Legit or Not? How Dutch Citizens Perceive Legitimacy of Algorithmic Decision-Making in Local Government

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Abstract

This thesis examines how citizens perceive the legitimacy of algorithmic decision-making (ADM) in the Dutch public sector. Using a 2×2 vignette experiment (N = 164), it tests the effects of task complexity, human involvement, and support for algorithmic governance frameworks on legitimacy perceptions. Findings reveal that ADM is seen as less legitimate for complex tasks and when human oversight is absent. Crucially, individual support for governance frameworks (e.g., CODIO) strongly predicts legitimacy, regardless of design. These results suggest that both contextual ADM design and citizens support in governance structures shape public legitimacy of these systems. The study offers practical recommendations for municipalities and highlights the need for participatory, transparent ADM policies.

Contents

1. Introduction

Over the past few years, numerous high-profile incidents in the Netherlands have brought attention to the risks of using algorithmic systems in the public sector. In 2023, it was revealed that the Dutch Education Executive Agency (DUO) used an automated fraud detection system that wrongly flagged thousands of students, mainly those with a migration background, as fraudsters for allegedly giving false information about their home address in order to receive higher student benefits (NOS, 2023). Similarly, the Dutch childcare benefits scandal (Toeslagenaffaire) exposed how an algorithm used by tax authorities falsely accused thousands of parents, many also from minority backgrounds, of fraud, which lead to severe financial hardship and unjust debt collection (Eubanks, 2018; Grimmelikhuijsen & Meijer, 2022).

These scandals have shown how algorithmic decision-making (ADM) systems can cause real harm to citizens, specifically marginalized groups, when they lack transparency, fairness, or accountability (Cath, 2021; Van den Meerssche, 2021; Wieringa, 2020;). Beyond individual suffering, such incidents have undermined public trust and damaged perceived legitimacy of government decisions, especially when citizens are given no explanation or alternative (Grimmelikhuijsen & Meijer, 2022)

Consequently, governments are beginning to understand that stronger frameworks are required to direct the use of ADM in public services (OECD, 2021; WRR, 2021). In the Randstad region, where large cities like Rotterdam, The Hague, and Amsterdam are increasingly using algorithmic systems for welfare assessments, crowd control, and parking enforcement, the development of responsible governance has become a key priority (Wieringa, 2020). One example is the CODIO framework (Code Goed Digitaal Openbaar Bestuur), which was developed to help public organizations implement algorithms in ways that respect public values (Ministerie van

BZK, 2021). The Hague has been actively involved in CODIO's development and testing, and Rotterdam is working to align its digital policies with similar principles (Meijer & Ruijer, 2021; Rekenkamer Rotterdam, 2024). These efforts aim to make ADM fairer and more accountable.

While such governance initiatives represent important steps forward, it remains unclear whether citizens actually perceive algorithmic decisions as more legitimate simply because such a framework is in place (Miller, 2020). Research suggests that public acceptance of ADM may also depend on contextual factors, such as the nature of the task, that is whether it is a routine administrative matter or a morally complex decision, and the extent to which humans are involved in the decision-making process (Binns et al., 2018, Lee, Kim & Lee, 2021). This study focuses on these three elements to better understand when and how ADM is perceived as legitimate by the public.

1.1 Problem Formulation

As algorithmic systems become more common in the public sector, governments face the challenge of ensuring that these technologies are not only effective but also perceived as legitimate by the people they affect (Schuilenburg, Van Eck, Zouridis, 2020). *Perceived legitimacy*, defined as the belief that a decision-making process is fair, trustworthy, and appropriate, is essential for maintaining public support and compliance in democratic societies (Tyler, 2006; Martin & Waldman, 2022).

Prior studies have identified important drivers of legitimacy perceptions, such as fairness, transparency, and accountability (Binns, 2018; Zarsky, 2016; Felten et al., 2019). More recently, scholars have emphasized that task characteristics (e.g., complexity or moral sensitivity) and human involvement also influence how ADM is evaluated (Busuioc, 2020; Starke et al., 2021). However, most existing studies assess general attitudes and lack empirical testing in realistic, local

government contexts. This gap is particularly pertinent in the Dutch context, where these high-profile incidents have underscored the urgent need for empirically grounded understanding of public perceptions.

Meanwhile, Dutch municipalities have begun implementing governance frameworks like CODIO to guide ethical ADM use (Ministerie van BZK, 2021). Yet, little is known about citizens' support of these frameworks, or whether such support influences their perceptions of automated decisions. This study addresses this gap by examining how task complexity, human involvement, and support of algorithmic governance frameworks interact to shape the perceived legitimacy of ADM in municipal settings.

1.2 Research Aim and Question

This study investigates how citizens evaluate the legitimacy of ADM in local government, focusing on three key factors: task complexity, human involvement, and support of algorithmic governance frameworks.

Grounded in theories of procedural justice, algorithmic transparency, and legitimacy, the study assumes that people evaluate ADM not only based on outcomes, but also on how decisions are made and explained. Using a vignette-based experimental design, participants respond to realistic municipal scenarios that manipulate task complexity and human involvement. This method supports causal inference while ensuring contextual relevance.

By focusing on Dutch municipalities, the research explores public perceptions in a setting where ADM has been actively introduced, but citizen responses remain underexplored. The main research question will therefore be as follows: "*How do task complexity and human involvement affect the perceived legitimacy of algorithmic decision-making in local public administration, and to what extent is this relationship moderated by support for algorithmic governance frameworks?"*

1.3 Scientific Relevance

Although there is a growing academic interest in how citizens perceive ADM, much of the existing literature examines general attitudes toward algorithmic systems, often outside of specific policy or service contexts (Lee, 2018; Zerilli et al., 2019). These studies tend to focus on abstract concerns about fairness, accuracy, and transparency, without fully accounting for the realistic conditions under which ADM systems are used in public administration.

This study responds to that gap by focusing on perceived legitimacy in the context of local government services, such as parking enforcement and welfare allocation. Using a vignette-based experiment, it empirically tests how citizens respond to ADM under different conditions of task complexity and human involvement (Martin & Waldman, 2022; Starke et al., 2021). This approach goes further than hypothetical or generalized opinions and provides evidence grounded in real municipal scenarios.

Most importantly, this study also contributes to the emerging literature on local algorithmic governance (Grimmelikhuijsen & Meijer, 2021; Janssen & Kuk, 2016). While recent policy efforts in the Netherlands, such as the development of the CODIO framework, emphasize public values in municipal ADM use, there is limited empirical research on how citizens perceive these frameworks or whether support of such governance principles affects legitimacy perceptions. By integrating governance support as a moderating factor, this study provides insight into how municipalities can not only comply with ethical standards but also improve public trust in ADM through visible and credible governance structures (Veale & Zuiderwijk, 2021).

1.4 Societal Relevance

The increasing integration of ADM systems into public services by Dutch municipalities has raised concerns (Algemene Rekenkamer, 2021). High-profile scandals, such as the childcare benefits

affair and the DUO student fraud detection case, have shown how ADM systems can produce unjust outcomes when human involvement is lacking or transparency is insufficient (NOS, 2023; Grimmelikhuijsen & Meijer, 2022). These incidents have not only harmed individuals, particularly those from marginalized communities, but have also eroded public trust in government decision-making (Algemene Rekenkamer, 2021; Binns, van Eck, & van der Sloot, 2022).

As previously mentioned, cities like Rotterdam and The Hague are working to develop algorithmic governance frameworks to guide the responsible use of ADM by embedding important public values (Ministerie van BZK, 2021; Veale & Zuiderwijk, 2021). This important step toward ethical algorithm use still sparks some questions. In the Dutch context, with a past of scandals which have undermined trust, it is yet unclear whether these algorithmic governance frameworks influence their perceived legitimacy of these ADM systems.

This study offers practical insights for policymakers and public administrators at the local level. By empirically testing how task complexity, human involvement, and support of governance frameworks affect perceived legitimacy, the research informs how municipalities can design and implement ADM in a way that increases public trust. For example, if support for a governance framework positively influences legitimacy perceptions, it may indicate a need for stronger public communication and education efforts. Conversely, if legitimacy is more dependent on human involvement in complex decisions, this may highlight the importance of preserving human judgement in ethically sensitive tasks (Starke et al., 2021; Bigman & Gray, 2018). More broadly, the findings also contribute to global debates on digital democracy, algorithmic transparency, and the ethical use of AI in the public sector, offering actionable knowledge for governments looking to build systems that are not only efficient, but also democratically legitimate (Danaher et al., 2017; Yeung, 2018).

The remainder of this thesis is structured as follows: *Chapter 2* presents the theoretical framework, reviewing literature on algorithmic legitimacy, task complexity, and human oversight. *Chapter 3* outlines the research design and methodology, detailing the vignette survey experiment. *Chapter 4* presents the empirical findings and discussion, and *Chapter 5* concludes with policy implications, recommendations, and future research directions.

