahead of you lies the master's thesis "Why did I receive a parking fine? - A vignette-based study into the effects of algorithmic decision-making transparency on institutional trust." I wrote this thesis to fulfill the graduation requirements of the master's program in International & European Governance (Public Administration) at Leiden University in the Hague, the Netherlands. I have been researching and writing my thesis from March to June 2023.

The summer school for Female Leadership in the Digital Age of the European Leadership Academy inspired me to enroll in the capstone "Towards Digital Transformation and the Algorithmic Bureaucracy." Participating in the summer school created an enthusiasm for the role between artificial intelligence (AI) and the public sector. Writing this thesis has given me many new insights, as it is a topic I had little knowledge about, yet is and is becoming incredibly important to society.

I thank my supervisor Hsini Huang for the guidance and constructive feedback during the past few months. You taught me more about the relationship between AI and the public sector, and my research skills have also extended. In addition, I would like to thank my friends (Nona, Daniek, and Pauline) and my family (especially my sister and sociologist-to-be) for their support. Sharing and discussing my thesis process was incredibly worthwhile and pleasant. Writing a thesis, completing courses, taking an internship, and orienting myself to my onward career were not always easy to manage. Nevertheless, I am proud of the work in front of you: I hope you will enjoy reading it.

Jeske Zijlstra

Rotterdam, June 8th, 2023

Abstract

Since the rise of artificial intelligence (AI) and its increased use in the public sector, there has been a two-fold debate in practice and academia about the relationship between transparency and trust. On the one hand, transparency can create an open government culture and improve trust; on the other hand, transparency confuses citizens and leads to delegitimization of government. This research contributes to the debate by examining the effect of algorithmic decision-making transparency on institutional trust and procedural fairness's role in this relationship through a quantitative vignette study focusing on enforcing parking fines. The study distinguishes itself from others by measuring institutional trust by three dimensions (competence, benevolence, and honesty) and transparency by two dimensions (accessibility and explainability). The results reveal that: (1) accessibility increases institutional trust and trust in the competence and benevolence of the institution; (2) explainability increases institutional trust and trust in the competence of the institution; (3) procedural fairness negatively affects the relationship between accessibility and institutional trust and between accessibility and trust in the competence of the institution; (3) procedural fairness positively affects the relationship between explainability and trust in the benevolence of the institution. These results imply that institutional trust is multidimensional and can be influenced differently but that access and explainability of decision-making increase trust. Furthermore, local governments can make greater use of the Dutch algorithm registry to provide citizens with access and explanations of decision-making to enhance trust in the institution.

Key words: Artificial intelligence, public decision-making, transparency, trust, procedural fairness

Content

1 Introduction

1.1 Research motivation

In April 2021, the European Commission announced plans to develop a strategy (the AI Act) for regulating artificial intelligence (AI). The AI Act is the world's first legal framework for AI and should ensure that European citizens will trust the use of AI (European Commission, 2021). However, the fact that trust is an essential value for the development of the Act is not uncommon; European citizens declare low trust in using AI in government (Castro & McLaughlin, 2021; Joint Research Centre, 2023). Hence, member states are developing remedies to ensure fruitful AI applications are not lost and that governmental decisions remain legitimate (Joint Research Centre, 2023).

One of the steps the Dutch government has taken to boost trust in the government is to develop an algorithm registry where public organizations can disclose their algorithms. For example, 1 of the 117 algorithms published on the registry relates to parking controls in the municipality of Rotterdam (Het Algoritmeregister, 2023). The parking control algorithm is a self-learning algorithm that uses photos of license plates to determine whether someone gets charged a fine for not having a permit or the absence of payment. Before a fine is issued, an employee of the municipality verifies the situation. Publicizing specific algorithms increases public information by the government, openness to societies' initiatives, accountability, and innovative technology (Rijksoverheid, 2023).

Although the registry is primarily focused on transparency about algorithms, this does not mean it always positively impacts trust. Whereas 'transparency optimists' argue that transparency enhances an open governmental culture, fosters greater trust in government, and reduces public corruption, the 'transparency pessimists' stress that transparency can confuse citizens, cause scandals related to misinformation, and even delegitimization of government (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014). Accordingly, this two-sided debate has received much attention in both practice and science since the emergence of AI, but empirical evidence is scarce and ambiguous.

This research seeks to contribute to the discussion and focuses on decision-making transparency and institutional trust. Decision-making transparency refers to the accessibility and explainability of information related to the steps leading to the decision (Grimmelikhuijsen,

2022; Grimmelikhuijsen et al., 2013). Institutional trust concerns confidence in public institutions' management design and performance (Kaasa & Andriani, 2021). Expected is that the accessibility to and explainability of decision-making transparency enhance institutional trust. Besides, when individuals experience fair procedures, the relationship between decision-making transparency and institutional trust strengthens. Namely, by providing access to the data and explaining the steps leading to the decision, public institutions can exhibit that decisions are not affected by bias or self-interest (Grimmelikhuijsen, 2022). Consequently, the public senses a feeling of control, increasing trust in the institution (De Fine Licht & De Fine Licht, 2020).

1.2 Research objective

This research aims to provide more insight into the relationship between algorithmic decision-making transparency and institutional trust and the moderating effect of procedural fairness. This objective can be accomplished by conducting quantitative research with a specific target group of citizens of the municipality of Rotterdam.

1.3 Research questions

The following research question is central to this study: *To what extent does algorithmic decision-making transparency contribute to the institutional trust of citizens in the municipality of Rotterdam, and what is the moderating effect of procedural fairness?*

Using the following sub-questions, the research question can be answered:

- How does decision-making transparency relate to institutional trust?
- To what extent is the relationship between decision-making transparency and institutional trust moderated by procedural fairness?

1.4 Scientific relevance

The effect of government transparency on trust is not a silent debate. In the policy sector, high transparency is often associated with high trust. However, empirical evidence is scarce, ambiguous, and little is known about how the relationship affects different social groups (Grimmelikhuijsen & Meijer, 2014; Janssen et al., 2020). Therefore, this study chose citizens of the Rotterdam municipality as a target group to understand better how transparency and trust relate to each other. In particular, a Dutch context makes this research unique. Because of the

child benefit scandal in the Netherlands, the role of AI in government is even more debated (Henley, 2021).

Since transparency and trust are broad concepts, studies measure them in multiple ways. For example, Grimmelikhuijsen and Meijer (2014) focus on policy outcome transparency, while this study puts decision-making transparency first. This study focuses on this specific form of transparency because AI seems, nowadays, more involved in decision-making (De Fine Licht & De Fine Licht, 2020). According to Alon-Barkat and Busuioc (2022), algorithms are frequently used to support the human decision-maker in bureaucratic contexts. Besides a different form of transparency, different methods can measure trust. For instance, Grimmelikhuijsen (2022) uses honesty as a central indicator of the trustworthiness of another, whereas this study concentrates on three dimensions: competence, benevolence, and honesty. This combination is used in this study because it assembles a more comprehensive view of the perceived trustworthiness of a public institution (Grimmelikhuijsen & Meijer, 2014). Even when it comes to the decision-making by both AI and humans, these dimensions prove most capable of measuring institutional trust (Choung et al., 2022b).

In addition, some empirical studies centralize the decision-maker in the relationship between transparency and trust and investigate whether the explainability of AI will help decision-makers and bureaucrats make correct decisions (Janssen et al., 2020). In contrast, this study will emphasize citizens' perceptions. In this way, an attempt was made to contribute to the empirical gap prevailing in the relationship between transparency and trust related to AI in public decision-making.

1.5 Societal relevance

The social relevance of this research is that public organizations, like municipalities, can gain more insights into transparency as a possible determinant of citizens' trust in the municipality. On the one hand, municipalities will know better where to spend their money: in other departments or in publicizing algorithms used in decision-making (Grimmelikhuijsen & Meijer, 2014). On the other hand, being trustworthy is a precondition to the effective functioning of public institutions. "If authorities must continually explain and justify their decision, their ability to manage effectively is diminished" (Van den Bos et al., 1998, p. 1449). Besides, governments must ensure the legitimation of their decisions and keep practical AI applications (Joint Research Centre, 2023).

1.6 Structure of the thesis

The structure of this thesis is rather straightforward. Chapter 2 (Theoretical framework) describes the role of AI in the public sector and examines the relevant concepts of this study, like institutional trust, decision-making transparency, and procedural fairness. Then, a conceptual model visually presents the hypotheses. Consequently, chapter 3 (Methodology) will discuss various aspects of gathering empirical data. For example, the vignette study's data collection strategy, research target, and design will be discussed. Furthermore, the operationalization of relevant concepts, assurance of validity and reliability, and ethical aspects of this study will be debated. After the methodology, chapter 4 (Results) will dive deeper into the characteristics of the sample. These descriptive statistics are then followed by a multivariate ANOVA that examines whether the variables are balanced between the different vignette groups. A correlation test will follow, and linear regression analyses will be performed to test the hypotheses. Finally, chapter 5 (Conclusion) answers the research question. Further, the limitations of this study, recommendations for future research, and practical recommendations for the municipality of Rotterdam will be discussed in this chapter.

2 Theoretical framework

2.1 AI and the public sector

The US and China are indisputable frontrunners in AI usage and AI research, followed by Europe, where developments are a bit slower (Castro & McLaughlin, 2021; Rathenau Instituut, 2021). Nevertheless, even in Europe, the use of AI increases daily. From Netflix recommending certain movies to speech predictions on our phones, algorithms are transforming societies (Busuioc, 2021). Simply stated, algorithms are rules applied sequentially (Busuioc, 2021). Not solely in a subtle way do algorithms play a part in our lives, but also more rigorously, such as in life-death situations where self-driving cars must choose, for example, between saving the rider or a pedestrian on the road. The rise of algorithms extends beyond just the private sector - algorithms are also widely used in government organizations (Busuioc, 2021; Janssen et al., 2020).

According to the Joint Research Centre (2023) of the European Commission, the public sector has various relations with AI. On the one hand, governments can regulate AI by developing rules. On the other hand, they can support AI development by making money available for AI-related projects. In addition, governments use AI themselves and can develop new techniques. For instance, AI can be used to improve public services for citizens and innovate internal processes of governments because AI can process many data (Joint Research Centre, 2023). Hence, the EU is trying to build capacity with member states by conducting joint research, establishing funds, and improving skills (Joint Research Centre, 2023).

The Netherlands is a member state with a leading AI position in the EU. To illustrate, the Netherlands has excellent research on AI, an active and skilled community, and many companies are constantly looking for innovative AI techniques (Ministerie van Economische Zaken en Klimaat, 2019; Rathenau Instituut, 2021). Moreover, the country wants to develop in AI; the Netherlands acknowledges that AI is socially and economically relevant in various sectors (Ministerie van Economische Zaken en Klimaat, 2019). Therefore, the Dutch government uses or aims to use AI for, amongst others, prevention in health care, reducing air pollutant emissions, analyzing traffic behavior, and determining the height of student loans (Grimmelikhuijsen, 2022). Besides, AI is used to optimize work processes within the Dutch government.

Although AI is widely used, applying these techniques is not without risk. In the Netherlands, for example, the child benefit scandal damaged trust in the national government because "the Dutch tax authorities mistakenly stopped the childcare benefits of a large number of parents (mostly of dual nationality), who were wrongly treated as fraudsters" (Berends, 2021, p. 1). As a result, thousands of families were flagged as potentially fraudulent by using unregulated algorithms (Amnesty International, 2021). While this is an example in the Dutch context, trust in AI seems to play a major role in the development of AI. Therefore, low trust in AI explains the EU's moderate competitiveness against the U.S. and China (Castro & McLaughlin, 2021). Due to AI techniques, European citizens fear discrimination, vague decision-making, and privacy violations. Innovation-restricting measures, accordingly, characterize European regulation around AI (Castro & McLaughlin, 2021).

The trustworthiness of AI is one of the biggest challenges of governments in the digital era (Joint Research Centre, 2023). Citizens must trust the application of AI in the public sector because if they do not, government decisions may lose legitimacy, and fruitful AI applications may be lost (Joint Research Centre, 2023). The next section will further explore the relationship between AI and trust, especially in public institutions.

2.2 The effect of AI on institutional trust

Trust is central in many disciplines such as sociology, psychology, economy, and political science (Grimmelikhuijsen et al., 2013). Within social science, trust is defined as "a psychological state compromising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (Rousseau, Sitkin, Burt & Camerer, 1998, p. 395). The concept is highly related to relationships between people and is about "one's belief in another's ability, benevolence, and integrity" (Choung et al., 2022b, p. 734). Ability refers to competence and looks like effectiveness; it involves the knowledge and skills to operate effectively (Grimmelikhuijsen & Meijer, 2014). Benevolence is about the intentions of another, whether one cares about the others (Grimmelikhuijsen & Meijer, 2014). Finally, scholars view sticking to agreements and telling the truth as honesty – also called integrity (Grimmelikhuijsen & Meijer, 2014).

Whereas the above definition concerns the perception of the trustworthiness of another, this research focuses on the trustworthiness of public institutions. This form of trust is called institutional trust and can be explained by two approaches (Kaasa & Andriani, 2021). Firstly,

the institutional performance approach argues that institutional trust stems from institutional performance (Kaasa & Andriani, 2021). In other words, citizens trust the government when a government shows effective administration or can boost economic performance. Secondly, the social trust approach demonstrates that civic engagement enhances institutional trust (Kaasa & Andriani, 2021). In addition, cooperation among citizens and having social relations creates an extension of the trust individuals feel for each other. Combining aspects from both approaches leads to the following definition of *institutional trust* used in this study: the confidence in the management design and performance of public institutions (Kaasa & Andriani, 2021).

Because trust is such a broad concept, different methods measure trust. For example, Grimmelikhuijsen (2022) exclusively captures honesty as part of the trustworthiness of another, while Grimmelikhuijsen and Meijer (2014) take all three dimensions (honesty, benevolence, competence) into account. Furthermore, Grimmelikhuijsen and Meijer (2014) acknowledge that these dimensions are interrelated but measure separate events. Therefore, in this study, it is decided to follow their lead and measure all three dimensions. Consequently, when a citizen perceives a public institution to be effective, skillful, and capable of making decisions (competence), caring about the interests of citizens (benevolence), and telling the truth (honesty), the institution is perceived as trustworthy (Grimmelikhuijsen & Meijer, 2014).

