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Document Version
Accepted author manuscript

Published in:
Public Policy and Administration

DOI:
10.1177/09520767231197801

Publication date:
2025

License
Unspecified

Citation for published version (APA):
Roehl, U., & Crompvoets, J. (2025). Inside Algorithmic Bureaucracy: Disentangling Automated Decision-making and Good Administration. *Public Policy and Administration*, *40*(2), 322-350. https://doi.org/10.1177/09520767231197801

Inside Algorithmic Bureaucracy: Disentangling Automated Decision-making and Good Administration

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Accepted manuscript to be published in *Public Policy and Administration.*

Abstract

Public administrative bodies around the world are increasingly applying automated, administrative decision-making as underlying technologies such as machine learning mature. Such decision-making is a central element of emerging forms of algorithmic bureaucracies. With its direct exercise of public authority over individual citizens and firms, automated, administrative decision-making makes it particularly important to consider relations to values of good administration. Based on a multiple case-study, the article focuses on how empirical use of automated decision-making influences and transforms issues of good administration in four policy areas in Denmark: Business and social policy; labour market policy; agricultural policy; and tax policy. Supplementing emerging literature, the article exemplifies how public authorities struggle to apply automated decision-making in ways that support rather than undermine good administration. We identify six empirical relations of usage of automated, administrative decision-making and good administration: I) Giving accurate and comprehensible reasons; II) Informing addressees' expectations; III) Combining material and algorithmic expertise; IV) Achieving effective oversight; V) Continuously ensuring quality; and VI) Managing high complexity. Additionally, we pinpoint related key capabilities for administrative bodies in order to support good administration.

Keywords

Algorithmic bureaucracy; administrative capabilities; administrative decisions; automated decision-making; good administration; multiple case-study.

1. Introduction

Administrative decision-making is a central element of public administration, as it is through such legally binding decisions that public authorities decide on what is lawful in specific cases in relation to specific individuals or firms. Use of *automated*, administrative decision-

making (henceforth AADM) is on the rise in public administration around the world fuelled by artificial intelligence (AI) and other types of advanced technology (Henman, 2020).

AADM is a key element of emerging forms of "algorithmic bureaucracy" (Vogl et al., 2020) where extensive use of technology heavily influences work practices, bureaucratic procedures, responsibilities of public servants, management practices, and organisational structures of public administrative bodies. In those bureaucracies we see a continued increase in use of semi and fully automated AADM characterized by shared forms of decision authority between public servants and automated decision-systems (Roehl, 2022).

Assessing this development, several authors have pointed to consequences of AADM for good administration (e.g., Cobbe, 2019; Widlak et al., 2021). Good administration covers "hard" regulations and "soft" norms aiming to secure the rights of citizens as well as correctness and legitimacy of public administrative activities (Ponce, 2005), and is often associated with underlying values such as accountability, carefulness, and fairness (Addink, 2019).[1]

With its direct exercise of public authority over individual citizens and firms (Goodsell, 1981), AADM stands out from other developments of algorithmic bureaucracy, making regulations and norms of good administration particularly relevant. Existing contributions have made a convincing, although often implicit, case for the relation between AADM and good administration. Often hailed in terms of efficiency and increased consistency of decisions (e.g., Jansson and Erlingsson, 2014: 302), authors also point to negative effects such as data bias and lack of transparency (e.g., Eubanks, 2018), accountability dysfunctions (e.g., Smith et al., 2010) and excessive curtailment of discretion (e.g., Buffat, 2015).

Not yet properly understood, administrative bodies' usage of AADM thus presents both opportunities and risks to good administration. The current state of knowledge not only restrict the understanding of potential negative societal effects of AADM, but also hampers public administrative bodies' ability to reap its advantages. This is particularly unfortunate in a period where administrative bodies increasingly procure and implement advanced decision-systems, just as policy-makers attempt to tame inappropriate use both within and beyond public administration.

[1] "Values of good administration" are here understood as a subset of the broader type of "public values" (Jørgensen & Bozeman, 2007, for example, identifies not less than 73 such public values). "Values" further refer to values (plural) as beliefs and ideologies rather than the value (singular) of this and that as employed in the literature on public value (e.g., Moore, 1997).