2. Theoretical Framework

2.1 Algorithmic Decision-Making in the Dutch Public Sector

Local governments in the Netherlands, especially in the Randstad region, are increasingly adopting ADM systems to improve efficiency, consistency, and large-scale service delivery (Jonk & Iren, 2021; Veale & Zuiderwijk, 2021). These systems are used across domains such as welfare distribution, fraud detection, housing allocation, and urban mobility management (Engbers, 2020; Lavin Barrientos, 2024).

From a theoretical perspective, ADM is often framed as a tool to reduce human error, ensure uniformity in decisions, and leverage data-driven insights for large-scale governance (Bovens, van Eck & Bovens, 2020). However, ADM also raises important normative concerns about how decisions are made and by whom. Scholars argue that as discretion shifts from street-level bureaucrats to systems designers and data scientists, democratic input into public decisions becomes more limited, a phenomenon described as 'automated discretion' (Zouridis et al., 2020).

This shift has serious implications for legitimacy, particularly regarding transparency, accountability, and citizen participation. When algorithms are used to make or influence decisions, the logic behind those decisions may become opaque, especially if systems are complex or poorly communicated (Pasquale, 2015). These "black box" conditions can make it difficult for citizens to

understand or challenge outcomes, eroding both input and throughput legitimacy (Grimmelikhuijsen & Meijer, 2022).

In the Dutch context, studies indicate that municipalities often implement ADM systems in an ad hoc and fragmented manner, lacking standardized ethical frameworks, clear procedures for oversight, or communication strategies (Jonk & Iren, 2021). Furthermore, many local governments rely on external vendors for system development and maintenance, which complicates issues of democratic accountability and public transparency (Grimmelikhuijsen & Meijer, 2022; Veale & Zuiderwijk, 2021). Some municipalities have started to introduce tools such as algorithm registers and internal audits to improve transparency and citizen engagement (Lavin Barrientos, 2024). Nevertheless, researchers emphasize that most local governments remain underequipped, both institutionally and legally, to handle the ethical implications of ADM on their own (Ananny & Crawford, 2018).

In summary, while ADM offers clear and practical advantages for local governments, it also poses challenges to democratic legitimacy, particularly when decision-making becomes opaque or unaccountable. These legitimacy concerns highlight the importance of understanding how citizens perceive ADM systems, especially in terms of fairness, transparency, and accountability. This issue is the focus on the next section.

2.2 Perceived Legitimacy of Algorithmic Decision-Making

Perceived legitimacy refers to the extent to which individuals believe that a decision-making process is fair, trustworthy, and appropriate (Tyler, 2006; Waldman & Martin, 2022). Unlike formal and legal legitimacy, which is based on laws and institutional authority, perceived legitimacy emphasizes citizens' subjective evaluations. A decision may be legally valid yet still be viewed as illegitimate if people believe the process behind it was opaque, unfair, or biased.

In the context of ADM, perceived legitimacy has become a central concern in both academic and policy debates. While earlier discussions focused primarily on the accuracy or efficiency of algorithmic systems, more recent research emphasizes how decisions are made matters just as much as their outcomes (Danaher et al., 2017; Binns et al., 2018).

Several procedural elements have been identified as critical for the public evaluations of legitimacy. Transparency and justifiability are frequently highlighted as important conditions for public acceptance. When citizens receive clear explanations about how algorithmic decisions are made, and can understand the reasoning behind the outcomes, they are more likely to view those decisions as fair (de Fine Licht & de Fine Licht, 2020). However, some studies suggest a more complex picture. In certain contexts, algorithms are perceived as more impartial or objective than humans, which lead to algorithm appreciation even in the absence of full explanations (Leicht-Deobald et al., 2019)

Another important element concerns accountability and redress. Scholars argue that ADM systems must be embedded in mechanisms that allow for appeals, oversight, or correction, especially when decisions significantly affect people's lives (Citron, 2007; Selbst & Barocas, 2018). While these themes are often addressed through governance frameworks (discussed in Chapter 2.5), they reflect a broader concern about aligning ADM with democratic values and procedural fairness.

Finally, human involvement plays a key role in shaping legitimacy perceptions. Research consistently shows that citizens are more likely to accept automated decisions when humans are involved in reviewing or approving them (Martin, 2019; Martin & Waldman, 2022). Human input is seen as a safeguard that ensures empathy, judgement, and contextual understanding remain part of the decision process, qualities that are often lacking in purely algorithmic systems.

With these insights combined, the literature suggests that perceived legitimacy in ADM is not determined solely by accuracy or legality of the system, but by how transparent, accountable, and human-centered the process is. This study focuses on two particularly influential factors, task complexity and human involvement, and investigates how they interact with citizens' support for algorithmic governance frameworks. These key dimensions are explored in the following sections.

2.3 Human Involvement

The degree of *human involvement* in ADM is one of the most influential factors shaping public perceptions of legitimacy (Binns et al., 2018; Starke et al., 2021). In public administration, ADM systems range from fully automated tools, where decisions are made without human input, to hybrid 'human-in-the-loop' models, where algorithmic recommendations are reviewed or moderated by public officials (Grimmelikhuijsen & Meijer, 2021; Martin and Waldman, 2022).

Research consistently shows that citizens prefer decision-making processes that involve human input. This is especially the case when moral and contextual complexity are at play (Jamieson et al., 2020; Lee, 2018). Fully autonomous systems are often perceived as less fair, less transparent, and less empathetic, lacking the discretion and judgement that human decision-makers provide (Martin, 2019). This preference is notable in public service contexts, where decisions such as determining welfare eligibility or detecting fraud can feel rigid and dehumanizing when made solely by algorithms (Bigman & Gray, 2018).

2.3.1 Algorithm Aversion Theory

The preference for human involvement in ADM is supported by the theory of 'algorithm aversion'. Dietvorst, Simmons, and Massey (2015) argue that people tend to react more negatively to algorithmic errors than to similar mistakes made by humans, even when algorithms are statistically

more accurate. This skepticism arises from perceptions that algorithms lack the flexibility, empathy, and contextual awareness necessary for legitimate decision-making, particularly in public administration, where decisions must inspire confidence and reflect moral sensitivity.

Subsequent research has refined this idea. Jussupow et al. (2020) identify three primary reasons for this aversion, each directly impacting perceptions of trust and fairness. First, fully automated systems often create a sense of lost control, as stakeholders feel their agency is diminished in high-stakes contexts like public policy. This erosion of control undermines trust in algorithmic outcomes. Second, the opacity of many algorithms fuels doubts about the fairness of decisions, as individuals struggle to understand the logic or data driving the process. Third, there is a widespread skepticism about algorithms' ability to handle subjective or morally complex cases, which further diminishes their perceived legitimacy. These factors explain why fully automated decisions often face resistance, particularly in public administration where legitimacy hinges on empathy and transparency (Jussupow et al., 2020).

However, acceptance of ADM increases significantly when algorithms serve in an advisory capacity, with human retaining final decision-making authority. This hybrid approach, combining algorithmic efficiency with human judgment, enhances trust and perceptions of fairness, especially in morally sensitive or high-stakes scenarios (Bigman & Gray, 2018; Martin & Waldman, 2022). By allowing human oversight to address concerns about control, transparency, and nuanced judgements, hybrid decision-making emerges as a best practice for ensuring legitimacy in ADM (Palmeira & Spassova, 2015).

In sum, both theoretical and empirical studies suggest that human involvement is critical for maintaining perceived legitimacy in ADM. The presence of a human decision-maker can signal

fairness, enable recourse, and reassure citizens that ethical judgement remains part of the process. Therefore, the first hypothesis is formulated as follows:

*Hypothesis 1***:** Algorithmic decision-making systems that include human involvement will be perceived as more legitimate than fully autonomous systems

2.4 Task Complexity

Task complexity refers to the level of difficulty, ambiguity, and uncertainty involved in performing or evaluating a decision (Wood, 1986). In public administration, this distinction is particularly important, as government decisions can vary widely in both procedural structures and moral sensitivity.

Low-complexity tasks are generally repetitive, objective, and guided by fixed rules. Examples include issuing parking fines or processing basic permit applications. These decisions tend to be standardized, carry limited consequences, and can often be automated without significant controversy (Starke & Lunich, 2020).

By contrast, high-complexity tasks often involve ethical dilemmas, competing values, and case-specific judgement. These include decisions such as detecting welfare fraud, determining benefit eligibility, or assessing child protection risks (Busuioc, 2020). Such tasks require moral reasoning and contextual sensitivity, characteristics that are typically associated with human discretion rather than algorithmic rule-following (Konig & Wenzelburger, 2021).

These differences in complexity shape public expectations regarding appropriate decision-making processes. Research suggests that citizens are more willing to accept automated systems in low-complexity scenarios but become more skeptical of ADM in high-complexity settings where human values and individual circumstances play a larger role (Starke et al., 2021).