Contemporary studies examining the interaction between AI and trust are primarily focused on trust as a predictor of technology acceptance. In contrast, the earlier focus was on usability and attitudes toward AI in organizations (Glikson & Woolley, 2020). However, trust has taken on an increasingly prominent role because of the complexity of AI and the unpredictability of AI behaviors (Glikson & Woolley, 2020). For example, people are afraid of losing their jobs because technology could slowly take them over. Accordingly, confidence in AI is not static; it can unfold differently (Glikson & Woolley, 2020). As a result, people may have low trust in AI beforehand, while this may increase after an initial interaction with AI. On the contrary, perceived trustworthiness of AI may diminish over time as people encounter errors and malfunctions (Glikson & Woolley, 2020).

According to McKnight et al. (2011), trust in technology is disparate from trust in humans since AI lacks moral responsibility. Therefore, trust in technology should be measured by functionality, reliability, and helpfulness instead of competence, benevolence, and honesty (McKnight et al., 2011). Here, functionality relates to what the technology can and cannot do,

reliability concerns integrity, and helpfulness is about the degree of usefulness for users (McKnight et al., 2011). Yet, AI is increasingly combined with a human element, showing that the dimensions of competence, benevolence, and honesty paint a more accurate portrait regarding the use of AI in public institutions (Choung et al., 2022b). Hence, as noted before, this research uses the dimensions related to trust in humans operationalized by Grimmelikhuijsen and Meijer (2014).

2.3 Transparency as an explaining factor of institutional trust

One of the ways the Dutch government is trying to boost institutional trust is by placing applied algorithms in the algorithm registry. Sharing this kind of information on processes and performance is also called transparency and forms one of the many drivers of trust (Grimmelikhuijsen et al., 2013; Moore, 2018). Although most definitions relate to the extent of accessibility and explainability of information, a general, concrete definition is hard to find since the concept applies to multiple academic disciplines (Grimmelikhuijsen, 2022). For that reason, this study concentrates on a specific form of transparency: government transparency. Government transparency is a concept used widely in studies to describe the accessibility of information on decision-making, processes, budgets, or performance of governmental bodies (Cucciniello et al., 2017). In this study, explainability is added, resulting in the following definition of government transparency: the accessibility and explainability of information on decision-making, processes, budgets, or performance of governmental bodies (Cucciniello et al., 2017; Grimmelikhuijsen, 2022). Taking both accessibility and explainability into account leads to the most comprehensive definition. This working definition has also been applied to empirical studies and found to be operationalizable (Grimmelikhuijsen, 2022).

That governments use AI frequently leads to debates according to transparency supporters and opponents. Following the 'transparency optimists', transparency enhances an open governmental culture, fosters greater trust in government, and reduces public corruption (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014). 'Transparency pessimists', on the contrary, stress that transparency can confuse citizens, cause scandals related to misinformation, and even delegitimization of government (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014).

The debate between supporters and opponents of transparency also concerns the extent to which AI should completely take over human processes. On the one hand, pure automation

might increase the effectiveness in organizations as algorithms could take over routinized tasks (Enarsson et al., 2021; Janssen et al., 2020). However, on the other hand, including humans is a way to ensure accountability and quality (Busuioc, 2021; Enarsson et al., 2021; Janssen et al., 2020). The European Commission supports this finding and stresses that human choice must be allowed when making decisions (Enarsson et al., 2021). This form of decision-making is called hybrid or semiautomated decision-making, in which humans and AI systems interact (Enarsson et al., 2021). Here, humans control and oversee algorithmic processes by correcting mistakes (Busuioc, 2021). To illustrate, algorithms related to facial recognition display more significant error rates for minorities (Busuioc, 2021). Fully automated decision-making would not consider these errors or even recognize them, while an individual's engagement could overcome these errors (Busuioc, 2021; Janssen et al., 2020). In the case of the parking controls in the municipality of Rotterdam, hybrid decision-making also occurs. For example, a parking enforcement officer will always check the photo of a license plate to determine whether issuing a fine is accurate (Het Algoritmeregister, 2023).

Since government transparency is still a broad concept, and AI is used increasingly in public decision-making, this study deals specifically with decision-making transparency as an activity of the government. Decision-making transparency is a form of government transparency, just as transparency of policy content and policy outcomes of effects (Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014). Decision-making transparency relates to the rationale behind the decision and the steps leading to this decision (Grimmelikhuijsen et al., 2013). When decision-making transparency is present, the public can assess if the decision outcome is accurate. Policy transparency follows from decision-making - it concerns information about the policy itself, such as the regulations and their implications for the public (Grimmelikhuijsen et al., 2013). Policy outcome transparency refers to policy results and relevant data that is available to the public (Grimmelikhuijsen et al., 2013). It follows policy transparency.

To conclude, decision-making transparency plays a central part in this study regarding the parking controls in the municipality of Rotterdam. In this research, *decision-making transparency* is defined as the accessibility and explainability of information related to the steps leading to the decision (Grimmelikhuijsen, 2022; Grimmelikhuijsen et al., 2013). When this form of transparency is present in a public institution, trust in the institution might expand (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014).

Namely, by explaining the role of algorithms in hybrid decision-making and the steps leading to the decision, public institutions can exhibit that decisions are not affected by bias or self-interest (Grimmelikhuijsen, 2022). Besides, providing access to algorithms is vital; it contributes to accountability (Grimmelikhuijsen, 2022). Based on these findings, the subsequent hypothesis is derived.

H1: Decision-making transparency (considering accessibility, explainability, or both) positively influences institutional trust (considering competence, benevolence, or honesty) more than no decision-making transparency.

2.4 Experiencing a fair procedure can increase the effect of transparency on trust

By making information about decision-making accessible and explaining why individuals receive a parking fine, they will see that decisions are not influenced by the bias or self-interest of the decision-maker (Grimmelikhuijsen, 2022). In other words, individuals can use decision-making information to evaluate whether decision-making procedures were utilized fairly. This effect is called the procedural fairness effect and finds its antecedents in the procedural justice theory, often used in legal studies (Tyler, 2006). According to the theory, individuals have different rationales for obeying the law (Molm et al., 2003). Following a normative approach, individuals are concerned about whether outcomes are achieved through fair proceedings (Tyler, 2006). Normative aspects include neutrality, lack of bias, and honesty (Tyler, 2006). So, people in court focus on the procedure rather than the outcomes of their experiences. When they feel that the judge is neutral and has good reasons for the decision, people will react positively regardless of the favorable outcome (Tyler, 2006).

Conversely, individuals tend to focus on the favorability of decision-making outcomes viewed from an instrumental approach. These individuals care about the justice of outcomes and whether they receive the outcomes they believe to deserve (Tyler, 2006). Obeying the law, therefore, depends on the perceived "justice of outcomes (distributive justice) and of the procedures by which they are arrived at (procedural justice)" (Tyler, 2006, p. 5). Since this research examines the effect of decision-making transparency on institutional trust, there is solely attention on the normative approach of the procedural justice theory, meaning that there will not be a focus on the justice of outcomes. Rather, it is about the perceived procedural fairness of decision-making. Whereas procedural justice is a commonplace concept with legal scholars and psychologists (Molm et al., 2003), previous studies related to sociology and public

administration showed that fair procedures enhanced multiple positive attitudes from citizens, including an increase in trust in public institutions (Tyler, 2006; Valkeapää & Seppälä, 2014, Van den Bos et al., 1998). These studies ascertain that the procedural fairness framework also applies to this research.

The degree of perceived fairness in decision-making depends on several factors. First of all, individuals can review multiple sorts of information that are made public. On the one hand, organizations might aim for transparency in the process of decisions (*accessibility*) (De Fine Licht & De Fine Licht, 2020). Related to AI, this would mean that the deliberations of the programmers, training data, testing data, source code, and records should be accessible to the public (De Fine Licht & De Fine Licht, 2020). On the other hand, organizations might aim for transparency in rationale, describing the reasons for making specific decisions (*explainability*) (De Fine Licht & De Fine Licht, 2020). Here, information about the explanation for the decision and the person accountable for the decisions should be offered (De Fine Licht & De Fine Licht, 2020).

While both forms of information seem to enhance positive aspects like increased public understanding and the feeling of control among the public, this is not necessarily the case. Therefore, according to De Fine Licht and De Fine Licht (2020), organizations must strive for transparency in rationale instead of transparency in the process because transparency in the process might have negative implications. For instance, by revealing the source code, it is easier for the AI industry to copy it rather than develop new ones (De Fine Licht & De Fine Licht, 2020). Also, individuals have much information to process when reviewing datasets and records, which could lead to information overload because human capacity has limited ability to process information (De Fine Licht & De Fine Licht, 2020). Furthermore, information about the process might be too complex for ordinary citizens (De Fine Licht & De Fine Licht, 2020).

By contrast, transparency in rationale will provide individuals with just the right amount of information they need to assess whether they have been treated fairly (De Fine Licht & De Fine Licht, 2020). This sort of information is called a policy of justifications and contains an explanation of the steps leading to the decision and the name of the responsible actor (De Fine Licht & De Fine Licht, 2020). Consequently, this will enhance the quality of decisions since decision-makers pay more attention to explaining the decision and the rationales (De Fine Licht & De Fine Licht, 2020). Besides, the explainability of decision-making allows individuals to

understand better why they are being fined, for example, which causes them to be more likely to acquiesce to a decision that is not beneficial to them (De Fine Licht & De Fine Licht, 2020). Even though De Fine Licht and De Fine Licht advise explainability of decision-making solely, this research investigates accessibility as well because, theoretically, both dimensions are essential factors in increasing trust in institutions (Grimmelikhuijsen, 2022; Grimmelikhuijsen et al., 2013).

The second factor on which perceived procedural fairness is dependent is the degree of stakes one has in the decision. Grimmelikhuijsen (2022) showed that in decisions with higher stakes, both explainability and accessibility of decision-making information play a part. This aligns with the assumption of the procedural justice theory: perceived fairness is of foremost importance in decisions where one has higher stakes in the outcome (Tyler, 2006). However, only explainability seemed to be relevant in other situations, meaning that accessibility of information is not as important as it looks (De Fine Licht & De Fine Licht, 2020; Grimmelikhuijsen, 2022). This finding will be examined further in this study.

Perceived procedural fairness is also affected by prior knowledge and one's predisposition to government, forming the third factor. Prior knowledge about the policy weakens the effect of transparency on trust (Grimmelikhuijsen & Meijer, 2014). In other words, when an individual has prior knowledge about a policy, transparency would not change the individual's stance towards the governmental body since the individual has already formed an opinion (Grimmelikhuijsen & Meijer, 2014). The same goes for one's predisposition to trust the government. Perceived trustworthiness in government will increase by a greater degree of policy outcome transparency in groups with citizens with little prior knowledge and low general trust in government (Grimmelikhuijsen & Meijer, 2014). Vice versa, when individuals have a high degree of general trust in government, perceived trustworthiness will decrease significantly to a low extent of policy outcome transparency (Grimmelikhuijsen & Meijer, 2014).

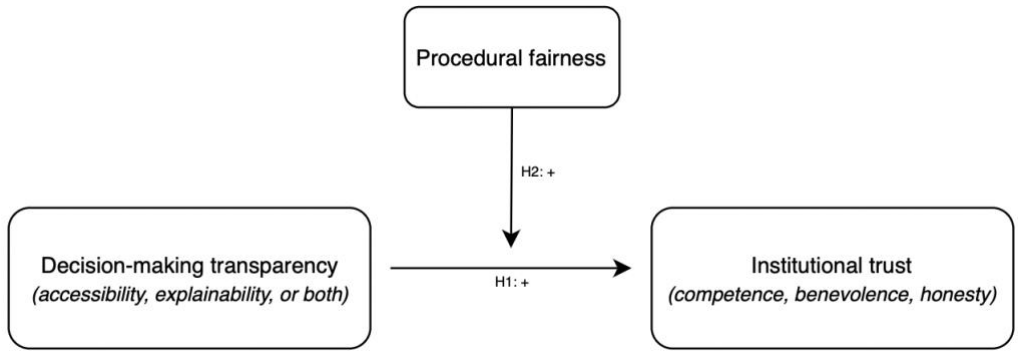
Overall, the empirical results do not seem to cast a unified light on the relationship between transparency and trust in government. On the one hand, most of the empirical evidence did show that transparency positively influences trust (Choung et al., 2022a; Grimmelikhuijsen, 2022; Grimmelikhuijsen & Meijer, 2014; Valkeapää & Seppälä, 2014; Van den Bos et al., 1998). But, on the other hand, this relationship was absent, or there was no equal impact of accessibility

and explainability on trust (De Fine Licht & De Fine Licht, 2020; Grimmelikhuijsen, 2022). The procedural fairness effect can clarify the relationship between transparency and trust because it will increase public understanding and the feeling of control (De Fine Licht & De Fine Licht, 2020). In this way, the procedural fairness effect is comparable to the principal-agent problem, where the parking officer has the agent role, and the public has the principal role. So, when the public gets access to and explanation of decision-making, the public can verify whether the parking officer has treated them fairly and thus considers decisions legitimate (De Fine Licht & De Fine Licht, 2020). Consequently, this sense of control and public understanding leads to trust in the institution (De Fine Licht & De Fine Licht, 2020). Hence, this expectation leads to the following hypothesis and conceptual model (see Figure 1):

H2: Procedural fairness is a positive moderator in strengthening the relationship between decision-making transparency (considering accessibility, explainability, or both) and institutional trust (considering competence, benevolence, or honesty).

Figure 1

Conceptual model



3 Methodology

3.1 Data collection strategy

To analyze the research question, quantifiable data are collected to test the relationship between algorithmic decision-making transparency and institutional trust, with procedural fairness as a moderating variable. More specifically, a vignette study was conducted in which participants were asked to read a constructed description of a situation (the vignette) and answer survey questions about this situation (Atzmüller & Steiner, 2010). Since Qualtrics can randomly divide respondents into groups, the researcher used this program to create the survey and collect respondents. In this way, each group of respondents randomly received one of the four vignettes.

The researcher distributed the questionnaire via WhatsApp, LinkedIn, and Facebook in Dutch and English between April 17 and 26. Reminders were sent out on April 24. Potential respondents were reached via a short message. This message briefly explained the survey topic, the time it would take to complete the survey, and the link to the survey. Potential respondents were also asked to distribute the survey in their network, known as snowball sampling.