So far, scholars have mostly prioritised theoretical and conceptual discussions of AADM, algorithmic bureaucracy and good administration. Building on the emerging body of literature, this article attempts to respond for calls of empirical research (e.g., Margetts, 2021) and cast light on real-life usage of AADM within administrative bodies. It thus also supplements increasingly widespread discussions on how to best govern and regulate use of advanced technology within public administration (e.g., Misuraca, 2020). To better understand the potential of AADM usage as well as the related opportunities and risks to good administration, we therefore ask:

- What are the primary empirical relations between AADM usage and good administration?
- How do administrative bodies manage relations between AADM usage and good administration?

Taking an explorative approach, we focus on how AADM usage influences and transforms issues of good administration within Danish administrative bodies in four policy domains: Business and social policy; labour market policy; agricultural policy; and tax policy. All cases represent use of semi and fully automated decision-systems which are part of wider, complex algorithmic systems incorporating multiple ICT systems, government databases, citizen portals and intertwined networks often based on combinations of robotic process automation, rule-based (expert) models, regression, big data, and machine learning (Roehl, 2022). As Denmark is a global digital government front-runner (United Nations, 2020) our findings might be relevant for other countries as use of AADM likely continues to increase.

The article shows how emerging algorithmic bureaucracy has consequences for good administration as increasing technology use interacts with work practices and organisational aspects both intentionally and unintentionally. We identify six empirical relations between AADM usage and good administration and formulate key capabilities for administrative bodies to successfully manage those relations.

The article proceeds in the following way: Next, we discuss emerging literature on AADM, algorithmic bureaucracy and good administration. We then present the underlying methods as well as the empirical setting of the four cases, before presenting and discussing our findings in two sections reflecting the dual research question. We finish with a short conclusion where we also touch upon implications for practice and research.

2. Automated, Administrative Decision-making and Good Administration

Administrative decision-making is traditionally a core activity of public administration and involves a high number of public servants around the world (henceforth, "public servant" is used as a term for caseworkers and other officials responsible for administrative decisions). As mentioned, it is through such legally binding decisions that public administrative bodies decide on what is lawful in specific administrative cases in relation to individual citizens and firms[2]. Decisions cover a wide spectrum of rights (e.g., decisions to grant unemployment benefit or childcare benefits) and duties (e.g., denial of permission to build a house or denial of parole), and involves differing degrees of administrative discretion.

As a key element of the emergence of algorithmic bureaucracies, increasing AADM usage appear alongside developments like one-stop online portals, open data, and smart city initiatives. AADM is based on automated outputs generated by decision-systems that incorporate relevant regulation of a given policy area (Roehl, 2022). Usage ranges on a continuum from semi to fully automated (Peeters, 2020) starting with simple assistance of the decision-system to public servants in the form of presentation of data or suggested procedural steps via suggested decisions to fully automated or even autonomous decisions (the latter type involving unsupervised learning) made by the decision-system (Roehl, 2022). Decision-systems are often part of complex algorithmic systems spanning multiple public authorities (Peeters and Widlak, 2018), and are accessed by civil servants through the operation of tablets, office applications, etc. (Roehl, 2022).

It is usually assumed that administrative decision-making characterized by low complexity in the form of being highly structured, involving lower levels of administrative discretion and based on high-quality data is most appropriately automated offering benefits in the form of efficiency, consistency, and error reduction. Conversely, administrative decision-making characterized by high complexity is most appropriately subject to lower levels of automation, i.e., semi-automated decision-making (Young et al., 2019).

Administrative bodies' usage of AADM is strongly related to ongoing ethical and social debates on advanced technologies (e.g., Mittelstadt et al., 2016) including issues of data bias, threats to equity and lack of accountability. Here we approach those issues through the prism

[2] Although traditions vary across legal traditions, the concept of administrative decisions is generic and known under headings such as "order" and "adjudication" (American tradition); "acte administratif individual" (Napoleonic tradition); "Verwaltungsakte" (Germanic tradition); and "förvaltningsbeslut" / "forvaltningsafgørelse" (Nordic tradition).

of good administration. While administrative decisions themselves are based on regulations (e.g., a social security act or a building act), administrative decision-making also takes place within a general framework of regulations and norms of good administration.