2.4.1 Algorithmic Appreciation Theory

While algorithm aversion highlights public skepticism toward ADM, algorithm appreciation theory suggests that under specific conditions, individuals may prefer algorithms over human decision-makers, particularly in ways that enhance perceived legitimacy. Logg et al. (2019) and Prahl & Swol (2017) argue that algorithm appreciation emerges in low-complexity, data-drives tasks where objectivity and consistency are valued. In such contexts, algorithms are perceived as impartial, free from human biases, and capable of delivering uniform outcomes, which encourages perceptions of fairness and procedural legitimacy (Starke & Lunich, 2020). For example, in public administration tasks like issuing parking fines or processing routine permit applications, citizens often trust algorithms to apply rules consistently, reducing the risk of subjective errors or favoritism that might undermine legitimacy.

The preference for algorithms in these scenarios stems from their perceived technical reliability and efficiency. Unlike human decision-makers, who may be influenced by fatigue, emotion, or personal bias, algorithms execute decisions based on predefined criteria, fostering trust in their impartiality (Logg et al., 2019). This aligns with public administration's emphasis on standardized, transparent processes, where predictable outcomes signal fairness. However, algorithm appreciation is highly context dependent. Castelo et al. (2019) finds that when tasks are complex, citizens overwhelmingly prefer human involvement. In that case, algorithms are seen as rigid and lacking the ethical reasoning or empathy needed to ensure legitimate decisions.

Thus, algorithm appreciation complements algorithm aversion by highlighting how task complexity shapes legitimacy perceptions. In low-complexity settings, the impartiality and efficiency of algorithms enhance public trust and fairness perceptions, supporting their legitimacy. In contrast, high-complexity tasks require human discretion to address moral and contextual

nuances, where algorithm appreciation diminishes (Castelo et al., 2019). This interaction underpins the second and third hypothesis.

*Hypothesis 2***:** Algorithmic decision-making systems used for low-complexity tasks will be perceived as more legitimate than those used for high-complexity tasks

Hypothesis 3: The negative effect of high complexity on perceived legitimacy will be stronger under conditions of low human involvement

2.5 Algorithmic Governance Frameworks in the Netherlands

As ADM becomes integral to Dutch public administration, governance frameworks have emerged as essential tools to ensure its ethical, transparent, and accountable implementation. These frameworks aim to align ADM with public values, addressing legitimacy concerns, such as opacity, discrimination, and diminished democratic oversight raised in earlier sections (Busuioc, 2020; Grimmelikhuijsen & Meijer, 2021). By establishing normative and procedural safeguards, they seek to enhance public trust and perceived fairness, critical components of legitimate decision-making in public administration.

In the Netherlands, key initiatives have been introduced to promote responsible ADM. The National Algorithm Register, launched in 2022, mandates public organizations to disclose details about their algorithms, including their purpose, risk levels, and degree of human involvement (Ministerie van BZK, 2022). This transparency mechanism empowers citizens and civil actors to scrutinize ADM systems, fostering accountability and mitigating the “black box” concerns that erode legitimacy (Pasquale, 2015). Similarly, the CODIO framework provides guidelines for municipalities to implement ADM in ways that uphold democratic values, non-discrimination, and procedural fairness (Ministerie van BZK, 2021). Cities like Rotterdam and The Hague have

adopted CODIO principles to enhance oversight and public engagement in algorithmic processes (Veale & Zuiderwijk, 2021).

Despite these advances, implementation remains inconsistent across Dutch municipalities. The Dutch Court of Audit (2021) highlights that many public institutions lack standardized procedures for testing algorithms, assessing their social impacts, or ensuring independent oversight. Smaller municipalities, in particular, face challenges due to limited legal expertise and technical capacity (Brouwers et al., 2022). These gaps raise questions about whether governance frameworks can effectively address legitimacy concerns, particularly regarding public trust in their ability to ensure fair and accountable ADM. This issue sets the stage for examining how citizens perceive and support these frameworks, as discussed in the following section.

2.5.2 Support for Algorithmic Governance Framework

Public support for algorithmic governance frameworks is an important psychological factor shaping perceptions of legitimacy in ADM. This support reflects individuals' belief that oversight mechanisms, such as the National Algorithm Register and CODIO framework, are necessary and effective in ensuring ethical, transparent, and accountable ADM (Araujo et al., 2020; Konig & Wenzelburger, 2021). When individuals endorse these oversight structures, they are more likely to perceive ADM systems as legitimate, even when technical details are unclear or when decisions are partially automated (Binns et al., 2018; Wirtz et al., 2019).

Support for governance frameworks may operate in two key ways. First, it can function as an independent predictor. Individuals who value these institutional safeguards may simply trust ADM systems more, regardless of how they are designed. This also aligns with the previously mentions concept of procedural trust which emphasizes belief in the fairness of the system over characteristics of specific decisions (Ananny & Crawford, 2018; Zerilli et al., 2019). Secondly,

and most importantly, support may act as a moderator, which means that it could conditions how design features like task complexity and human involvement influence legitimacy perceptions. For example, high support may buffer the negative effects of fully automated decisions or complex ADM tasks by reassuring citizens that appropriate oversight is in place (Martin & Waldman, 2022). Conversely, individuals with low support may remain skeptical of ADM legitimacy even when system design is transparent or human centered. This logic is also supported by earlier findings on algorithms aversion and appreciation (Castelo et al., 2019; Lee, 2018).

Following these insights, three hypotheses are proposed to examine how support for governance frameworks shapes legitimacy perceptions by looking at the main effect of support, a two-way moderation, and lastly a three-way moderation. The hypotheses are as follows:

Hypothesis 4: Higher support for algorithmic governance frameworks will be positively associated with perceived legitimacy of ADM systems.

Hypothesis 5: Support for algorithmic governance frameworks will moderate the relationship between task complexity and human involvement on perceived legitimacy, such that higher support lessens the negative effects of complex or autonomous systems

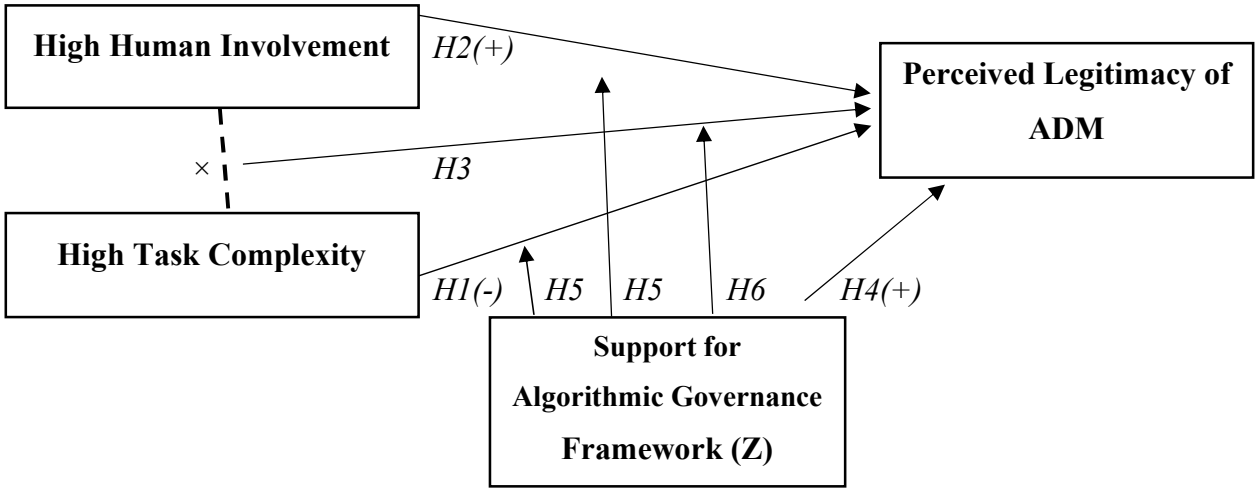
Hypothesis 6: The interaction between task complexity and human involvement will be moderated by support for algorithmic governance frameworks, so that the combined effect of complexity and autonomous will differ depending on participants' level of support

2.6 Conceptual Model

Based on the theoretical discussion in the previous sections, this study proposes a model that integrates the main variables influencing the perceived legitimacy of ADM in local government.

Figure 1

Conceptual Model of Factors Influencing the Perceived Legitimacy of Algorithmic Decision-Making



Note. Human involvement and task complexity dummy coded as low = 0, and high =1. H3 is the interaction between the two independent variables.

3. Methodology

3.1 Experimental Design

This study employs a 2×2 between-subjects vignette experiment to examine how task complexity (low vs. high) and human involvement (low vs. high) in ADM systems influence perceived legitimacy among Dutch citizens. Four vignettes, each depicting a municipal ADM system making an administrative decision, were designed to manipulate these variables, with participants randomly assigned to one condition via Qualtrics to ensure balanced allocation and enhance internal validity (Aguinis & Bradley, 2014)

Task complexity was operationalized by varying task types (Busuioc, 2020; Konig & Wenzelburger, 2021). Low-complexity scenarios described routine, rule-based tasks, while high-complexity scenarios involved morally sensitive tasks requiring discretionary judgements. Human

involvement was manipulated by presenting decisions as either fully automated or involving human oversight (Martin & Waldman, 2022).

To ensure clarity and realism, vignettes were pilot-tested with a small sample (n = 7), and minor revisions were made based on feedback to improve readability and ensure unambiguous manipulations. The final vignettes are provided in Appendix A. The four experimental conditions are summarized in Table 1.