3.2 Research target

The research target of this study consists of citizens in the municipality of Rotterdam. The municipality comprises approximately 660.000 citizens and is quite diverse regarding migration backgrounds (Onderzoek 010, 2022). The largest group, 21.1%, is between 27 and 39 years old (Onderzoek 010, 2022). In this research, 68.9% of the respondents are between 21 to 30 years old. Moreover, the sample is highly educated; 39.5% of the respondents have a master's degree. In comparison, only 28% of the citizens in the municipality of Rotterdam have a higher education diploma, bachelor's degree, master's degree, Ph.D. or higher (Centraal Bureau voor de Statistiek, 2020). Regarding car owners, 37% of citizens in the municipality of Rotterdam own a car, and in this sample, 43.7% of the respondents do (Onderzoek 010, 2021). So, the sample is roughly representative of car ownership but not entirely concerning age and education.

3.3 Design of the vignette study

3.3.1 Demographic questions

At the start of the survey, participants filled out questions about their gender, age, education level, monthly income, and political affiliation (see Figure 2 for the survey setup). These variables affect people's predisposition toward trust (Grimmelikhuijsen et al., 2013). Likewise, the participant's income seems to be affecting people's trust in institutions, as individuals with a medium to high income usually have the highest levels of trust (Mingo & Faggiano, 2020). Hence, gross income per month is questioned.

Moreover, participants indicated to what extent they trusted another person. Participants' judgments about other people, also known as interpersonal or social trust, might influence the effect of procedural fairness in the relationship between decision-making transparency and institutional trust (Mingo & Faggiano, 2020). Because people with a reliable social network are more likely to trust institutions than those with a less reliable social network (Mingo & Faggiano, 2020). Since the decision enforcement of the parking controls consists of hybrid decision-making, including both humans and AI, it is relevant to understand to what extent individuals trust others. Three items based on the Social Trust Index (STI) measure interpersonal trust ($\alpha = .723$) (Mingo & Faggiano, 2020).

In addition, participants pointed out whether they own a car and how many times they have received a parking fine in the last two years. Following the procedural justice theory, procedural fairness "is especially relevant for trust in authority when the decision outcome matters more to the recipient" (Grootelaar & Van den Bos, 2018 from Grimmelikhuijsen, 2022, p. 252). Therefore, participants owning a car are expected to feel like they have higher stakes in the decision outcome and value both accessibility and explainability of decision-making. In contrast, participants without a car might have different values (Grimmelikhuijsen, 2022).

Whether citizens of the municipality of Rotterdam have received a fine before this questionnaire is also accordant to ask; having prior knowledge about the policy will weaken the effect of transparency on trust (Grimmelikhuijsen & Meijer, 2014). Citizens who received more fines than others already formed an opinion on how fines are distributed. Hence, they may respond differently to the assigned degree of accessibility and explainability of the role of AI.

Further, the extent to which respondents generally, and thus pre-scenario, trust the municipality is important information. Since trust in the government in the field of AI is expected to be low because of the child benefits scandal in the Netherlands, it is essential to question the participants to what extent they trust the government (Henley, 2021). Hence, institutional trust is measured as a pre-test, and the scale will be addressed later.

Besides, it is relevant to examine to what extent participants had positive experiences with the municipal administration. According to uncertainty reduction theory (URT), individuals experience less uncertainty when they have had previous experience with the municipal Rotterdam administration (Liu, 2021). However, that uncertainty will be greater when individuals have no experience with municipal administration of the municipality of Rotterdam because they know little about each other's attitudes or qualities (Liu, 2021). Therefore, it is expected that individuals with positive experiences with municipal administration will also experience higher institutional trust.

The last introductory question is about the extent participants trust the ability of AI to support human decision-making (Chong et al., 2022). As participants may have formed certain beliefs about their trust in the government, they can form them, too, regarding their trust in AI (Grimmelikhuijsen & Meijer, 2014).

3.3.2 Presenting four different scenarios

After the introductory questions, participants were randomly assigned to one of the four vignettes in which the participant received a parking fine. Participants had to read this very carefully and imagine this situation in their lives. Examples of official parking fines have been viewed to make the letter as realistic as possible. The parking fine scenario was chosen because it may be recognizable to participants. Approximately 245.000 citizens (roughly 37%) in the municipality of Rotterdam own a car, compared to almost nine million cars in the Netherlands (Centraal Bureau voor Statistiek, 2022; Onderzoek 010, 2021). Besides, the municipality fines approximately 500.000 to 750.000 car owners per year (Gemeente Rotterdam, n.d.; Verkeersboete.nl, 2022). Receiving a parking fine is therefore seen as a realistic case.

Four different vignettes operationalize *decision-making transparency*. Each vignette has varying degrees of accessibility and explainability. *Accessibility* consists of having or not having access to the algorithm, the data used to train the algorithm, and the participant's tested

data (De Fine Licht & De Fine Licht, 2020). *Explainability* consists of explaining or not explaining the steps leading to the decision and naming the person accountable for the decision (De Fine Licht & De Fine Licht, 2020). Participants either read government letter 1 (accessibility and explainability), letter 2 (accessibility), letter 3 (explainability), or letter 4 (no exposure). Hence, vignette groups 1 to 3 form the treatment groups, and group 4 is the control group in this study.

3.3.3 Measures of institutional trust and procedural fairness after the manipulation

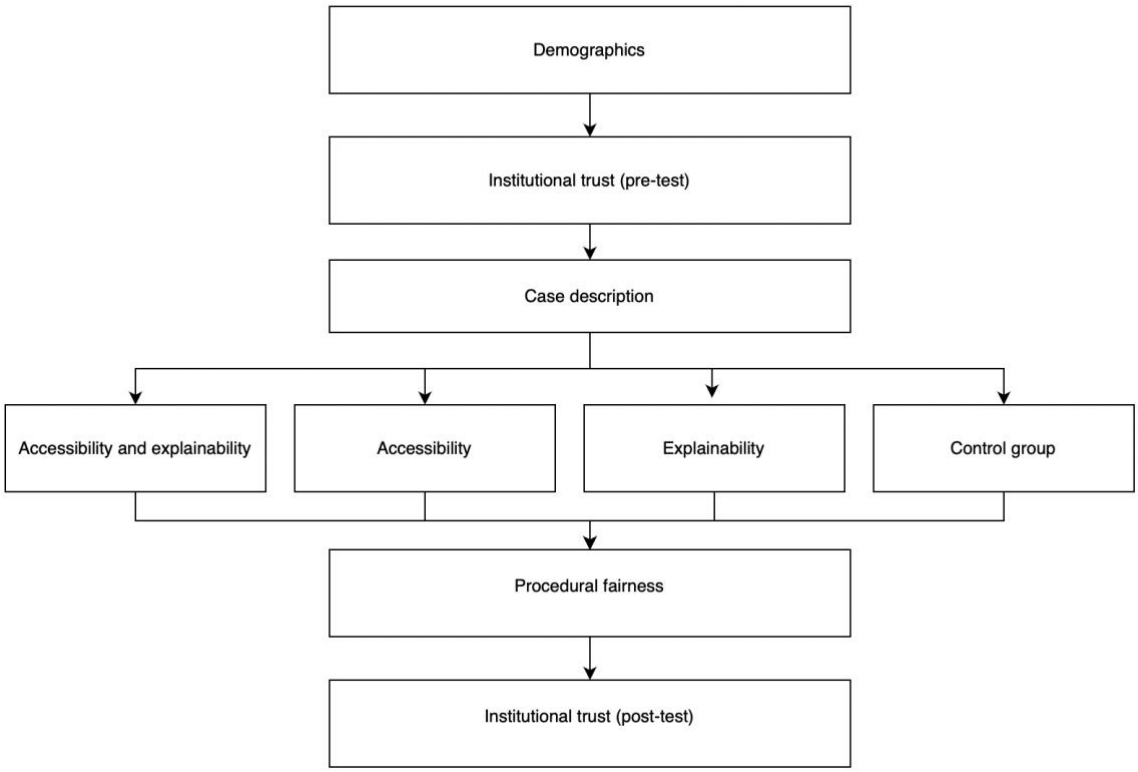
After reading the vignette, participants had to answer questions regarding their perceived procedural fairness and institutional trust. Three dimensions of trust (competence, benevolence, and honesty) measure *institutional trust* (Grimmelikhuijsen & Meijer, 2014). McKnight et al. (2002) developed this scale and validated the items for the public sector. The scale consists of five items for competence, four for benevolence, and three for honesty and is measured as a pre-and post-test ($\alpha > .89$) (Grimmelikhuijsen & Meijer, 2014). The three dimensions are interconnected, but according to Grimmelikhuijsen and Meijer (2014), they measure distinct aspects of institutional trust. Therefore, this study also examines the effect of transparency on each dimension. Judging from the reliability tests, the scales for the dimensions are reliable ($\alpha > .73$).

The pre-institutional trust test provides a baseline for comparing the effects of the manipulation. On the one hand, it constitutes a control to check whether the manipulation makes a difference. It also allows the post-test results of the control group to be compared with the pre-test results of the two groups to see how much they differ (Toshkov, 2016). On the other hand, questioning with twice the same number of statements can reveal what the researcher wants to study (Toshkov, 2016). This disadvantage is discussed further under the limitations of this study in the conclusion.

The concept of perceived *procedural fairness* is measured through four items by Daly and Geyer (1994). The scale ($\alpha > .66$) was used in the context of decisions regarding the relocation of employees. The scale deals specifically with procedural fairness and is based on the antecedents of procedural fairness by Tyler (2006), which makes it appropriate for this study as well. The first two items are reversed items. Both scales (institutional trust and procedural fairness) appear to be 5-point Likert scales with answers ranging from fully agree (5) to disagree fully (1) (see appendices).

Figure 2

Survey set-up



3.4 Validity and reliability

3.4.1 Validity

Internal validity was ensured in this study using validated measurement scales applied to the public sector (Grimmelikhuijsen & Meijer, 2014; McKnight et al., 2002). Moreover, the scales were found to be feasible in several studies and using them contributes to the study's internal validity (Babbie, 2016). In addition, having a control group and several treatment groups allow the researcher to check whether the manipulation makes a difference (Toshkov, 2016). Nonetheless, the manipulation of this study could be checked by asking the respondents whether they experienced accessibility and explainability of decision-making while imagining the vignette scenarios. Only then is the researcher sure that the manipulation caused the difference between pre-and post-tests. This aspect will be further addressed in the limitations section in the conclusion.

In contrast, this research has high content validity for institutional trust since all three dimensions of this concept are measured. This allows for a more comprehensive view of

institutional trust. What could have been improved regarding the study's internal validity is the randomization of respondents to the control and treatment groups. Although participants voluntarily participated, meaning that there was a relatively random sample, participant characteristics between the groups were not minimized with certainty. External factors could influence the manipulation. However, the multivariate ANOVA analysis demonstrated that each of the control variables is well balanced between the different vignette groups. Nevertheless, this disadvantage of the study will be further addressed in the limitations section in the conclusion.

External validity was attempted by choosing a broad research target for this study. The percentages of people owning a car in the sample and the population are close. Nevertheless, the young and highly educated sample does not align with the population. Therefore, external validity is less evident in this study.

3.4.2 Reliability

Regarding the reliability of this research, it is essential to have consistent measurements. One way to guard against this is creating consisting vignette scenarios. In this research, the vignettes are formulated similarly, except for the variation of the studied treatment conditions. Moreover, the respondents could answer questions on a 5-point Likert scale, enabling the researcher to analyze the data without recoding answers, which is necessary with open questions. Thereby, bias in data is overcome. Also, the researcher tested the questionnaire in a small sample of ten respondents to check whether the questions and vignette scenarios were clearly formulated.

3.5 Ethical aspects of this study

The participants' privacy was ensured because they participated entirely anonymously in the survey. Moreover, participants were informed about the goal of the research and data storage. Participants had to agree with voluntary participation before the survey could begin. In addition, the data were presented only at aggregate levels, making it impossible to trace back individual outcomes. Finally, the data were stored on Qualtrics during data gathering and on SPSS during the statistical analyses. After the thesis is finished, the data will be deleted.

4 Results

4.1 Descriptive statistics

The researcher distributed the survey to various citizens of the municipality of Rotterdam and individuals who regularly travel to the municipality of Rotterdam. As a result, 181 people started the questionnaire, but 55 had yet to complete all the questions. Most respondents, 18, dropped out at the statements about institutional trust just before the vignette. Consequently, 126 people completed the questionnaire. Four individuals used the English survey and 122 the Dutch one; the answers were combined into one dataset for the analyses. According to the bot detection of Qualtrics, seven responses were likelier to be a bot than a human since Google's reCAPTCHA score was below .05 (Qualtrics, 2023). These answers might be possible outliers in the dataset. Therefore, these cases were excluded from the dataset, which leads to a sample of N = 119 in this research.

Of the 119 respondents, 59 identified as male (49.6%) and 60 as female (50.4%). As shown in Figure 3, gender is equally distributed within the vignette groups, but some outliers exist. Regarding age, most respondents (68.9%) are between 21 and 30 years (see Figure 4). In vignette groups accessibility and explainability, accessibility, and the control group, the maximum age group is 51 to 60 years. In contrast, the maximum age group in vignette explainability is greater than 71 years - nonetheless, age is equally distributed within the vignette groups.

The sample is highly educated (see Figure 5). Most respondents (39.5%) have a master's degree. In addition, vignette groups accessibility and explainability, accessibility, and the control group have higher educated respondents because vignette group explainability also has respondents with a high school or secondary education diploma. Nevertheless, education is equally distributed within the vignette groups. Because of the highly educated sample, one would expect a high gross monthly income, but this is not the case. Most respondents (45.4%) have a gross monthly income of 0-1999 euros. Since the survey is distributed in the researcher's network, it is plausible that many respondents are studying and earning little. Still, this variable is equally distributed within the vignette groups (see Figure 6).

Respondents could indicate their political preference by choosing a party from the Rotterdam City Council they would vote for if there were elections tomorrow. Because political

preferences tend to diverge within the sample, the researcher developed a division of left and right parties using the study by Voorn (2021). This division resulted in 10 left and four right parties. Groenlinks, D66, PvdA, DENK, Volt, Partij voor de Dieren, BIJ1, 50PLUS, ChristenUnie, and SP are the left parties. The right parties are Leefbaar Rotterdam, VVD, CDA, and Forum voor Democratie. Whereas most respondents preferred a left party, a few preferred right parties, but this difference is insignificant (see Figure 7).