Table 1

Vignette Design Matrix

Condition	Task Complexity	Human Involvement	Description
1	Low	Low	The ADM system autonomously allocates parking fines without any human oversight.
2	Low	High	The ADM system recommends parking fines, but a municipal officer reviews each recommendation and makes the final decision
3	High	Low	The ADM system autonomously detects potential welfare fraud, making decisions without any human review or approval

4	High	High	The ADM system flags potential welfare fraud, but a caseworker evaluates the flagged cases and has the final say in the decision

3.2 Data Collection and Sampling

An online survey, conducted via Qualtrics, used a between-subjects design with four vignette conditions. Participants were randomly assigned to one condition, reading a scenario and answering questions on perceived legitimacy of ADM, governance framework support, and control variables (see Appendix A for survey details).

The target population was adults aged 18-65 in the Randstad region of the Netherlands. Participants were recruited via social media (e.g., Instagram, LinkedIn, Facebook) and snowball sampling, a non-probability method where respondents shared the survey within their networks (Goodman, 1961). This approach maximized reach within time and resource constraints,

Following Aguinis and Bradley (2014), a minimum of 40 participants per condition (total n = 160) was targeted for sufficient statistical power. The inclusion criteria required residency in the Randstad and adequate Dutch or English comprehension, which resulted in 191 responses, 164 of them were valid. Moreover, the sample was diverse in age, gender (55.5% female), and education, with a slight left-of-center political orientation (M = 2.88, 1-7 scale) and more participants from Rotterdam (33.5%) and The Hague (18.9%).

Randomization checks were conducted and confirmed balanced assignment. Chi-square tests showed no significant differences in gender ($X^2(3, N = 164) = 0.78$, $p = .85$) or employment status ($X^2(3, N = 164) = 3.28$, $p = .350$ across conditions. One-way ANOVAs found no differences

in age ($F(3, 160) = 0.86$, $p = .46$), algorithmic understanding ($F(3, 160) = 0.22$, $p = .54$), and awareness of governance frameworks ($F(3, 160) = .72$, $p = .54$), confirming successful randomization within the data collected.

3.3 Quantitative Operationalization

3.3.1 Dependent Variable: Perceived Legitimacy of ADM

The dependent variable in this study is *perceived legitimacy* of ADM, which is defined as citizens' subjective evaluation of whether a decision-making process is fair, trustworthy, and appropriate. This conceptualization draws on established procedural and public administration literature (Tyler, 2006; Martin & Waldman, 2022; Grimmelikhuijsen & Meijer, 2022). Following this definition, perceived legitimacy can be broken down into multiple dimensions: fairness, trustworthiness, and appropriateness, each of which contributes to citizens' overall acceptance of ADM.

To operationalize this concept, this study followed the approach of Martin and Waldman (2022) and Grimmelikhuijsen and Meijer (2022), who developed multi-item scales capturing different aspects of legitimacy in ADM contexts. Participants were presented with 15 statements that reflect these three dimensions. Responses were recorded on a 5-point Likert scale, ranging from (1) *Strongly disagree* to (5) *Strongly agree.* Example items include: "The decision-making process was fair", "I trust the way this decision was made", and "The decision-making process is appropriate for government use." These items were adapted from validated instruments used in earlier experimental studies of ADM legitimacy, particularly in the public sector (e.g., Starke et al., 2021; McKnight et al., 2002; Colquitt, 2001).

In the analysis, the three dimensions, fairness, trustworthiness, and appropriateness, were first calculated as separate scale averages in SPSS. Subsequently, these were combined into a

single composite variable, in line with how previous studies have treated legitimacy as a unified construct (Martin & Waldman, 2022). This composite score was used as the dependent variable in the statistical analysis. Table 2 provides a detailed overview of the operationalization.

Table 2

Operationalization of the Dependent Variable: Perceived Legitimacy

Variable	Dimensions	Indicator / Example Item	Value	Source
Perceived Legitimacy	Fairness	"The decision-making process was fair" "The system treated people equally" "This process respected the rights of individuals" "Everyone would have received the same treatment in this situation" "The procedure followed to reach the decision was unbiased" "The system considered relevant information when making its decision"	5-point Likert scale	Waldman & Martin (2022); Starke et al. (2021); Tyler (2006);Colquitt (2001); Grimmelikhuijsen & Meijer (2022)
	Trustworthiness	"I trust the way this decision was made." "The system's decision can be relied upon" "The decision-making system is competent"	5-point Likert scale	Grimmelikhuijsen & Meijer (2022); McKnight et al. (2002); Grimmelikhuijsen & Knies (2015); Waldman & Martin (2022); Starke

	"The system acts in the best interests of citizens"		et al. (2021); Tyler (2006)
	"The algorithmic system used here is trustworthy"		
Appropriateness	"This decision-making process is appropriate for government use."	5-point Likert scale	Waldman & Martin (2022); Castelo et al. (2019); Logg et al. (2019); Grimmelikhuijsen & Meijer (2022); Starke & Lünich (2020)
	"This decision-making system fits the type of task described"		
	"The use of an algorithm in this scenario makes sense"		
	"I find it acceptable that the municipality uses this kind of system here"		
	"This situation calls for an automated decision-making system"		

3.3.2 Independent Variable: Task Complexity and Human Involvement

The two independent variables, *task complexity* and *human involvement*, were implemented through the experimental vignette design (see Chapter 3.2 and Appendix A). Each participant was randomly assigned to a single scenario in which the complexity of the administrative task and the presence of human involvement in the ADM system were systematically varied. The vignettes drew on established operationalizations in the public administration literature (Busuioc, 2020; Starke & Lunich, 2020; Martin & Waldman, 2022).

For statistical analysis, the two experimental manipulations were translated into binary variables. *Task complexity* was coded as a dummy variable, with 0 indicating a low-complexity task and 1 indicating a high-complexity task. This operationalization reflects theoretical

distinctions in the literature between routine, rule-based decisions and discretionary, ethically charged decisions (Konig & Wenzelburger, 2021; Starke & Lünich, 2020). According to algorithmic appreciation theory, ADM may be perceived as more legitimate in simpler tasks, whereas in more complex contexts, legitimacy is more contested due to the need for empathy and contextual judgement (Castelo et al., 2019; Logg et al., 2019)

Similarly, *human involvement* was operationalized through a dummy variable as well, coded 0 for no human involvement and 1 for a human-in-the-loop involvement. This aligns with the algorithm aversion theory, which states that citizens tend to prefer hybrid systems that include human involvement especially when moral sensitivity and risk are high (Bigman & Gray, 2018; Jussupow et al., 2020; Martin & Waldman, 2022).

These operationalizations thus translate the theoretical mechanism discussed in Chapter 2 into concrete conditions for empirical testing. They serve as the two primary independent variables in the regression models presented in Chapter 4. Since these variables were not pre-coded in the raw dataset, they were constructed manually in SPSS based on the experimental scenario each respondent received. Table 3 provides an overview of this operationalization.

Table 3

Operationalization of the Independent Variables: Task Complexity and Human Involvement

Variables	Dimensions	Indicator / Example Item	Value	Source
Task Complexity	Complexity of Decision	The decision in the vignette was complex The decision required ethical consideration	Binary	Wood (1986); Nagtegaal (2023)

		The decision required contextual judgement		
Human Involvement	Human Oversight	A human was involved in making the decision. A human checked the outcome of the algorithm	Binary	Martin & Waldman (2022); Jussupow et al. (2020)

3.3.3 Moderator: Support for Algorithmic Governance Frameworks

As discussed in Chapter 2.5.1, support for algorithmic governance frameworks reflects the normative approval of their function and necessity (Grimmelikhuijsen & Meijer, 2022; Konig & Wenzelburger, 2021; Martin & Waldman, 2022).

Support was measured using four items, each capturing a different evaluative aspect of governance frameworks: general support, trust, acceptance, and perceived fairness. These dimensions reflect prior operationalizations of public support for algorithmic systems and governance institutions, which often include trust, fairness perceptions, and normative endorsement as key components (Araujo et al., 2020, Binns et al., 2018; Konig & Wenzelburger, 2021; Lee, 2018; Wirtz et al., 2019). The items were also recorded on a 5-point Likert scale and were combined into a composite variable by averaging their scores. See Table 4 for a detailed view of the operationalization.

3.3.4 Control Variables

To account for potential confounding effects, several control variables were included in the analysis: age, gender, employment status, political orientation, algorithm understanding, and

awareness of governance frameworks. These variables were selected because prior research suggests they may influence how individuals perceive ADM and public sector legitimacy more broadly.

Firstly, age and gender are standard demographic controls that have been found to shape attitudes toward digital government and technology acceptance. For example, younger and more educated individuals often exhibit greater openness to technological innovation in public services (Dorobantu & Margetts, 2019; Moon, 2002). Next, employment status may influence perceptions of fairness and vulnerability to administrative decisions, particularly in welfare-related contexts. Prior research suggests that unemployed individuals or those in risky work may perceive ADM as less fair or more threatening (Busuioc, 2020). In this study, a binary was created to indicate whether a respondent was currently employed or a full-time student (1) or not employed (0).