Many sample respondents do not own a car (56.3%), while 43.7% of the respondents do. Additionally, most respondents never received a fine (69.7%). Both variables are equally distributed within the vignette groups (see Figures 8 and 9). Regarding interpersonal trust, most people in the sample trust another person. For example, as seen in Figure 10, respondents in the control group highly trust the individuals surrounding them. Although there are a couple of outliers, interpersonal trust is equally distributed within the vignette groups.

Respondents in the sample had mostly positive experiences with the municipal administration of the municipality of Rotterdam. In each vignette group, this variable is equally distributed (see Figure 11). The same applies to respondents' confidence in AI's ability to support human decision-making. The distribution of responses here, although slightly larger compared to positive experiences with municipal administration, is similar in each vignette group (see Figure 12).

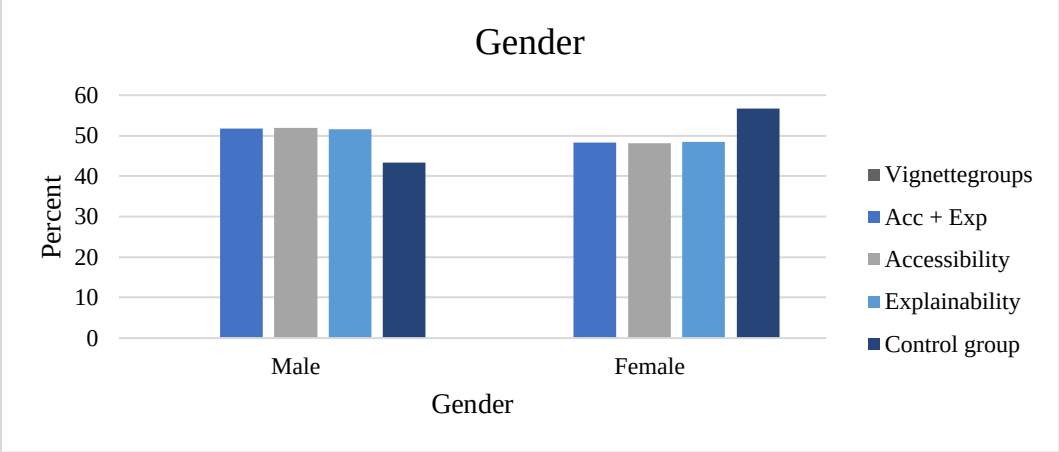
Looking at Figure 13 and Table 1, respondents in the vignette group accessibility and explainability hold the highest institutional trust (pre-test), and those in the control group hold the lowest institutional trust (pre-test). Besides, the answers in the vignette group explainability tend to diverge the most. Regardless, institutional trust (pre-and post-test) is equally distributed within the vignette groups.

One variable that diverges a lot within this sample is procedural fairness; Table 1 shows that respondents experienced varying degrees of procedural fairness in each vignette group. Respondents exposed to accessibility and explainability experienced the greatest degree of procedural fairness, and those exposed to sole accessibility of the steps leading to the decision the least. According to the F-test, procedural fairness is unequally distributed within the vignette groups (see Figure 14 and Table 1).

Opposite, the response distribution of institutional trust (post-test) is less far apart (Figure 15 and Table 1). Institutional trust is rated highest by respondents exposed to accessibility and explainability and lowest by respondents in the control group (no exposure). When the boxplots of the pre-test and post-test of institutional trust are compared, it is noticeable that institutional trust increased in each vignette group with the post-test. Only in the control group, the mean of institutional trust remained almost the same.

Figure 3

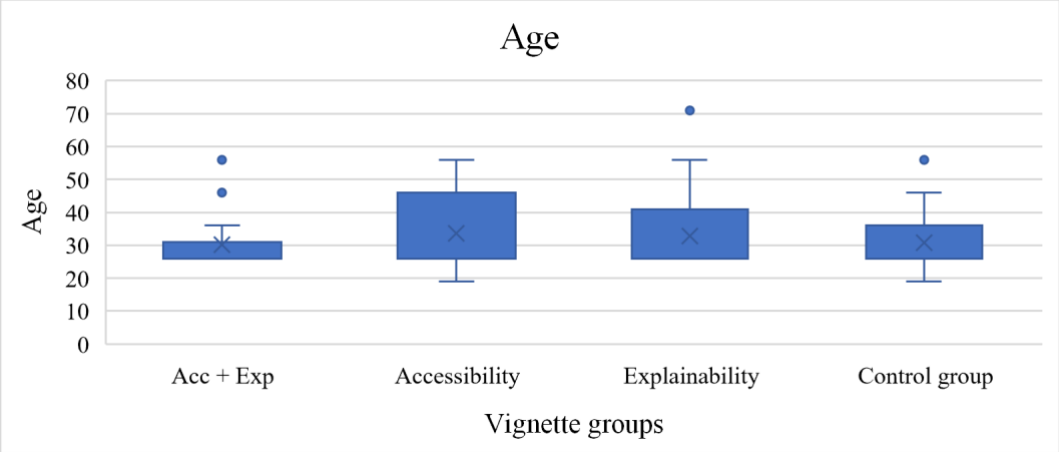
Gender per vignette



Note. F (3, 115) = .203, p = 0.894

Figure 4

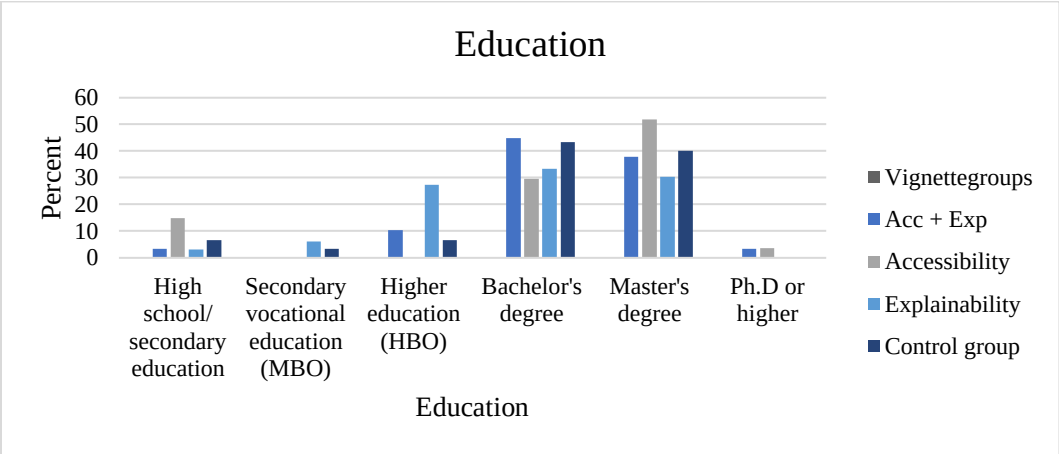
Age per vignette



Note. F (3, 115) = .628, p = 0.599

Figure 5

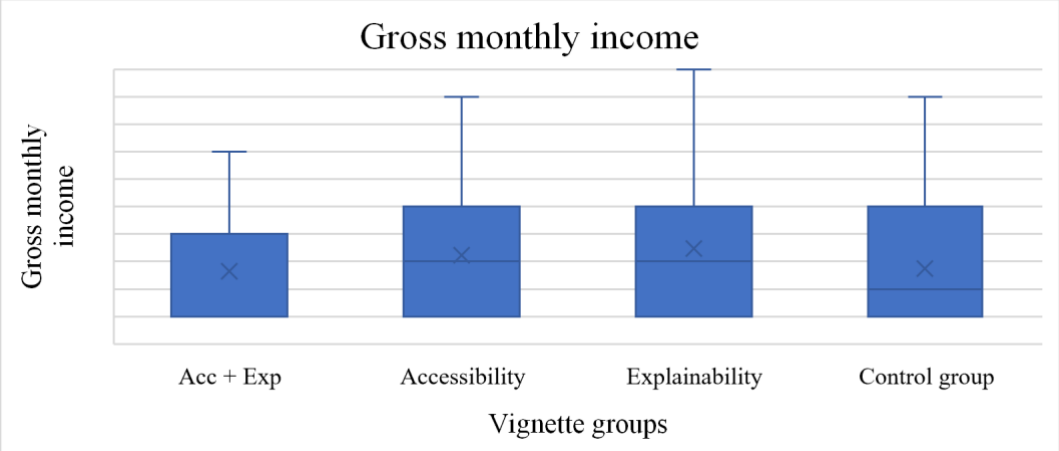
Education per vignette



Note. F (3, 115) = .794, p = 0.500

Figure 6

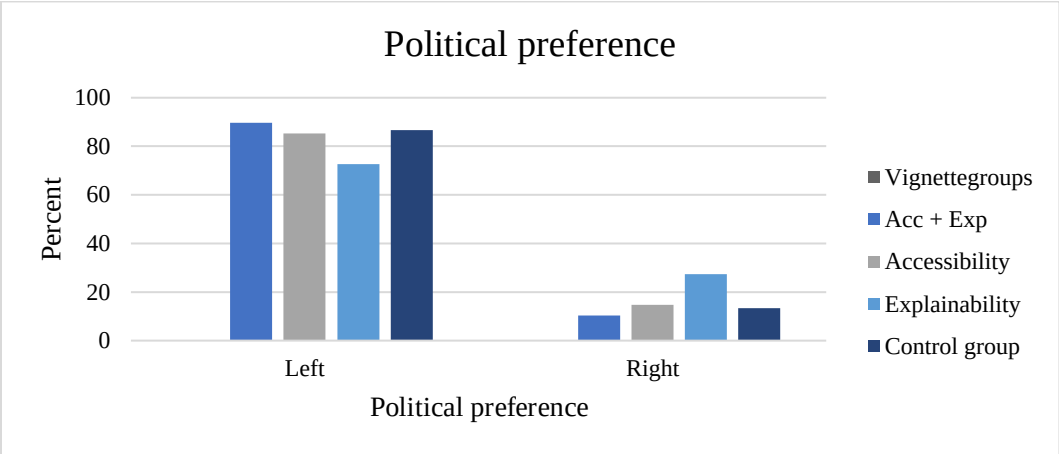
Gross monthly income per vignette



Note. F (3, 115) = .901, p = 0.443

Figure 7

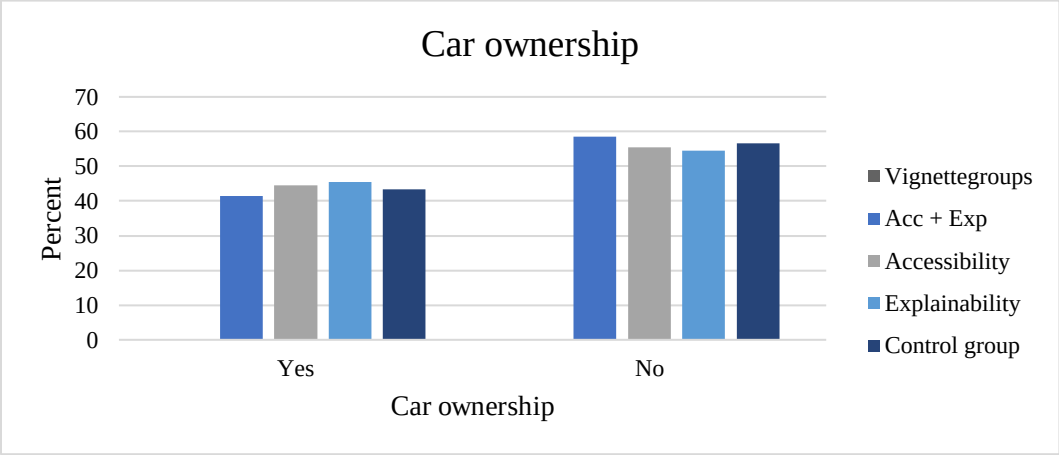
Political preference per vignette



Note. F (3, 115) = 1.260, p = 0.292

Figure 8

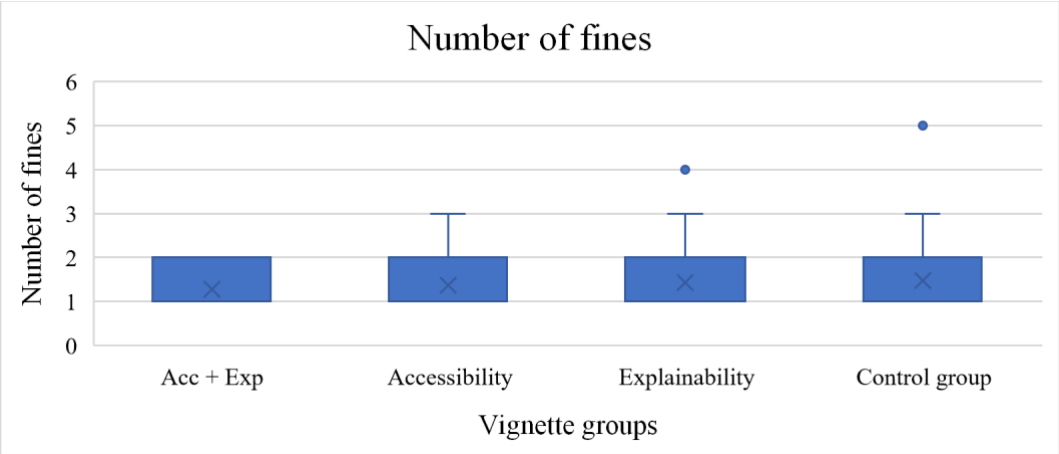
Car ownership per vignette



Note. F (3, 115) = .036, p = 0.991

Figure 9

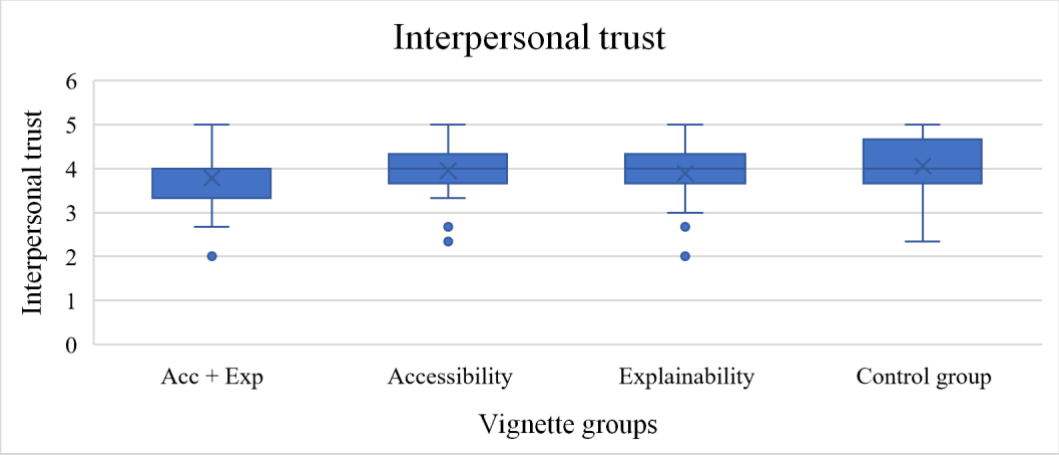
Number of fines per vignette



Note. F (3, 115) = .400, p = 0.753

Figure 10

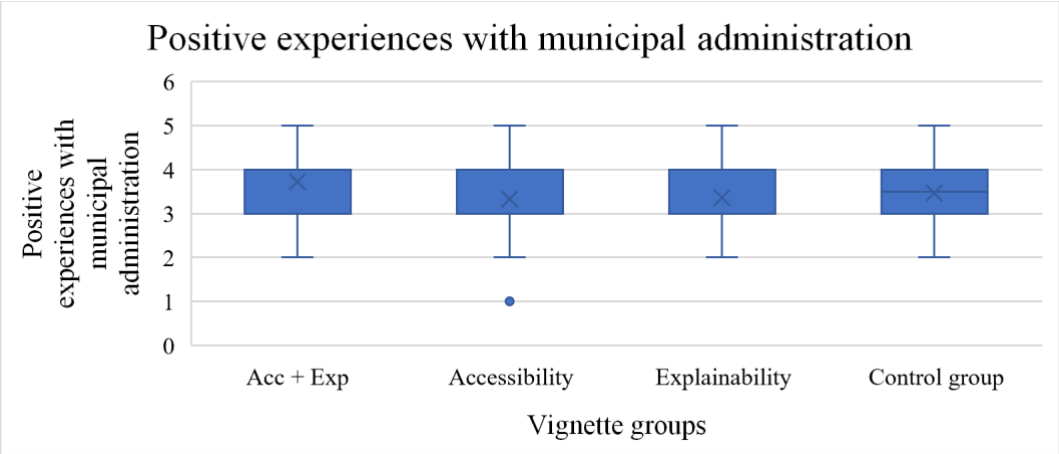
Interpersonal trust per vignette



Note. F (3, 115) = .874, p = 0.457

Figure 11

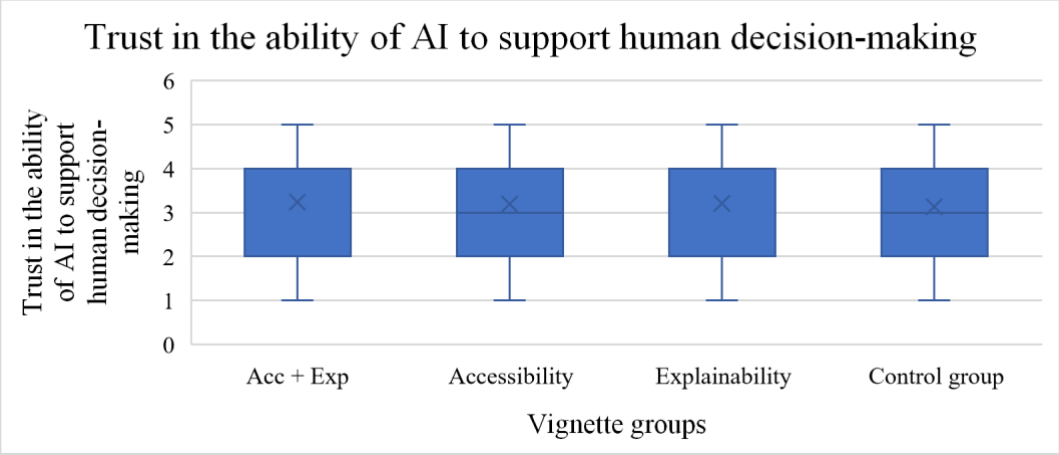
Positive experiences with municipal administration per vignette



Note. F (3, 115) = 1.186, p = 0.318

Figure 12

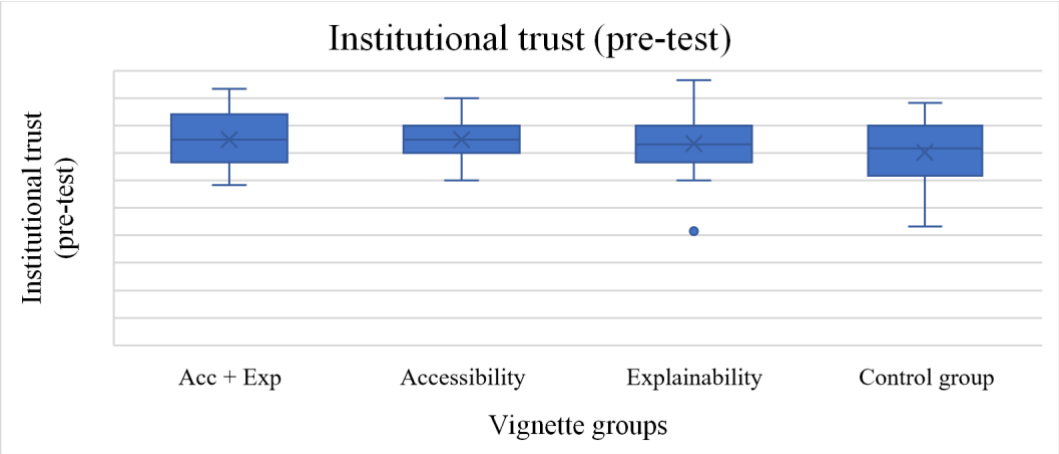
Trust in the ability of AI to support human decision-making per vignette



Note. F (3, 115) = .047, p = 0.986

Figure 13

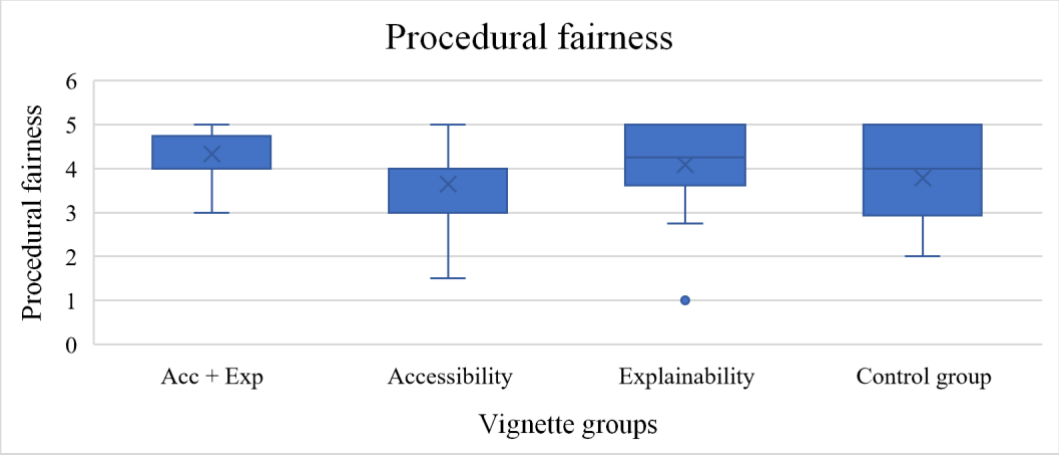
Institutional trust (pre-test) per vignette



Note. F (3, 115) = 1.310, p = 0.275

Figure 14

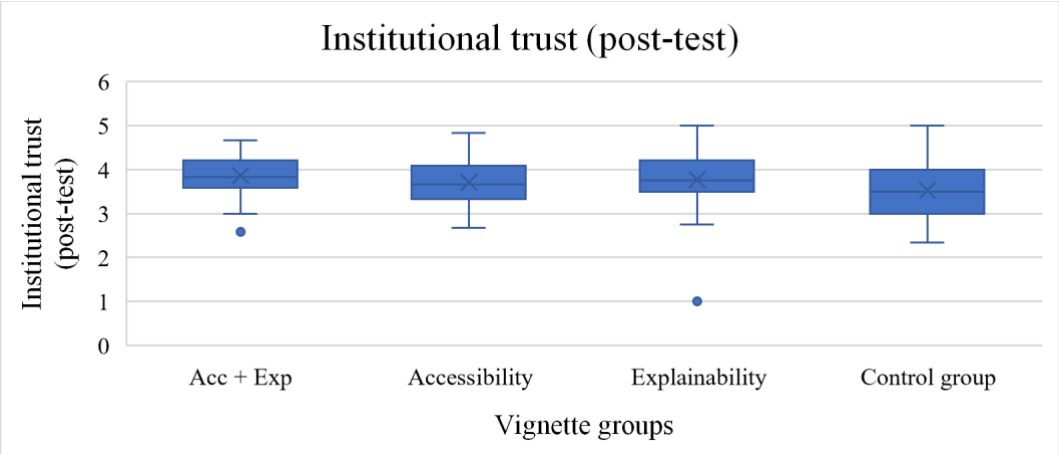
Procedural fairness per vignette



Note. F (3, 115) = 3.765, p = 0.013

Figure 15

Institutional trust (post-test) per vignette



Note. F (3, 115) = 1.551, p = 0.205

Table 1

Descriptive statistics of institutional trust (pre- and post-test) and procedural fairness

Variable	Treatment condition	N	Mean	Standard deviation	Min.	Max.	Range
Institutional trust (pre-test)	Accessibility and explainability	29	3.75	0.51	2.92	4.67	1.75
	Accessibility	27	3.75	0.40	3.00	4.50	1.50
	Explainability	33	3.67	0.55	2.08	4.83	2.75
	Control group	30	3.52	0.56	2.17	4.42	2.25
Procedural fairness	Accessibility and explainability	29	4.34	0.52	3.00	5.00	2.00
	Accessibility	27	3.65	0.90	1.50	5.00	3.50
	Explainability	33	4.09	0.89	1.00	5.00	4.00
	Control group	30	3.79	1.00	2.00	5.00	3.00
Institutional trust (post-test)	Accessibility and explainability	29	3.85	0.50	2.58	4.67	2.08
	Accessibility	27	3.72	0.48	2.67	4.83	2.17
	Explainability	33	3.77	0.73	1.00	5.00	4.00
	Control group	30	3.53	0.65	2.33	5.00	2.67

4.2 Balance check

Since this research used four different scenarios and thus one control group and three treatment groups, it is essential to investigate whether the groups significantly differ in control variables on the one hand (gender, age, education, gross monthly income, political preference, car ownership, number of parking fines, interpersonal trust, positive experiences with municipal administration, trust in AI's ability to support human decision-making) and variables on the other hand (institutional trust pre-and post-test, and procedural fairness). This type of inspection is called a balance check. Hence, a multivariate ANOVA (MANOVA) is conducted because

including multiple variables simultaneously compared to a univariate analysis will lower the chance of type I errors (Field, 2017).

4.2.1 MANOVA with control variables

As shown in the notes of Figures 3 to 12, the control variables are equally distributed within the vignette groups according to the MANOVA analysis. Also, the Box's Test statistic of the assumption of the equality of covariance matrices is 231.34, p = .057, which means that the covariance matrices are roughly as equal as assumed (Field, 2017). Furthermore, using Pillai's trace, there was a non-significant effect of the included variables in the different vignette groups, V = 0.194, F (30, 324) = .747, p = 0.832. This non-significant effect means that control variables (gender, age, education, gross monthly income, political preference, car ownership, number of parking fines, interpersonal trust, positive experiences with municipal administration, and trust in AI's ability to support human decision-making) are balanced between the vignette groups. Randomization regarding the control variables is thereby controlled, which means the groups can be compared in further statistical analyses.

4.2.2 MANOVA with dependent variables

However, looking at the dependent variables, the Box's Test statistic of the assumption of the equality of covariance matrices is 30.421, p = .049. This statistic means that the covariance matrices are not as equal as assumed (Field, 2017). Using Pillai's trace, there was a non-significant effect of the included variables in the different vignette groups, V = 0.130, F (9, 345) = 1.738, p = 0.079. Observing the post hoc tests, Dunnett's test (see Table 2) indicates a significant difference between the group accessibility and explainability and the control group regarding procedural fairness. In other words, respondents experienced higher procedural fairness when they simultaneously had access to the algorithm, the data used to train the algorithm, the participant's tested data, and were explained which steps led to the decision and whom the accountable person was, compared to respondents who had no transparency of the decision-making. Other dependent variables do not differ significantly between the vignette groups (see notes of Figures 13 to 15).

Table 2

Post hoc test for procedural fairness

Dependent variable		Vignette groups	Vignette groups	Mean difference	Std. Error	Sig.
Procedural fairness	Dunnett t (2-sided)	Accessibility and explainability	Control group	.545	.221	.040*
		Accessibility	Control group	-.144	.225	.860
		Explainability	Control group	.299	.214	.366

Note. *p < .05

Note. The Tukey and Games-Howell tests were also performed and presented similar results.

4.3 Correlations

In this research, bivariate correlation analyses are conducted. In addition, Spearman's correlation coefficient will be examined since all the variables are, or are converted to, ordinal variables. The correlation matrix (Table 3) presents several positive and negative correlations. It is striking that the higher the respondents' trust in the municipality of Rotterdam (concerning both the pre-test and post-test) correlates with procedural fairness of the parking fine decision-making process. In addition, respondents' trust in the municipality of Rotterdam (concerning both the pre-test and post-test) is associated with the positive experiences they had with the municipal administration of the municipality of Rotterdam. Moreover, the correlation matrix shows that a higher score on institutional trust is correlated with a higher score on interpersonal trust. In other words, the higher respondents' trust in the municipality of Rotterdam, the more they trust other people around them. Finally, it emerges that procedural fairness in the decision-making process about the parking fine is associated with trust in AI's ability to support human decision-making.