Additionally, the political orientation of participants is also important as these ideological beliefs can shape expectations about government decision-making, automation, and trust in institutions (Helbling et al., 2022; Schaub & Ziller, 2021). For instance, left-leaning individuals may prioritize fairness and equity, while right-leaning respondents may emphasize efficiency and order. Political orientation was measured using a 7-point Likert scale, and a centered variable was computed for use in regression models. Next, algorithmic understanding, which is participants' self-reported familiarity with how algorithms work, can influence perceptions of ADM systems. People who understand algorithmic processes may be more likely to trust or critically evaluate automated decisions (Araujo et al., 2020; Jussupow et al., 2020). For this continuous variable, a mean-centered variable was also computed for the regression analysis.

Lastly, awareness of algorithmic governance frameworks was also controlled for, as it plays a key role in citizens' perceptions of legitimacy of ADM systems. Awareness refers to

individuals' knowledge of the institutional structures, such as ethical guidelines, algorithm registers, or audit mechanisms that govern algorithm use in the public sector (Grimmelikhuijsen & Meijer, 2022). Prior research shows that such awareness acts as a cognitive filter through which ADM outcomes are evaluated, increasing perceptions of fairness and accountability (Ananny & Crawford, 2018; Binns et al., 2018). Together, these control variables allow for a more robust estimation of the effects of task complexity, human involvement, and governance framework support on the perceived legitimacy of ADM.

Table 4

Operationalization of the Moderators and the Control Variables

Variables	Dimensions	Indicator / Example Item	Value	Source
Support of Algorithmic Governance Frameworks	General support	"To what extent do you support the implementation of such a framework to oversee algorithmic decision-making in government services?"	5-point Likert scale	Araujo et al., 2020, Binns et al., 2018; Konig & Wenzelburger, 2021; Lee, 2018; Wirtz et al., 2019
	Trustworthiness	"The existence of an algorithmic governance framework increases my trust in algorithmic decisions."		
	Acceptance	"Knowing a system follows democratic and legal principles makes me more accepting of its decisions."		

	Fairness	"An algorithmic governance framework makes me feel the decision-making process is more fair."
Control variables		Age (centered) Gender (dummy) Employment Status (dummy) Political orientation (centered) Algorithmic Understanding (centered) Awareness of algorithmic governance framework (centered)

3.4 Quantitative Reliability and Validity

The internal consistency of all multi-item constructs was assessed using Cronbach's alpha. A threshold of $\alpha \geq 0.70$ was used to determine acceptable reliability (Field, 2018). The Cronbach's alpha for each dimension of the dependent variable, *perceived legitimacy,* indicated strong internal reliability (Fairness: $\alpha = .914$; Trustworthiness: $\alpha = .944$; Appropriateness: $\alpha = .945$). These were then combined into a single composite variable with similarly high internal consistency ($\alpha = .950$). Moreover, the moderator *support for algorithmic governance frameworks* combined four items and showed a strong reliability ($\alpha = .883$), also indicating high internal consistency.

Content validity was ensured by adapting scale items from established literature in the field of public administration and algorithmic governance. Moreover, the vignettes were pilot-tested on

a small sample (n=7) to check for clarity, realism, and comprehension. Based on feedback, minor adjustments were made to improve the wording and structure.

3.5 Analysis Strategy

A phased analytical approach was used to examine the effects of task complexity and human involvement in perceived legitimacy, moderated by support for algorithmic governance frameworks. All analyses were conducted using IBM SPSS Statistics (version 30).

3.6.1 Descriptive and Preliminary Analyses

Prior to hypothesis testing, descriptive statistics will be computed for all key variables, including the dependent variable (perceived legitimacy), independent variables (task complexity and human involvement), the continuous moderator (support for algorithmic governance frameworks), and all control variables (gender, age, employment status, political orientation, education level, algorithmic understanding, and awareness of algorithmic governance frameworks).

Randomization checks confirmed balanced assignment across the four experimental conditions using chi-square tests for categorical variables and one-way ANOVAs for continuous variables (see Section 3.3).

3.6.2 Regression Analysis

Hierarchal multiple regression analyses will be conducted to examine the effects of task complexity, human involvement, their two-way interaction, and the moderating role of support for algorithmic governance frameworks on perceived legitimacy. This approach will allow for the assessment of the unique variance explained by each block of predictors, addressing the study's hypotheses systematically.

To reduce multicollinearity, the continuous control variables will be mean-centered (age, awareness, political orientation, and algorithmic understanding). Additionally, the continuous moderator variable will also be mean-centered prior to computing the interaction terms (Aiken & West, 1991). Multicollinearity will be evaluated using Variance Inflation Factor (VIF) values for predictors. All VIF values were below 5 (with a mean VIF of 1.1), indicating that multicollinearity was not a significant concern.

Six hierarchical regression models will be estimated. Model 1 will be the baseline model and include control variables (gender, age, employment status, political orientation, algorithmic understanding, and awareness of algorithmic governance frameworks) to account for background variance in perceived legitimacy. Model 2 will add two binary predictors: task complexity (0 = low, 1 = high) and human involvement (0 = low, 1 = high) to test their main effects. Model 3 will include the two-way interaction (task complexity × human involvement) to test Hypothesis x, which states that the effect of one predictor on perceived legitimacy depends on the level of the other. Model 4 will add the main effect of support for algorithmic governance frameworks. Model 5 will include two-way interactions between the experimental predictors and support for algorithmic governance to test moderation effects. Model 6 will incorporate the three-way interaction (task complexity × human involvement × support for algorithmic governance) to examine whether the two-way interaction varies by support level.

For each model, the standardized regression coefficient (β) and corresponding *t* statistics for strength and significance. Model fit will be assessed using R^2, with ΔR^2, ΔF, and associated p-values indicating the contribution of each predictor block. If the two-way interaction in Model 3 is significant ($p < .05$), Estimated Marginal Means (EMM) will be analyzed using SPSS's General Linear Model Univariate procedure to explore the interaction across experimental conditions.

Significant interactions in Model 5 and 6 will be probed using the PROCESS macro (Version 4.2, Hayes, 2022) to examine the conditional effects at ±1 SD of the moderator.

4. Empirical Findings and Discussion

4.1 Descriptive Statistics

Descriptive statistics were computed to provide an overview of the sample characteristics and to examine bivariate associations among key study variables. Table 5 displays the means, standard deviations, and Pearson correlation coefficients for all the continuous variables. Table 6 reports on the distribution of key categorical variables. Lastly, Table 7 presents the mean levels of perceived legitimacy by experimental conditions (task complexity × human involvement).

4.1.1 General Descriptives

The dependent variable, perceived legitimacy of ADM, had a mean score of 3.29 (SD = 1.08), indicating a moderate average level of perceived legitimacy across the sample. This outcome variable showed a relatively wide distribution, suggesting there was meaningful variation in how participants assessed the legitimacy of ADM scenarios.

Support for algorithmic governance frameworks had the highest average score among all continuous predictors (M = 3.17, SD = 0.99), indicating that while respondents tended to support governance, they were somewhat less aware of its specific mechanisms. Notably, algorithmic understanding (M = 3.62, SD = 1.06) was relatively high. This suggests that many respondents felt confident in their knowledge of how ADM systems function. Participants' average political orientation was left-leaning (M = 2.88, SD = 1.79) on a 7-point scale, which may shape general attitudes toward government intervention and technological fairness. Age (M = 2.55, SD = 1.61)

was measured on a categorical ordinal scale and roughly centered around younger adults, aged between 25 – 34.

4.1.2 Bivariate correlations

As shown in Table 5, perceived legitimacy was significantly and negatively correlated with both human involvement (r = -.31, $p < .01$) and task complexity (r = -.34, $p < .01$), suggesting that participants rated ADM systems as less legitimate when they involved less human oversight or addressed more complex decisions. These results support the idea that both ADM design features directly influence legitimacy judgements.

Support for algorithmic governance frameworks was strongly and positively associated with perceived legitimacy (r = .58, $p < .01$), representing the largest observed correlation in the matrix. This underscored the relevance of institutional trust in shaping public evaluation of ADM. Additionally, awareness of governance frameworks was positively correlated with both perceived legitimacy (r = .28, $p < .01$) and support (r = .33, $p < .01$), but the magnitude of the association was smaller in each case. So, while awareness is relevant, it may use be of less importance than broad attitudinal support.

Age was significantly and negatively associated with awareness (r = -.16, $p < .05$) and algorithmic understanding (r = -.24, $p < .01$). These results indicate that younger participants were generally more knowledgeable about ADM processes and governance. However, age showed no direct association with perceived legitimacy (r = -.04, ns), which suggest its role may be more indirect or conditional. Political orientation was positively associated with age (r = .33, $p < .01$), consistent with established generational patterns in ideology, but it showed no significant association with the key outcome or predictors. Algorithmic understanding was moderately correlated with awareness (r = .23, $p < .01$), which reinforces ideas that there is a link between

knowledge and attentiveness to these frameworks, though neither was strongly associated with human involvement or task complexity.