Table 3

Spearmen's correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender [Female]	1														
2. Age	-.222*	1													
3. Education	-.104	.411***	1												
4. Gross monthly income	-.269**	.650***	.456***	1											
5. Political preference [Left]	.229**	-.154	-.065	.233*	1										
6. Car ownership [Yes]	-.143	.606***	.208*	.598***	-.284**	1									
7. Number of fines	-.087	.097	.150	.339***	-.290 **	.324***	1								
8. Positive experience municipal administration	.028	-.082	.013	-.016	-.001	-.059	.092	1							
9. Trust ability AI to support human decision-making	-.134	-.007	.136	.005	.077	-.033	.013	.55	1						
10. Interpersonal trust	-.042	.262**	.214**	.185*	.060	.119	.012	.160	.158	1					
11. Accessibility	-.025	.040	.135	.052	.029	.008	.028	-.059	-.005	.018	1				
12. Explainability	-.024	.051	-.187*	.084	-.173	.022	-.021	-.109	.015	-.035	-.336***	1			
13. Acc + exp	-.024	-.050	.059	-.078	.098	-.027	-.050	.174	.021	-.120	-.308***	-.352***	1		
14. Procedural Fairness	-.145	-.120	-.114	-.099	.047	-.042	-.057	.130	.196*	.124	-.212*	.095	.214*	1	
15. Institutional Trust (pre-test)	-.051	-.136	.064	-.132	-.020	-.182*	-.059	.455***	.135	.203*	.076	-.015	.064	.298***	1
16. Institutional Trust (post-test)	.034	-.169	-.060	-.176	.052	-.115	-.082	.466***	.151	.171	-.024	.081	.147	.581***	.764***

Note. * p < .05; ** p <.01; *** p< .001

4.4 Regression analyses

4.4.1 Data checks

Before conducting linear regression analyses, several data checks must be fulfilled. Firstly, this research will look at the absence of multicollinearity in the data. When multicollinearity occurs, the regression coefficients may be incorrectly estimated because of the strong relationships between the predictor variables (Field, 2017). To guard against this, the variance inflation factor (VIF) should not exceed 10, but the tolerance value should exceed 0.2. In this research, the VIFs are well below 10 (VIF < 3.4), and the tolerance values are above 0.2 (tolerance > 0.3), meaning there is no multicollinearity.

Secondly, the values of the residuals must be independent. The Durbin-Watson test can reveal whether the model is accurate by testing the distance of the data from the regression line (Field, 2017). In this study, the Durbin-Watson values are close to 2, which should be the case. In other words, the residuals do not correlate with each other.

Thirdly, the variance in the residuals must be similar at each point in the model (homoscedasticity), which can be checked by plotting the standardized values the model predicts against the standardized residuals (Field, 2017). In this research, the scatterplots present roughly arbitrary residuals meaning that the variance of the residuals is roughly constant. Yet, there may be heteroscedasticity in the data.

Fourthly, the overall influence of a case on the model is inspected in this research. According to Field (2017), Cook's distance can measure this type of influence, and this value should not exceed 1.0. In this research, there are no values above 1.0 present. Hence, the dataset lacks outliers.

4.4.2 Linear regression analyses

Taking these data checks together, the hypotheses of this research can be tested by conducting a linear regression analysis. Table 4 presents the regression analysis of the dependent variable institutional trust. In addition, Tables 5, 6, and 7 present the regression analyses of each dimension of institutional trust (competence, benevolence, and honesty). To avoid multicollinearity, the moderator (procedural fairness) was centered in this study. Three interaction variables were created by multiplying the independent variables by the centered

moderator to measure the effect of the moderator. Further, the control variable, positive experiences with municipal administration, is controlled for in every model because this variable correlated strongly with institutional trust. Other control variables are controlled in the last model of each regression analysis. Each table summarizes the results of the regression analyses showing the unstandardized coefficients, the significance of the effect, R2, R2 adjusted, and the F test. Throughout the model, a 95% confidence interval was used.

From all tables, it is striking that having positive experiences with municipal administration positively impacts institutional trust in the municipality of Rotterdam. This effect aligns with the positive correlation between the two variables in Table 3. In addition, procedural fairness positively affects institutional trust, observed in Tables 4 to 7. This result means that the fairer respondents perceived the procedure of the parking fine decision, the higher their trust in the municipality of Rotterdam.

Hypothesis 1 states that decision-making transparency (considering accessibility, explainability, or both) positively influences institutional trust (considering competence, benevolence, or honesty) more than no decision-making transparency. According to Table 4, accessibility to decision-making transparency positively affects institutional trust more than no decision-making transparency. This result means that access to the algorithm, the data used to train the algorithm, and the participants' tested data leads to greater institutional trust. Furthermore, this effect holds true for the dimensions of competency and benevolence of institutional trust (see Tables 5 and 6). In other words, access to the algorithm, the data used to train the algorithm, and the participants' tested data leads to greater trust in the competency and benevolence of the municipality of Rotterdam.

Similar to accessibility, Table 4 shows a positive effect of explainability on institutional trust. This result means that explaining the decision-making steps and the responsible officer's name increases institutional trust in the Rotterdam municipality. In addition, Table 5 presents a positive effect of explainability on institutional trust concerning the competency dimension. In other words, explaining the steps of decision-making and the name of the responsible officer will increase trust in the competency of the Rotterdam municipality. Nevertheless, simultaneously providing accessibility and explainability does not significantly affect institutional trust. Moreover, honesty as a dimension of institutional trust is not affected by

decision-making transparency in this sample (see Table 7). Therefore, hypothesis 1 is partially accepted.

Hypothesis 2 states that procedural fairness is a positive moderator in strengthening the relationship between decision-making transparency (considering accessibility, explainability, or both) and institutional trust (considering competence, benevolence, or honesty). Table 4 shows that procedural fairness negatively affects the relationship between accessibility and institutional trust. It means that the effect of access to the algorithm, the data used to train the algorithm, and the participants' tested data on institutional trust is reduced by experiencing a fair procedure. The same effect is visible for the dimension competence of institutional trust (see Table 5). In other words, the effect of access to the algorithm, the data used to train the algorithm, and the participants' tested data on trust in the competency of the Rotterdam municipality is reduced by experiencing a fair procedure.

In contrast, Table 6 indicates that procedural fairness positively affects the relationship between explainability and trust in the benevolence of the Rotterdam municipality. This result means that the effect of explaining the decision-making steps and naming the responsible officer on trust in the benevolence of the Rotterdam municipality increases by experiencing a fair procedure. Nevertheless, procedural fairness does not affect the relationship between decision-making transparency and institutional trust when accessibility and explainability are simultaneously presented. Likewise, procedural fairness as a moderator in this sample does not affect the relationship between decision-making transparency and honesty as a dimension of institutional trust (see Table 7). Accordingly, hypothesis 2 is partially accepted.

Table 4

Regression analyses of the dependent variable institutional trust (general concept)

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Constant	2.429***	.222	1.027***	.237	.767**	.254	.866	.445
Positive experiences with municipal administration	.317***	.057	.281***	.045	.284***	.044	.263***	.046
Accessibility	.231	.144	.284*	.112	.213	.113	.254*	.116
Explainability	.275*	.136	.151	.107	.132	.105	.161	.111
Accessibility AND Explainability	.244	.141	.034	.113	-.002	.111	.054	.128
Procedural Fairness (centered)			.403***	.046	.468***	.052	.358***	.080
Procedural Fairness (centered) * Accessibility					-.259*	.104	-.146	.122
Procedural Fairness (centered) * Explainability							.204	.116
Procedural Fairness (centered) * Accessibility AND Explainability							.103	.176
Gender Female							.103	.085
Age							-.012	.052
Education							.014	.038
Gross monthly income							-.018	.050
Political preference Left							-.077	.116
Car ownership Yes							-.059	.109
Number of fines							.015	.067
Trust in the ability of AI to support human decision-making							.015	.035
Interpersonal trust							.085	.064
R^2	.242		.545		.569		.604	
R^2 adjusted	.216		.525		.545		.538	
F	9.108***		27.040***		24.604***		9.075***	
Observed	119		119		119		119	

Note. * p < .05; ** p <.01; *** p< .001

Table 5

Regression analyses of the dependent variable competence (first dimension of institutional trust)

Variable	Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Constant	2.729***	.206	2.215***	.275	1.504**	.517
Positive experiences with municipal administration	.232***	.053	.219***	.052	.213***	.054
Accessibility	.275*	.133	.295*	.130	.202	.134
Explainability	.266*	.127	.221	.125	.216	.129
Accessibility AND Explainability	.207	.132	.130	.131	.041	.148
Procedural Fairness (centered)			.148**	.054	.213*	.093
Procedural Fairness (centered) * Accessibility					-.312*	.141
Procedural Fairness (centered) * Explainability					-.045	.135
Procedural Fairness (centered) * Accessibility AND Explainability					.184	.204
Gender Female					-.004	.099
Age					.059	.060
Education					.007	.044
Gross monthly income					-.017	.058
Political preference Left					-.002	.135
Car ownership Yes					-.187	.127
Number of fines					-.003	.077
Trust in the ability of AI to support human decision-making					.032	.041
Interpersonal trust					.079	.075
R^2	.177		.229		.330	
R^2 adjusted	.149		.194		.217	
F	6.150***		6.697***		2.923***	
Observed	119		119		119	

Note. * p < .05; ** p <.01; *** p< .001

Table 6

Regression analyses of the dependent variable benevolence (second dimension of institutional trust)

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Constant	2.515***	.243	1.723***	.316	2.231**	.450	2.249***	.596
Positive experiences with municipal administration	.301***	.063	.281***	.060	.277***	.059	.252***	.062
Accessibility	.306	.157	.336*	.150	.341*	.153	.358*	.155
Explainability	.094	.150	.024	.143	.026	.142	.043	.149
Accessibility AND Explainability	.106	.155	-.013	.151	-.063	.165	-.049	.171
Procedural Fairness (centered)			.228***	.062	.073***	.103	.053	.107
Procedural Fairness (centered) * Accessibility					.088	.159	.112	.163
Procedural Fairness (centered) * Explainability					.328*	.151	.300	.156
Procedural Fairness (centered) * Accessibility AND Explainability					.356	.227	.411	.236
Gender Female							.000	.114
Age							-.046	.070
Education							.051	.051
Gross monthly income							-.013	.067
Political preference Left							-.283	.155
Car ownership Yes							-.138	.146
Number of fines							-.047	.089
Trust in the ability of AI to support human decision-making							.004	.047
Interpersonal trust							.119	.086
R^2	.188		.275		.312		.367	
R^2 adjusted	.160		.277		.262		.260	
F	6.612***		8.552***		6.237***		3.444***	
Observed	119		119		119		119	

Note. * p < .05, ** p <.01, *** p< .001

Table 7

Regression analyses of the dependent variable honesty (third dimension of institutional trust)

Variable	Model 1		Model 2	
	Coefficient	SE	Coefficient	SE
Constant	1.697***	.390	1.714**	.558
Positive experiences with municipal administration	.272***	.057	.231***	.058
Accessibility	.151	.146	.191	.145
Explainability	.072	.136	.126	.139
Accessibility AND Explainability	.048	.147	.038	.160
Procedural Fairness (centered)	.212*	.088	.118	.100
Procedural Fairness (centered) * Accessibility	-.246	.145	-.153	.153
Procedural Fairness (centered) * Explainability	.027	.137	.064	.146
Procedural Fairness (centered) * Accessibility AND Explainability			.262	.221
Gender Female			-.092	.107
Age			-.046	.065
Education			.058	.048
Gross monthly income			-.051	.063
Political preference Left			-.241	.146
Car ownership Yes			-.170	.137
Number of fines			.073	.084
Trust in the ability of AI to support human decision-making			.025	.044
Interpersonal trust			.129	.081
R^2	.261		.353	
R^2 adjusted	.214		.244	
F	6.602***		3.237***	
Observed	119		119	

Note. * p < .05, ** p <.01, *** p< .001

5 Conclusion

5.1 An answer to the research question

Since AI is being integrated into the public sector, there is a question of the extent to which government should be transparent about it. Hence, a two-sided debate between government 'transparency optimists' and 'transparency pessimists' is ongoing, in which empirical evidence is scarce and unequivocal (Grimmelikhuijsen et al., 2013). This research has tried to contribute to this discussion by answering the following research question: *To what extent does algorithmic decision-making transparency contribute to the institutional trust of citizens in the municipality of Rotterdam, and what is the moderating effect of procedural fairness?*

A quantitative vignette study was conducted to answer this research question. First, through a web survey, respondents were randomly exposed by Qualtrics to one of four scenarios in which respondents supposedly received a parking fine from the municipality of Rotterdam. Then, after respondents had empathized with the situation, they were asked about their institutional trust and whether they felt they were treated fairly by the municipality of Rotterdam. The most important results will be summarized and compared with the literature below.

In line with the expectations, accessibility, and explainability of decision-making lead to greater institutional trust. Whereas providing access to algorithms and their data enhances accountability, explaining decision-making steps allows public institutions to show that decisions are not affected by bias or self-interest (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014; Grimmelikhuijsen, 2022). Accessibility and explainability of decision-making in this way increase institutional trust in the municipality of Rotterdam. Nonetheless, institutional trust is not affected when accessibility and explainability are simultaneously incorporated into the parking fine. The absence of this effect is probably due to the length of the parking fine. Respondents might have experienced information overload because they had to process much information (De Fine Licht & De Fine Licht, 2020).

Focusing on the dimensions of institutional trust, it appears that accessibility and explainability of decision-making lead to greater trust in the competence of the municipality of Rotterdam. In other words, when citizens experience decision-making transparency, they have

higher trust in the knowledge and skills of the municipality of Rotterdam to operate effectively. This effect can be explained by public institutions showing that bias or self-interest does not influence decisions (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014; Grimmelikhuijsen, 2022). Citizens may therefore feel that the municipality is acting capably and professionally regarding parking fines.