Table 5

Descriptive Statistics and Correlations between Continuous Variables

Variable	*n*	M	SD	1	2	3	4	5	6	7
1. Perceived Legitimacy (DV)	164	3.29	1.08	-						
2. Human Involvement (0 = low, 1 = high)	164	0.51	0.50	-.31**	-					
3. Task Complexity (0 = low, 1 = high)	164	0.48	0.50	-.34**	-.01	-				
4. Support for Governance Frameworks	164	3.56	0.87	.58**	-.11	-.04	-			
5. Age	164	2.55	1.61	-.04	-.07	.10	-.09	-		
6. Political orientation (1 = left, 7= right)	164	2.88	1.79	.05	-.07	.06	.04	.33**	-	
7. Algorithmic understanding	164	3.62	1.06	.02	-.04	.01	.02	-.24**	-.11	-
8. Awareness of governance frameworks	164	3.17	0.99	.28**	-.09	-.05	.33**	-.16*	-.06	.23**

Note. Values are Pearson correlation coefficients. M = Mean; SD = Standard Deviation. *p < .05. **p < .01 (2-tailed).

4.1.3 Categorical Variable Distributions

As shown in Table 6, 55.5% of participants identified as female (n = 91) and 44.5% as male or other (n = 73). Employment status was skewed toward those employed or studying full time (83.6%), while only 16.4% were not currently employed. Both gender and employment were dummy coded for inclusion as control variables in regression analyses. Randomization checks showed no significant imbalance in these variables across experimental conditions, supporting internal validity of the factorial design (see Chapter 3.3 for randomization checks).

Table 6

Frequency Table (Categorical Variables)

Variable	**Category**	***n***	**Percentage**
Gender	Male/Other (0)	73	44.5%
	Female (1)	91	55.5%
Employment status	Not Employed (0)	27	16.4%
	Employed (1)	137	83.6%

Note. Gender and employment were dummy coded for the regression analyses (1 = Female/Employed or Student, 0 = Male/Not Employed).

4.1.4 Experimental Condition Averages

Table 7 summarizes the mean levels of perceived legitimacy across the four experimental conditions. Participants in the low complexity/low involvement condition reported to highest perceived legitimacy (M = 3.78, SD = 0.94), followed by the low complexity/high involvement condition (M = 3.52, SD = 1.05). In contrast, conditions featuring high task complexity showed reduced legitimacy ratings, particularly when paired with low human involvement. The high complexity/high involvement scenario produced the lowest legitimacy score (M = 2.36, SD = 1.05), over one full SD below the highest condition. These patterns indicate that both task complexity and human involvement may separately affect how legitimate people think ADM is, and they might also combine in more complex ways to influence those perceptions. These possibilities were examined more formally in the next part of the analysis using statistical models.

Table 7

Descriptive Statistics for Experimental Conditions

Condition	Task Complexity	Human Involvement	*n*	M	SD
1	Low (0)	Low (0)	41	3.78	0.94
2	Low (0)	High (1)	44	3.52	0.84
3	High (1)	Low (0)	39	3.48	0.97
4	High (1)	High (1)	40	2.36	1.05
Total			164	3.29	1.08

Note. Higher scores indicate greater perceived legitimacy of ADM (1-5 scale).

4.2 Regression Analyses

Model 1: Baseline

Model 1 included gender, age, employment status, political orientation, algorithmic understanding, and awareness of algorithmic governance frameworks. This model explained 9% of the variance in perceived legitimacy (R^2 = .09), with the overall model reaching marginal significance, $F(6, 157) = 2.53$, $p = .025$. Among these variables, awareness of algorithmic governance frameworks was the only significant predictor, $\beta = .28$, $t = 3.46$, $p < .01$. A one standard deviation (SD) increase in awareness corresponded to a 0.28 SD increase in legitimacy perceptions. This supports theoretical work suggesting that institutional transparency tools (e.g., algorithm registers or ethical frameworks like CODIO) enhance legitimacy by reassuring citizens that oversight mechanism are in place (Grimmelikhuijsen & Meijer, 2022). Other demographic variables (e.g., gender, age, political orientation) showed small and non-significant effects. These findings show that legitimacy perceptions are not strongly shaped by individual demographics in this context but instead are influenced by the awareness of ADM governance mechanisms.

Model 2: Main Effects of Independent Variables

In Model 2, the two experimental conditions were added, that is task complexity and human involvement. This significantly increased the explained variance to 28% ($\Delta R^2 = .19$, $\Delta F(2,155) = 20.62$, $p < .001$), signaling that design features of ADM systems are key determinants of legitimacy perceptions. Both manipulators were significant, with task complexity $\beta = -0.34$, $t = -4.90$, $p < .001$ and human involvement $\beta = -0.29$, $t = -4.18$, $p < .001$. These effects are moderate to large in size and in line with algorithm aversion theory, which states that people distrust algorithmic decisions in morally sensitive or complex situations (Dietvorst et al., 2015). A one SD increase in task complexity led to a 0.34 SD decrease in perceived legitimacy. Notably, the inclusion of task

complexity and human involvement reduced the effect size of awareness (β = .23, down from .28), though it remained statistically significant. This implies that design features have more influence than general awareness, but both are relevant in shaping public legitimacy perceptions.

Model 3: Interaction Effect of the Independent Variables

Model 3 introduced the interaction between task complexity and human involvement, which significantly improved model fit (ΔR^2 = .04, ΔF = 8.57, p = .004), bringing the total explained variance to 32%. The interaction term was significant and negative: β = -0.34, t = -2.93, p = .004. This finding indicates a compounding negative effect which is that perceived legitimacy is especially low when tasks are complex and human involvement is low. To better understand the nature and magnitude of this interaction, the EM Means was computed for perceived legitimacy across the task complexity conditions, controlling for control variables. As shown in Table 8, participants in the low complexity condition reported significantly higher perceived legitimacy (EMM = 3.58, SE = .083, 95% CI [3.42, 3.75]) compared to those in the high complexity condition (EMM = 2.39, SE = .147, 95% CI [2.10, 2.68]). This difference of 1.19 scale points is large, especially given that the legitimacy scale ranges from 1 to 5. The univariate test confirmed that this difference was statistically significant, F(1,154) = 49.33, p < .001.

Moreover, these estimated means demonstrate that the difference is not only statistically significant but also meaningful. A drop of over one full scale point in legitimacy indicated that citizens do not just slightly prefer simpler ADM tasks, they see complex algorithmic decisions as fundamentally less trustworthy and fair.

While Table 9 focuses on the main effects of task complexity, the inclusion of the interaction term suggests that this legitimacy drop is even more severe when complexity is high and no human involvement is present. In other words, ADM systems operating without human

involvement are particularly illegitimate in complex decision-making contexts. This finding supports the growing consensus in ADM literature that hybrid decision-making models, where human reviewers retain final authority, are essential for safeguarding democratic values (Martin & Waldman, 2022; Bigman & Gray, 2018).

Table 8

Estimated Marginal Means of Perceived Legitimacy by Task Complexity

Task complexity	Estimated Means	SE	95% CI
Low (0)	3.583	.08	[3.42, 3.75]
High (1)	2.389	.15	[2.10, 2.68]

Note. EMM are based on the ANCOVA model, controlling for age, gender, employment status, political orientation, algorithmic understanding, and awareness of governance frameworks. Higher values indicate greater perceived legitimacy of ADM. CI are set at 95%

Model 4: Main Effect of the Moderator

Model 4 introduces support for algorithmic governance frameworks as a predictor to test its influence in perceived legitimacy of ADM, alongside the existing experimental manipulations and their interactions. This addition led to the largest increase in model explanatory power, raising the variance explained from $R^2 = .32$ to $R^2 = .54$ ($\Delta R^2 = .22$, $\Delta F = 73.69$, $p < .001$). Support was a highly significant and dominant predictor, with a standardized beta of $\beta = .51$, $t = 8.59$, $p < .001$. This indicates that individuals who support these oversight frameworks perceived ADM systems as significantly more legitimate, independent of system design. Specifically, a one SD increase in governance support was associated with a 0.51 SD increase in perceived legitimacy, marking this as the strongest effect in the model.

In contrast, the main effect of both task complexity and human involvement became non-significant. Task complexity having β = -.12, p = .125 and human involvement having β = -.06, p = .473. This implies that design features by themselves can no longer predict legitimacy of support is taken into account, suggesting that support for governance mechanisms may be more important over concerns about specific ADM structures. However, the interaction term (Task Complexity × Human Involvement) remained significant and negative, β = -.34, t = -3.56, p < .001. This confirms that even among citizens who generally support algorithmic governance, ADM systems performing complex tasks without human input are perceived as particularly illegitimate. This finding also aligns with broader literature which states that people still expect moral sensitivity in high-stakes public decisions, even when institutional safeguards are present (Jussupow et al., 2020; Bigman & Gray, 2018). Lastly, the control variable "awareness of governance frameworks", which was previously significant, became non-significant in Model 4 (β = .05, p = .394). This suggests that normative support for oversight is more important for legitimacy perceptions than only factual awareness.

Model 5: Moderation Effects of Support for Algorithmic Governance Frameworks

In this model, two interaction terms were introduced: *Task Complexity* × *Support* and *Human Involvement* × *Support.* Despite the theory, neither moderation term was significant. With *Task Complexity* × *Support* having β = -.001, t = -0.01, p = .991 and *Human involvement* × *Support* having β = -.01, t = -.12, p = .905. This model's overall explanatory power remained unchanged at R^2 = .54, with ΔR^2 = .00, indicating that the inclusion of these interactions did not improve fit (ΔF = 0.008, *ns*). The continued non-significance of task complexity and human involvement, alongside the presence of the main effect of support (β = .52, p < .001) and the interaction between complexity and involvement (β = -.34, p < .001), confirms that support functions as an independent

predictor. That is, people who support governance frameworks perceive ADM systems as more legitimate across the board, regardless of system design.

In words, Model 5 demonstrates that while support for algorithmic governance exerts an independent influence on perceived legitimacy of ADM, it does not moderate how participants respond to varying levels of complexity or human involvement in ADM systems.

Model 6: Three-way Interaction

Model 6 extended the prior models by testing the full three-way interaction between task complexity, human involvement, and support for algorithmic governance frameworks using the PROCESS macro (Model 3; Hayes, 2022). The primary aim was to determine whether the interaction between complexity and human involvement varied as a function of participants' level of support for algorithmic governance.

The model accounted for a large amount of the variance in perceived legitimacy, $R^2 = .54$, $F(13, 150) = 13.67$, $p < .001$, indicating a strong overall model fit. Importantly, the inclusion of the three-way interaction term resulted in only a small and non-significant increase in explained variance ($\Delta R^2 = .003$, $F = .87$, $p = .35$), suggesting that support for algorithmic governance did not significantly moderate the two-way interaction between task complexity and human involvement.

As in previous models, both task complexity ($\beta = -.34$, $p < .001$) and human involvement $\beta = -.29$, $p < .001$) remained significant negative predictors of perceived legitimacy. These findings confirm that high complexity and low human involvement independently and adversely affect perceptions of ADM legitimacy. The two-way interaction between task complexity and human involvement also remained statistically significant ($\beta = -.34$, $p < .001$), reinforcing that the negative effects of high task complexity are worsened under conditions of low human involvement. In contrast, the three-way interaction involving support did not reach significance (β

= -.01, p = .35), indicating that the combined effect of these two ADM features did not differ across levels of support for governance frameworks.

Thus, while Model 6 confirmed the significance of the two-way interaction between design features of ADM, it did not support a moderating role for support for algorithmic governance frameworks in this relationship. Compared to Model 5, which already explained 54.2% of the variance, Model 6 provided no meaningful improvement in explanatory power. So, although institutional support strongly influences overall legitimacy perceptions, it does not appear to change how individuals interpret complexity and human involvement in ADM scenarios.

4.3 Discussion

Across the six statistical models, several clear patterns emerged, providing insight into how people make sense of ADM systems. Firstly, the results offer strong support for the idea that citizens prefer ADM systems that include human involvement. Participants rated ADM systems as more legitimate when a human was part of the decision process, supporting Hypothesis 1. This aligns with earlier theories of algorithm aversion, which state that people are uneasy with automated systems making important decisions without human judgement, especially in complex scenarios (Dietvorst et al., 2015; Martin & Waldman, 2022). The findings show that Dutch citizens do not just value efficiency or consistency, they also value empathy and accountability for the outcomes, especially considering the highly publicized scandals that have formed opinions about ADM systems. The same pattern is held for task complexity. ADM systems addressing simpler decisions were seen as significantly more legitimate than those handling complex and ambiguous tasks. This confirms Hypothesis 2 and also supports prior research suggesting that people are more comfortable with automation in low-stakes and rule-based scenarios (Castelo et al., 2019; Starke et al., 2021). In contrast, when decisions are complex, participants clearly preferred a more human

centered approach. This confirms the idea that people see complex tasks as needing moral reasoning and contextual understanding, qualities they tend to associate with human, not algorithms.

Notably, the data also showed that task complexity and human involvement interact. When complexity was high and human involvement low, perceived legitimacy dropped sharply. This supports Hypothesis 3, and highlights that these two features do not operate in isolation. Rather, they compound each other. Complex ADM systems without human involvement are perceived as particularly problematic. This repeats prior concerns about the "black box" nature of ADM and establishes that legitimacy is about both process transparency and ethical assurance (Pasquale, 2015).

The role of support for algorithmic governance frameworks emerged as one of the most consistent predictors in the study. As expected under Hypothesis 4, people who supported these frameworks were much more likely to see ADM systems as legitimate, regardless of how those systems were designed. This fits with theories of procedural trust, where legitimacy comes not only from the decision itself, but from trust in the structures around it (Ananny & Crawford, 2018)

Interestingly, the influence of task complexity and human involvement weakened when support was added to the model, implying that institutional trust may serve as a kind of reassurance, making people less sensitive to how decisions are made.

However, support did not moderate the effects of task complexity or human involvement, either alone or in combination. Hypotheses 5 and 6 were therefore not supported. In other words, although people who trust governance frameworks tend to view ADM more positively in general, this trust does not change how they respond to specific ADM design features. Whether a task was complex or involved a human did not matter depending on support levels. This can suggest that

perceptions of fairness and legitimacy are still closely tied to the design of the ADM process itself. Also, that even strong institutional support cannot fully override concerns about complexity or autonomy in decision-making.

Together, the results support a layered understanding of perceived legitimacy in ADM. Human involvement and task simplicity make systems feel more trustworthy and fairer, especially when paired. At the same time, public support for governance frameworks plays a powerful, independent role in shaping these views, but does not alter how people respond to design features. These findings emphasize the need for both human centered ADM design and strong institutional frameworks. Legitimacy does not depend on one of these, but it depends on their combination.

Table 9

Hierarchal Regression Predicting Perceived Legitimacy

Predictors	**Model 1** *Baseline*	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Control Variables						
Gender (Female = 1)	-.07	-.09	-.12	-.05	-.05	-.09
	(-.94)	(-1.31)	(-1.72)	(-.79)	(-.79)	(-.74)
Age (centered)	-.03	-.03	-.02	.02	.02	.01
	(-.34)	(-.34)	(-.19)	(.34)	(.33)	(.29)
Employment (Employed = 1)	.02	.04	.04	.05	.05	.10
	(.19)	(.62)	(.57)	(.81)	(.80)	(.81)
Political orientation (centered)	.06	.06	.04	.01	.01	.01
	(.76)	(.75)	(.54)	(.16)	(.13)	(.33)
Algorithmic understanding (centered)	-.05	-.04	-.03	.01	.01	.02
	(-.59)	(-.57)	(-.42)	(.25)	(.24)	(.26)
Awareness of frameworks (centered)	.28	.23	.21	.05	.05	.05
	(3.46)**	(3.19)**	(3.05)**	(.86)	(.80)	(.71)
Experimental Manipulations						
Task Complexity (High = 1)		-.34	-.14	-.12	-.12	-.72
		(-4.90)***	(-1.44)**	(-1.54)**	(1.52)*	(-5.89)***

Human Involvement (High = 1)		-.29 (-4.18)***	-.10 (-1.04)	-.06 (-.72)	-.06 (-.71)	-.54 (-4.42)***
Moderator						
Support for Alg. Gov. Frameworks (centered)				.51 (8.56)***	.52 (5.41)***	.65 (8.55)***
Interaction Terms						
Task Comp. x Human Inv.			-.34 (-2.93)***	-.34 (-3.56)***	-.34 (-3.52)***	-.86 (-3.50)***
Task Comp. x Support					-.00 (-.01)	-.00 (-.03)
Human Inv. x Support					-.01 (-.12)	-.01 (-.09)
Task Comp. x Human Inv. x Support						-.27 (-.93)
Model Fit						
R^2	.09	.28	.32	.54	.54	.54
R^2 Change	.09	.19	.04	.22	.00	.00
ΔF	2.528	20.618	8.568	73.694	0.008	.87
N	164	164	164	164	164	164

Note. Models 1-5 use standardized regression coefficients (β); *t* statistics in parentheses (*t*). *p<.05, **p<.01, ***p<.001.

5. Conclusion

5.1 Overview of thesis

This thesis explored how Dutch citizens perceive legitimacy of algorithmic decision-making (ADM) in local government, focusing on three key factors: task complexity, human involvement, and support for algorithmic governance frameworks. Chapter 1, the introduction, outlined the problem, research questions, and the societal urgency of this topic, particularly in light of recent ADM-related scandals. Chapter 2 developed a theoretical framework and it integrated insights from algorithm aversion, algorithmic appreciation, and procedural legitimacy. Next, Chapter 3 outlined a 2×2 vignette experiment with 164 participants from the Randstad region. In these conditions, task complexity and human involvement were manipulated across realistic municipal scenarios. Chapter 4 presented the empirical findings, supported by hierarchical regression models, which demonstrated that ADM systems are perceived as significantly less legitimate when tasks are complex and human involvement is low. Moreover, support for governance frameworks had the strongest positive association with legitimacy perception, although it did not moderate the effects of task complexity or human involvement. Lastly, Chapter 5 discusses the implications of these results for theory, practice, and future research.