Besides the effect of decision-making transparency on competence, accessibility of decision-making leads to greater trust in the benevolence of the municipality of Rotterdam. This result means that access to decision-making transparency leads to greater trust in the municipality's goodwill to help citizens and act in the interest of citizens. When the Rotterdam municipality provides access to algorithms and data, citizens may feel that the municipality has their best interests at heart by not withholding information. As a result, citizens feel they have control over the municipality because they can check the intentions of the municipal actions (De Fine Licht & De Fine Licht, 2020). This result, however, contrasts with the advice of De Fine Licht and De Fine Licht (2020); they argue that transparency about processes (accessibility) can lead to information overload because individuals must process much information that can also be complicated. Therefore, transparency about rationales (explainability) must be sought because it provides adequate information that individuals need to see if they have been treated fairly (De Fine Licht & De Fine Licht, 2020). Regardless, the results of this study show that this is not confirmed when looking solely at the trust in the benevolence of the Rotterdam municipality. This may be partly explained by the fact that respondents did not have access to the actual algorithm or data but only read the option to request it from the municipality. Respondents did not have to process complex data as a result.

Furthermore, the results do not quite match expectations regarding procedural fairness as a moderator. For example, the relationship between the accessibility of decision-making and institutional trust appears to be negatively affected by the experience of procedural fairness. The same is confirmed when looking at competence; the relationship between the accessibility of decision-making and trust in the competence of the municipality of Rotterdam is negatively influenced by experiencing a fair procedure. These results suggest that when citizens have access to decision-making and experience fair procedures, their overall institutional trust and trust in the competence of the municipality decreases. As De Fine Licht and De Fine Licht (2020) point out, providing access to decision-making can create information overload that prevents citizens from feeling a sense of control over the municipality. However, this is most

likely not the explanation for the outcome of this study. Namely, in this study, respondents had no actual access to the algorithm and data. As a result, the parking fine they hypothetically received contained little information other than the possibility of requesting the data from the municipality. Respondents could, therefore, not properly determine in this way whether they were treated fairly by the municipality. Their overall trust in the municipality and confidence in the competence of the municipality decreased as a result.

On the opposite, the relationship between the explainability of decision-making and trust in the benevolence of the Rotterdam municipality is positively affected by procedural fairness. In other words, when citizens are exposed to the explainability of decision-making and experience fair procedures, their trust in the benevolence of the municipality increases. One explanation for this effect may be that citizens can verify that decisions were made without bias or self-interest when the steps to decision-making are explained to them (Cucciniello et al., 2017; Grimmelikhuijsen et al., 2013; Grimmelikhuijsen & Meijer, 2014; Grimmelikhuijsen, 2022). Citizens are, therefore, able to determine whether they have been treated fairly and what the municipality's intentions are; they experience a sense of control which contributes to their trust in the municipality (De Fine Licht & De Fine Licht, 2020). Subsequently, citizens experience the municipality of Rotterdam as benevolent.

Whereas Grimmelikhuijsen (2022) demonstrated a positive effect of transparency on institutional trust as measured by honesty, this research does not show significant relationships around honesty as a dimension of institutional trust. This effect could possibly be explained by the fact that both researchers use different items to measure trust in honesty. Also, Grimmelikhuijsen does not examine trust in the institution but rather trust in the algorithm and the street-level bureaucrat. Individuals in this study may need more information than just access and explainability of algorithms to determine whether a municipality is acting fairly, thus missing a positive effect.

5.2 Limitations of this study

As previously indicated, this study has some shortcomings. First and foremost, this study lacks randomization. Although there was a relatively random sample, meaning that members of the population participated randomly in this study as they voluntarily participated, the researcher did not randomly distribute the sample members into the control and experiment groups. As a result, participant characteristics between the groups were not minimized with

certainty; thus, external factors may affect the results. In other words, there is little certainty that the results result from manipulating the independent variable. The design of this study was chosen for reasons of time and feasibility. Indeed, to obtain randomization, a sample would first have to be collected and then divided between the experiment and control groups. Since these two steps are time-consuming, it was chosen to combine them and randomly assign participants to one of the four vignettes via Qualtrics. MANOVA analyses were then used to examine whether the groups were similar based on several variables, which proved to be the case in this study. Nevertheless, there can always be external factors present that influence the effect of the manipulation.

Secondly, no manipulation check can measure whether respondents experience accessibility and explainability in the vignettes. The researcher has assumed that the designed vignettes satisfy accessibility and explainability, but respondents may have experienced this differently. As a result, it cannot be determined with certainty that the significant results from the analyses are caused by accessibility and explainability. Therefore, the results cannot be generalized to the population.

Thirdly, accessibility and explainability are operationalized as extremes; accessibility and explainability may or may not have occurred in the different vignettes. Accordingly, the scenarios which contained the explanation of the steps leading to the decision were quite long. This may have caused respondents to not read the letter carefully or to have to process too much information. In addition, the length of the government letters may explain the high drop-out rate at the time the letter was presented. Future research could investigate the different amounts of information that may be desirable to individuals regarding algorithmic decision-making.

Fourthly, the number of respondents per vignette is low, affecting the correlations, MANOVAs, and regression analyses. In addition, only one vignette per respondent was assigned, resulting in one measurement per respondent. The disadvantage of this between-subject method is that few measurements are present in this study (Atzmüller & Steiner, 2010). These few measurements may be related to a chance of heteroscedasticity in the dataset. Despite, this design was chosen because of the time to complete the survey and socially desirable responses. For example, if respondents were assigned two vignettes, they would understand what the survey is trying to test. Moreover, reading two vignettes takes much time

and may cause them to drop out. In this study, 30% of all the respondents who started the survey dropped out when the vignette appeared.

Fifthly, this study did not include the cultural context of the individuals participating. According to Kaasa and Andriani's (2021, p. 61) study, "individual's institutional trust is higher in regions with smaller power distances. It is possible that a large power distance induces citizens to develop feelings of vulnerability and powerlessness against government decisions". In other words, when individuals feel fewer opportunities to participate in decision-making processes, they would have lower institutional trust compared to individuals who experience lots of opportunities to participate. Since the population in Rotterdam municipality is very diverse regarding migration backgrounds, the cultural context might have played a role in the relationship between decision-making transparency and institutional trust.

5.3 Future research recommendations

As mentioned, future research can focus on different amounts of transparency of algorithmic decisions. After all, this research only tested the effect of accessibility and explainability as extremes, but it is plausible that individuals desire different degrees of transparency. Information can also be presented in different ways. In addition, as Grimmelikhuijsen (2022) also points out, future research should test different scenarios regarding bias. In this study, transparency showed no bias in hybrid decision-making about parking fines. However, one can also test whether the influence of accessibility and explainability holds up when a situation is presented with bias in decision-making.

Moreover, the shares people have in decisions can also be varied more. As in this study, a parking fine of 69.26 euros is a very realistic case, but it may have less impact on people who receive a fine of more than 200 euros and lose their driver's license. Although this study did examine whether having a car affects institutional trust after reading the hypothetical scenario, follow-up research may vary more with different types of decisions and amounts, such as, for example, a parking fine.

Another aspect that should be considered in future research is the cultural context of individuals participating in studies related to institutional trust. Especially in research targets where the population is very diverse regarding migration backgrounds, it is interesting to

examine whether the cultural context affects the relationship between decision-making transparency and institutional trust.

5.4 Policy implications

The results of this study, taken with caution, are relevant to the municipality of Rotterdam and its transparency policy. As this research shows, having access to and explainability of decision-making increases institutional trust. Hence, the municipality should invest in making the algorithm, the data used to train the algorithm, and the participant's tested data public and explaining the decision-making steps. This mainly affects confidence in the competence and benevolence of the municipality of Rotterdam. In particular, when citizens experience a fair procedure and understand the steps of decision-making, trust in the benevolence of the municipality grows.

Facilitating access to the algorithm and data seems best done through the Dutch algorithm registry. Here the steps can also be explained for decision-making. Currently, the municipality of Rotterdam can include the register in their letters when parking fines are issued. Citizens with parking fines can then check how the algorithm works and for what purpose the municipality used the algorithm. Moreover, public understanding will be enhanced when the municipality explains why citizens receive parking fines in government letters.

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7 Appendix A: questionnaire in Dutch

Beste deelnemer,

Wanneer u woont in of heen-en-weer reist voor uw werk naar de gemeente Rotterdam bent u van harte uitgenodigd om de vragenlijst voor het onderzoek "Knowing = trusting?" in te vullen! Het doel van de enquête is te onderzoeken wat u vindt van het handhavingsbesluit van parkeerboetes door de gemeente Rotterdam. De vragenlijst is gericht op transparantie van besluitvorming en vertrouwensaspecten, en het invullen duurt 5 tot 10 minuten. Er zijn geen goede of foute antwoorden, het gaat om uw mening of ervaring.

Verwerking van resultaten

De resultaten van het onderzoek worden verwerkt in een master scriptie. Uw anonimiteit wordt gewaarborgd doordat de enquête anoniem wordt ingevuld. De uiteindelijke resultaten van het onderzoek zullen op geen enkele wijze te herleiden zijn tot individuele antwoorden.

Gegevens bewaren

Uw gegevens bewaar en verwerk ik volgens de richtlijnen van de algemene verordening gegevensbescherming (AVG). Naast de student zullen alleen de scriptiebegeleider en de tweede lezer toegang krijgen tot alle door u verstrekte gegevens. Verder blijven uw geanonimiseerde antwoorden ten minste tot het einde van mijn onderzoek bewaard in een beveiligde omgeving voor controle doeleinden.

Vrijwillige deelname

Bovendien is uw deelname vrijwillig, wat betekent dat u zich ten alle tijden zonder consequenties kunt terugtrekken en uw antwoorden kunt laten verwijderen. U kunt dit doen door te mailen naar j.w.zijlstra@umail.leidenuniv.nl

Ik vertrouw erop u voldoende geïnformeerd te hebben en dank u hartelijk voor uw medewerking.

Met vriendelijke groet, Jeske.

Om de enquête te starten dient u akkoord te gaan met de volgende punten:

1. Ik ben voldoende geïnformeerd over het onderzoek. Ik heb alle informatie kunnen lezen en de mogelijkheid gehad vragen te kunnen stellen.
2. Ik neem vrijwillig deel aan dit onderzoek. Het is mij duidelijk dat ik de deelname op elk moment kan beëindigen.
3. Ik geef toestemming om de gegevens die tijdens dit onderzoek over mij worden verzameld te verwerken zoals is uitgelegd in de hier bovenstaande informatie.

- Ik ga akkoord
- Ik ga niet akkoord

Met welk gender identificeert u zichzelf het meest?

- Man
- Vrouw
- Niet-binair/derde geslacht

Wat is uw leeftijd?

- 18 t/m 20 jaar
- 21 t/m 30 jaar
- 31 t/m 40 jaar
- 41 t/m 50 jaar
- 51 t/m 60 jaar
- 61 t/m 70 jaar
- 71 +

Wat is uw hoogst behaalde opleidingsniveau?

- Lager dan middelbareschooldiploma
- Middelbareschooldiploma of vergelijkbaar
- Middelbaar Beroepsonderwijs (MBO)
- Hoger Beroepsonderwijs (HBO)
- Bachelor degree
- Master degree
- Kandidaats/ Phd

Wat is uw **maandelijkse** bruto-inkomen? (het salaris vóór aftrek van belastingen en premies)

- 0 - 1999 euro
- 2000 - 3999 euro
- 4000 - 5999 euro
- 6000 - 7999 euro
- 8000 - 9999 euro
- Meer dan 10.000 euro

Op welke partij zou u stemmen als er morgen gemeenteraadsverkiezingen waren in Rotterdam?

- Leefbaar Rotterdam
- VVD
- Groenlinks
- D66
- PvdA
- DENK
- Volt
- Partij voor de Dieren
- BIJ1
- 50PLUS
- ChristenUnie
- SP
- CDA
- Forum voor Democratie

Bent u in het bezit van een auto?

- Ja
- Nee

Hoe vaak heeft u in de laatste **twee jaar** een parkeerboete gekregen?

- Nooit
- 1 tot 3 keer
- 4 tot 6 keer
- 7 tot 9 keer
- Meer dan 10 keer

De volgende stellingen gaan over het vertrouwen dat u heeft in andere personen. In hoeverre bent u het eens met de volgende stellingen? (5 = helemaal mee eens, 1= helemaal niet mee eens)

1. De meeste mensen zijn te vertrouwen.
2. De meeste mensen proberen eerlijk te zijn.
3. De meeste mensen proberen behulpzaam te zijn.

De volgende stellingen gaan over het vertrouwen dat u heeft in de gemeente Rotterdam. In hoeverre bent u het eens met de volgende stellingen? (5 = helemaal mee eens, 1= helemaal niet mee eens)

4. De gemeente Rotterdam is capabel.
5. De gemeente Rotterdam is effectief.
6. De gemeente Rotterdam is kundig.
7. De gemeente Rotterdam is professioneel.
8. De gemeente Rotterdam voert haar taken zeer goed uit.
9. Als burgers hulp nodig hebben, doet de gemeente Rotterdam haar best om hen te helpen.
10. De gemeente Rotterdam handelt in het belang van de burgers.
11. De gemeente Rotterdam is oprecht geïnteresseerd in het welzijn van de burgers.
12. De gemeente Rotterdam benadert burgers op een oprechte manier.
13. De gemeente Rotterdam is oprecht.
14. De gemeente Rotterdam komt haar toezeggingen na.
15. De gemeente Rotterdam is eerlijk.

In hoeverre bent u het eens met de volgende stelling? "Ik heb positieve ervaringen met de gemeentelijke administratie van de gemeente Rotterdam" (5 = helemaal mee eens, 1= helemaal niet mee eens)

In hoeverre bent u het eens met de volgende stelling? "Ik heb vertrouwen in het vermogen van kunstmatige intelligentie (AI) om menselijke besluitvorming te ondersteunen" (5 = helemaal mee eens, 1= helemaal niet mee eens)

De volgende vragen gaan over een hypothetische situatie. Het is belangrijk dat u zich goed probeert in te leven in de geschetste situatie.

Stel je voor: De gemeente Rotterdam zet scanauto's met camera's in om parkeercontroles uit te voeren. De camera's op de scanauto gebruiken een beeldherkenningsalgoritme om kentekens te identificeren. Het kenteken komt in het Nationaal Parkeer Register en de vergunningendatabase van de gemeente Rotterdam. Hier wordt gecontroleerd of de auto het recht heeft om geparkeerd te worden. Is er geen vergunning of is er niet betaald voor het parkeren, dan wordt het kenteken doorgestuurd naar een parkeerhandhaver van de gemeente Rotterdam. Deze ambtenaar controleert of het parkeergeld inderdaad niet is betaald en bekijkt de gemaakte scanfoto's. Op 11 april 2023 ontving u de **volgende brief** van de gemeente Rotterdam:

Brief 1

"Geachte heer/mevrouw,

Op 10 april 2023 is een verkeersovertreding begaan met het voertuig met kenteken XX-XX-XX. Dit kenteken staat op uw naam, of u was tijdens de overtreding huurder van dit voertuig. Daarom ontvangt u deze beschikking met informatie over de overtreding en het bedrag dat u moet betalen.