5.2 Theoretical and Practical Contributions

Theoretically, this study contributed to a more nuanced understanding of ADM legitimacy by showing that design features and governance attitudes operate simultaneously but independently. While prior literature emphasizes either structural frameworks (e.g., transparency, oversight) or psychological biases (e.g., algorithm aversion), this study integrates both. This combination shows how design-context interactions (task complexity × human involvement) and institutional support

shape public perceptions. The findings support and extend on the algorithm aversion theory and algorithm appreciation theory (Dietvorst et al., 2015; Logg et al., 2019). This is especially by showing that perceived legitimacy is highest in simple, rule-based tasks when humans remain in the loop. On the practical side, this research provides municipal policymaker and public administrators with empirical guidance on which ADM structures foster public trust. It highlights that ADM legitimacy is not only a technical issue but also an institutional and ethical concern. Notably, the study reveals that support for algorithmic governance frameworks has a more substantial impact on perceived legitimacy than the ADM design itself, which can imply that support may buffer against public skepticism in certain cases.

5.3 Policy Recommendation

From these insights, some policy recommendations have been formulated. Firstly, municipalities should implement hybrid decision-making models for high-complexity tasks. Human-in-the-loop models should be maintained in these highly sensitive areas, as legitimacy of these ADM systems suffers greatly without human involvement (Bigman & Gray, 2018; Martin & Waldman, 2022). Next, support should be enhanced through participatory governance. Support for algorithmic frameworks was the strongest predictor of perceived legitimacy; therefore, municipalities should involve citizens in the design and evaluation of ADM policies via citizens panels, workshops, or participatory audits (Wieringa, 2020). Lastly, and most importantly, municipalities should strengthen and promote the CODIO framework. These CODIO guidelines are a set of ethical and procedural guidelines developed by experts in the ADM-field. This framework highlights ensures that Dutch public sector organizations implement algorithmic systems in a way that uphold democratic values (Ministerie van BZK, 2021). Evidence of this thesis suggests that institutional

support, rather than only awareness, fosters legitimacy perceptions. Therefore, outreach campaigns, and public explainer tools are recommended.

5.4 Limitations

Methodologically, the use of a vignette experiment ensures internal validity but limits ecological realism. This means that participants may respond differently to hypothetical versus real-life ADM decisions. Sample-wise, the reliance on non-probability sampling and the concentration in the Randstad region may restrict the generalizability of findings to other Dutch regions or international contexts. On the theoretical side, the study assumes a linear model of legitimacy perceptions. While interaction terms were tested, deeper psychological mechanism, such as moral reasoning, or personal experiences with bureaucracy, were not explored in depth. Also, support and awareness of governance frameworks were treated as individual-level attitudes rather than institutional variables, which can limit conclusions about actual policy effects.

5.5 Further Research

Future studies could improve and extend this research in several ways. First, the use of longitudinal or field experiments to strengthen the external validity. Researchers could then track legitimacy perceptions before and after real-world ADM policy implementations, or they could conduct field experiments in cooperation with municipalities. Additionally, future studies could examine group differences and vulnerabilities. Especially among marginalized groups, such as migrants, low-income citizens, who may perceive ADM legitimacy differently given their disproportionate exposure to ADM harms (Eubanks, 2018). Moreover, future research can disentangle support and procedural trust. While this study found support to be highly predictive, it did not clarify why support matters, which could be clarified in the future.

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Appendix A

Vignette Survey

Welcome to this research study conducted as part of a thesis project at Leiden University.

Please carefully read the information provided below before proceeding

Purpose of the study:

The purpose of the study is to explore the perceptions on algorithmic decision-making processes.

Anonymity and confidentiality:

All responses are anonymous. You will not be asked to provide your name or any personally identifiable information. Your answers cannot be linked back to you individually.

Data storage and publication:

Data collected will be stored securely and handled confidentially. In any resulting publications, findings will be presented in aggregate form to ensure anonymity.

Potential risks:

There are no known or anticipated risks associated with participation in this study.

Right to withdraw:

Participation in this study is entirely voluntary. You may withdraw at any point without any consequences and without the need to provide a reason.

Eligibility criteria:

Participants must be at least 18 years of age and must be living in the Randstad.

If you have any questions, please contact: s2424509@vuw.leidenuniv.nl

Consent

I declare that I am at least 18 years of age and voluntarily agree to participate in this study. I have been informed about the purpose, procedures, and potential risks associated with participation.

1. What is your age?
    a. 18–24
    b. 25–34
    c. 35–44

    d. 45–54
    e. 55–64
    f. 65 or older
2. What is your gender?
    a. Male
    b. Female
    c. Non-binary/other
    d. Prefer not to say
3. What is your highest level of education completed?
    a. Primary education
    b. Secondary education
    c. Vocational training (MBO)
    d. University of applied sciences (HBO)
    e. University (WO bachelor/master/PhD)
4. I understand how algorithmic systems work.
5. Which city do you live in?
    a. Rotterdam
    b. Den Haag
    c. Utrecht
    d. Amsterdam
    e. Other
6. What is your employment status?
    a. Unemployed
    b. Part-time employment
    c. Full-time employment
    d. Military or civil service
    e. Retired
    f. Student
    g. Unable to work
7. How would you describe your general political views?
    a. Left

b. Center-left
c. Center
d. Center-right
e. Right
f. Other
g. Prefer not to say

Scenario

Condition 1: low task complexity and low human involvement

City A is a growing city in the Randstad with about 360,000 residents. It has a young population, strong public transport, and focuses on sustainable urban development.

City A uses an algorithm to help manage parking violations. The system collects information from license plate cameras and parking sensors to detect if a car is parked without a valid permit or in a restricted area.

If the system detects a violation, it automatically issues and sends a parking fine to the vehicle owner.

No municipal worker reviews the fine before it is sent. The system makes the decision fully automatically.

Condition 2: Low task complexity and high human involvement

City B is a growing city in the Randstad with about 360,000 residents. It has a young population, strong public transport, and focuses on sustainable urban development.

City B uses an algorithm to help manage parking violations. The system collects information from license plate cameras and parking sensors to detect if a car is parked without a valid permit or in a restricted area.

If the system detects a possible violation, it sends a recommendation to a municipal worker.

The municipal worker checks the flagged case and makes the final decision about whether to send a parking fine or not.

Condition 3: high task complexity and low human involvement

City C is a busy and diverse city in the Randstad with more than 650,000 residents. It has a large social services department and invests in digital technologies.

City C uses an algorithm to support the handling of applications for social assistance (bijstandsuitkering).

The system analyzes information from housing registrations, employment records, and municipal databases to find possible mistakes or irregularities in applications.

If the system detects a possible mistake or irregularity, it automatically stops or reduces the applicant's social assistance payment without review by a municipal worker.

No municipal worker checks or approves the case. The system makes the decision fully automatically.

Condition 4: high task complexity and high human involvement

City D is a busy and diverse city in the Randstad with more than 650,000 residents. It has a large social services department and invests in digital technologies.

City D uses an algorithm to support the handling of applications for social assistance (bijstandsuitkering).

The system analyzes information from housing registrations, employment records, and municipal databases to find possible mistakes or irregularities in applications.

If the system detects a possible mistake or irregularity, it sends a recommendation to a municipal caseworker.

The municipal worker reviews the flagged application and makes the final decision about whether the applicant's social assistance payment should be stopped, reduced, or continued.

8. "The decision-making process was fair"
9. "The system treated people equally"
10. "This process respected the rights of individuals"
11. "Everyone would have received the same treatment in this situation"
12. "The procedure followed to reach the decision was unbiased"
13. "The system considered relevant information when making its decision"
14. "I trust the way this decision was made"
15. "The system's decision can be relied upon"
16. "The decision-making system is competent"

17. “The system acts in the best interests of citizens”
18. “The algorithmic system used here is trustworthy”
19. “Using an algorithm for this kind of decision is appropriate”
20. “This decision-making system fits the type of task described”
21. “The use of an algorithm in this scenario makes sense”
22. “I find it acceptable that the municipality uses this kind of system here”
23. “This situation calls for an automated decision-making system”

“Algorithmic governance frameworks are sets of rules, principles, and guidelines that public organizations use to ensure the responsible use of algorithms in government decision-making.”

1. Have you heard that municipalities in the Netherlands use algorithmic governance frameworks for algorithmic decision-making?
2. I know that such frameworks include principles like transparency, accountability, and privacy.
3. To what extent do you support the implementation of such a framework to oversee algorithmic decision-making in government services?
4. The existence of an algorithmic governance framework increases my trust in algorithmic decisions.
5. Knowing a system follows democratic and legal principles makes me more accepting of its decisions.
6. An algorithmic governance framework makes me feel the decision-making process is more fair.