Informatie over de overtreding en de opgelegde administratieve sanctie:
Omschrijving overtreding: u heeft niet betaald voor het parkeren. De scanauto heeft een foto van uw kenteken gemaakt. Het kenteken is binnengekomen bij het Nationaal Parkeer Register en het vergunningenbestand van de gemeente Rotterdam. Hier wordt gecontroleerd of de auto recht heeft op parkeren. Omdat u niet heeft betaald voor het parkeren, is het kenteken doorgestuurd naar een parkeerhandhaver van de gemeente Rotterdam. Deze ambtenaar heeft gecontroleerd of er inderdaad niet is betaald en heeft de gemaakte scanfoto's bekeken. Als gevolg daarvan ontvangt u een parkeerboete. Informatie over het algoritme, de gegevens die gebruikt zijn om het algoritme te trainen en uw geteste gegevens kunt u opvragen bij parkeerhandhaver Mr. X.
Locatie: Heemraadssingel, Rotterdam
Datum: 10-04-2023
Te betalen: 69,26 euro (vast bedrag van 66,50 + 1 uur parkeergeld 2,76)

Brief 2

"Geachte heer/mevrouw,

Op 10 april 2023 is een verkeersovertreding begaan met het voertuig met kenteken XX-XX-XX. Dit kenteken staat op uw naam, of u was tijdens de overtreding huurder van dit voertuig. Daarom ontvangt u deze beschikking met informatie over de overtreding en het bedrag dat u moet betalen.

Informatie over de overtreding en de opgelegde administratieve sanctie:
Omschrijving overtreding: u heeft niet betaald voor het parkeren. Informatie over het algoritme, de gegevens die gebruikt zijn om het algoritme te trainen en uw geteste gegevens kunt u opvragen bij de gemeente Rotterdam.
Locatie: Heemraadssingel, Rotterdam
Datum: 10-04-2023
Te betalen: 69,26 euro (vast bedrag van 66,50 + 1 uur parkeergeld 2,76)

Brief 3

"Geachte heer/mevrouw,

Op 10 april 2023 is een verkeersovertreding begaan met het voertuig met kenteken XX-XX-XX. Dit kenteken staat op uw naam, of u was tijdens de overtreding huurder van dit voertuig. Daarom ontvangt u deze beschikking met informatie over de overtreding en het bedrag dat u moet betalen.

Informatie over de overtreding en de opgelegde administratieve sanctie:
Omschrijving overtreding: u heeft niet betaald voor het parkeren. De scanauto heeft een foto van uw kenteken gemaakt. Het kenteken is binnengekomen bij het Nationaal Parkeer Register en het vergunningenbestand van de gemeente Rotterdam. Hier wordt gecontroleerd of de auto recht heeft op parkeren. Omdat u niet heeft betaald voor het parkeren, is het kenteken doorgestuurd naar een parkeerhandhaver van de gemeente Rotterdam. Deze ambtenaar, Mr. X., heeft gecontroleerd of er inderdaad niet is betaald en heeft de gemaakte scanfoto's bekeken. Als gevolg daarvan ontvangt u een parkeerboete.
Locatie: Heemraadssingel, Rotterdam
Datum: 10-04-2023
Te betalen: 69,26 euro (vast bedrag van 66,50 + 1 uur parkeergeld 2,76)

Brief 4

"Geachte heer/mevrouw,

Op 10 april 2023 is een verkeersovertreding begaan met het voertuig met kenteken XX-XX-XX. Dit kenteken staat op uw naam, of u was tijdens de overtreding huurder van dit voertuig. Daarom ontvangt u deze beschikking met informatie over de overtreding en het bedrag dat u moet betalen.

Informatie over de overtreding en de opgelegde administratieve sanctie:
Omschrijving overtreding: u heeft niet betaald voor het parkeren.
Locatie: Heemraadssingel, Rotterdam
Datum: 10-04-2023
Te betalen: 69,26 euro (vast bedrag van 66,50 + 1 uur parkeergeld 2,76)

De volgende vragen hebben betrekking op de situatie waarin u zich zojuist heeft ingeleefd. In hoeverre bent u het eens met de volgende stellingen? (5 = helemaal mee eens, 1= helemaal niet mee eens)

16. De gemeente Rotterdam besloot mij te beboeten op een manier die niet eerlijk was tegenover mij.
17. De manier waarop de gemeente Rotterdam besloot om mij te beboeten, was niet eerlijk tegenover mij.
18. De gemeente Rotterdam was eerlijk tegenover mij bij het nemen van de beslissing om mij te beboeten.
19. De stappen die de gemeente Rotterdam nam om mij te beboeten, waren eerlijk tegenover mij.

De volgende vragen hebben betrekking op de situatie waarin u zich zojuist heeft ingeleefd. In hoeverre bent u het eens met de volgende stellingen? (5 = helemaal mee eens, 1= helemaal niet mee eens)

20. De gemeente Rotterdam is capabel.
21. De gemeente Rotterdam is effectief.
22. De gemeente Rotterdam is kundig.
23. De gemeente Rotterdam is professioneel.

24. De gemeente Rotterdam voert haar taken zeer goed uit.
25. Als burgers hulp nodig hebben, doet de gemeente Rotterdam haar best om hen te helpen.
26. De gemeente Rotterdam handelt in het belang van de burgers.
27. De gemeente Rotterdam is oprecht geïnteresseerd in het welzijn van de burgers.
28. De gemeente Rotterdam benadert burgers op een oprechte manier.
29. De gemeente Rotterdam is oprecht.
30. De gemeente Rotterdam komt haar toezeggingen na.
31. De gemeente Rotterdam is eerlijk.

8 Appendix B: questionnaire in English

Dear participant,

If you live in or commute to Rotterdam, you are kindly invited to fill out this questionnaire on "**Knowing = trusting?**"! The purpose of the survey is to explore your attitude toward the enforcement decision of parking fines by the municipality of Rotterdam. The questionnaire is focused on decisional transparency and trust aspects, and it takes about 5 to 10 minutes to complete. There are no right or wrong answers, it is about your opinion or experience.

Processing results

The results of the survey will be processed into a master thesis. Your anonymity will be ensured by completing the survey anonymously. The results of the survey will in no way be traceable to individual responses.

Data storage

I store and process your data according to the guidelines of the General Data Protection Regulation (AVG). In addition to the student, only the thesis supervisor and the second reader will have access to any data you provide. Furthermore, your anonymized responses will be kept at least until the end of my research in a secure environment for monitoring purposes.

Voluntary participation

Moreover, your participation is voluntary, which means that you can withdraw at any time without consequences and have your answers removed. You can do this by emailing j.w.zijlstra@umail.leidenuniv.nl

I trust to have informed you sufficiently and thank you very much for your cooperation.

With kind regards, Jeske Zijlstra

To start the survey, you must agree to the following points:

I. I have been sufficiently informed about the survey. I have been able to read all the information and have had the opportunity to ask questions.
II. I am voluntarily participating in this survey. It is clear to me that I can terminate participation at any time.

III. I consent to the processing of the data collected about me during this study as explained in the information provided here above.

- I agree
- I do not agree

Which gender do you identify with the most?

- Male
- Female
- No gender/ third gender

Which category below includes your age?

- 18 to 20 years
- 21 to 30 years
- 31 to 40 years
- 41 to 50 years
- 51 to 60 years
- 61 to 70 years
- 71 +

What is your highest level of education?

- Lower than high school/ secondary education
- High school/ secondary education
- Secondary vocational education (MBO)
- Higher education (HBO)
- Bachelor's degree
- Master's degree
- Ph.D or higher

What is your gross **monthly** income? (Salary prior to deduction of taxes and contributions)

- 0 – 1999 euros
- 2000 – 3999 euros
- 4000 – 5999 euros
- 6000 – 7999 euros

- 8000 – 9999 euros
- More than 10.000 euros

Which party would you vote for if there were municipal elections in Rotterdam tomorrow?

- Leefbaar Rotterdam
- VVD
- Groenlinks
- D66
- PvdA
- DENK
- Volt
- Partij voor de Dieren
- BIJ1
- 50PLUS
- ChristenUnie
- SP
- CDA
- Forum voor Democratie

Do you own a car?

- Yes
- No

How many times did you receive a parking fine in the last **two years**?

- Never
- 1 – 3 times
- 4 – 6 times
- 7 – 9 times
- 10 +

The following statements are about your trust in another person (5 = fully agree, 1 = fully disagree)

1. Most people can be trusted.
2. Most people would try to be fair.

3. People most try to be helpful.

The following statements are about the trust you have in the municipality of Rotterdam. To what extent do you agree with the following statements? (5 = fully agree, 1 = fully disagree)

4. The municipality is capable.
5. The municipality is effective.
6. The municipality is skilful.
7. The municipality is professional.
8. The municipality carriers out its duty very well.
9. If citizens need help, the municipality will do its best to help them.
10. The municipality acts in the interest of citizens.
11. The municipality is genuinely interested in the well-being of citizens.
12. The municipality approaches citizens in a sincere way.
13. The municipality is sincere.
14. The municipality honors its commitments.
15. The municipality is honest.

To what extent do you agree with the following statement? “I have positive experiences with the municipal administration of the municipality of Rotterdam” (5 = fully agree, 1 = fully disagree)

To what extent do you agree with the following statement? “I trust the ability of artificial intelligence (AI) to support human decision-making” (5 = fully agree, 1 = fully disagree)

The following questions are about a hypothetical situation. You must try to empathize with the situation outlined.

Imagine this: The municipality of Rotterdam deploys scanning cars with cameras to perform parking controls. An image recognition algorithm is used to check whether the car has the right to be parked. If there is no permit or if the parking has not been paid for, the license plate is forwarded to a parking enforcement officer of the municipality of Rotterdam. This officer checks whether the parking fee has indeed not been paid. On April 11, 2023, you received the following letter from the municipality of Rotterdam:

Letter 1

Dear Sir/ Madam,

On April 10, 2023, a traffic violation was committed with the vehicle with the license plate XX-XX-XX. This registration number is in your name, or you were the renter of this vehicle during the violation. Therefore, you are receiving this order with information about the violation and the amount you must pay.

Information about the violation and the administrative sanction imposed:
Description violation: you did not pay for parking. The scan car has taken a picture of your license plate number. The license plate number came in with the National Parking Register and the permit database of the municipality of Rotterdam. Here it is checked whether the car has the right to be parked. Because you did not pay for parking, the license plate number was forwarded to a parking enforcement officer of the municipality of Rotterdam. This officer checked whether there was indeed no payment and looked at the scan photos taken. As a result, you will receive a parking fine. Information about the algorithm, the data used to train the algorithm and your tested data can be obtained from parking officer Mr. X.
Location: Heemraadssingel, Rotterdam
Date: 10-04-2023
To be paid: 69,26 euros (fixed amount of 66,50 + 1-hour parking fee 2,76)

Letter 2

Dear Sir/ Madam,

On April 10, 2023, a traffic violation was committed with the vehicle with the license plate XX-XX-XX. This registration number is in your name, or you were the renter of this vehicle during the violation. Therefore, you are receiving this order with information about the violation and the amount you must pay.

Information about the violation and the administrative sanction imposed:

Description violation: you did not pay for parking. Information about the algorithm, the data used to train the algorithm and your tested data can be obtained from the municipality.

Location: Heemraadssingel, Rotterdam

Date: 10-04-2023

To be paid: 69,26 euros (fixed amount of 66,50 + 1-hour parking fee 2,76)

Letter 3

Dear Sir/ Madam,

On April 10, 2023, a traffic violation was committed with the vehicle with the license plate XX-XX-XX. This registration number is in your name, or you were the renter of this vehicle during the violation. Therefore, you are receiving this order with information about the violation and the amount you must pay.

Information about the violation and the administrative sanction imposed:

Description violation: you did not pay for parking. The scan car has taken a picture of your license plate number. The license plate number came in with the National Parking Register and the permit database of the municipality of Rotterdam. Here it is checked whether the car has the right to be parked. Because you did not pay for parking, the license plate number was forwarded to a parking enforcement officer of the municipality of Rotterdam. This officer, Mr. X. checked whether there was indeed no payment and looked at the scan photos taken. As a result, you will receive a parking fine.

Location: Heemraadssingel, Rotterdam

Date: 10-04-2023

To be paid: 69,26 euros (fixed amount of 66,50 + 1-hour parking fee 2,76)

Letter 4

Dear Sir/ Madam,

On April 10, 2023, a traffic violation was committed with the vehicle with the license plate XX-XX-XX. This registration number is in your name, or you were the renter of this vehicle during the violation. Therefore, you are receiving this order with information about the violation and the amount you must pay.

Information about the violation and the administrative sanction imposed:
Description violation: you did not pay for parking.
Location: Heemraadssingel, Rotterdam
Date: 10-04-2023
To be paid: 69,26 euros (fixed amount of 66,50 + 1-hour parking fee 2,76)

The following questions relate to the situation you have just imagined. To what extent do you agree with the following statements? (5 = fully agree, 1 = fully disagree)

16. The municipality of Rotterdam decided to fine me in a way that was not fair to me.
17. The way the municipality of Rotterdam decided to fine me was not fair to me.
18. The municipality was fair to me in making the decision to fine me.
19. The steps the municipality took to fine me were fair to me.

The following questions relate to the situation you have just imagined. To what extent do you agree with the following statements? (5 = fully agree, 1 = fully disagree)

20. The municipality is capable.
21. The municipality is effective.
22. The municipality is skilful.
23. The municipality is professional.
24. The municipality carriers out its duty very well.
25. If citizens need help, the municipality will do its best to help them.
26. The municipality acts in the interest of citizens.
27. The municipality is genuinely interested in the well-being of citizens.
28. The municipality approaches citizens in a sincere way.
29. The municipality is sincere.

30. The municipality honors its commitments.
31. The municipality is honest.