While precise scope and wording differentiate between legal traditions, roughly similar obligations – in the form of regulations and norms – as well as underlying values of good administration exist in liberal, democratic governmental systems across the world (Appel and Coglianese, 2020). Such obligations are meant to shape administrative decision processes and constitute basic norms for public administrative behaviour including relations to citizens and firms (Remac and Langbroek, 2011).

Stressing that the definition is non-exhaustive, the British legal scholar, Cane (2011: 377), defines good administration as "…adherence to hard and soft law, and to policies and procedures; timeliness; accuracy in provision of information; having and giving good reasons for decisions; avoiding conflicts of interest; acting reasonably, fairly, consistently, and proportionately."

Some authors see good administration as an attempt to level the inherent imbalance of powerful administrative bodies vis-à-vis somewhat powerless individual citizens or firms (Hasenfeld et al., 1987). This imbalance is generally due to the former's superior resources in terms of unilateral interpretation of relevant regulation, professional expertise and access to authoritative sanctions (fines, imprisonment etc.) (Goodsell, 1981).

Seen in this light, much existing literature on AADM within public administration, law and critical algorithmic studies can be understood as discussing the apparent endangering of good administration by technology usage thereby furthering the said imbalance in power between administrative bodies and citizens or firms (e.g., Eubanks, 2017). Four elements in the literature are particularly dominant:

Firstly, authors point to the risk of reaching incorrect or unfair administrative decisions as automated, administrative decisions might be based on data being biased and/or skewed (Cobbe, 2019). This is at odds with the obligation of equal treatment of like-minded cases.

Secondly, authors point to the importance of transparency and the risk AADM pose to it. Both public servants and addressees being subject to decisions shall ideally be able to understand how a decision is made which can be endangered by complex "black-box" algorithms particularly if those are based on artificial intelligence (Henman, 2020). Here AADM usage risks endangering the obligation of reason-giving.

Thirdly, administrative bodies responsible for administrative decisions in a certain policy area cannot transfer such responsibility to, say, ICT suppliers having developed a decision-system, or de facto escaping the responsibility by arguing "the computer says no" (Widlak et al., 2021). Such transfer goes against the obligation of so-called non-delegation (Motzfeldt and Næsborg-Andersen, 2018) and the underlying, broader value of accountability.

Finally, authors argue that AADM usage risks resulting in an excessive curtailment of administrative discretion. If relevant regulation obliges an administrative body to take individual aspects into account as part of administrative decision-making then decision-making cannot be left to decision-systems unable to depart from policies or guidelines where appropriate (Cobbe, 2019). Doing so goes against the obligation of no "fettering" of mandated discretion and the underlying value of carefulness.

Digging into empirical usage of AADM, we base our investigation on a broad socio-technical understanding of the interplay of humans and technology (Lips, 2020). We view decision-systems, and the wider algorithmic systems they are nested, in as shaping work and organisations just as humans' use of technology and the institutional context influence technology (Bailey & Barley, 2020). While decision-systems are designed with certain ends in mind, those ends can change over time in response to social, economic, cultural, and political pressure (Liu & Graham, 2021) just as one end might conflict with other ends of the same system. In this way, technology itself and technology usage in public administration reflect broader underlying conflicts of values within public administration. Such conflicts must continuously be negotiated and balanced by public servants and administrative bodies as all values – including values of good administration – can seldomly be met at the same time (Hood, 1991).

In the attempt to identify and understand how AADM usage relate to issues of good administration we therefore focus on the empirical "knots and bolts" that constitute the ongoing dynamic interplay of decision-systems, work practices, bureaucratic procedures, responsibilities of public servants, management practices, and organisational structures.

The benefits of such an approach are that we do not a priori restrict ourselves to a limited number of (well-known) relations of AADM and good administration, but are open to less known relations as well. We do not a priori expect usage of AADM to solely undermine or solely support good administration. Instead, we accept that usage of AADM might show different relations to good administration across administrative bodies and policy areas

thereby representing examples of both broader "public value failure" and "public value success" (Schiff et al., 2022).

3. Methods

3.1 Research design

This article is based on a multiple case-study (Miles & Huberman, 1994) of four policy areas in which Danish public administrative bodies employ semi and fully automated administrative decision-making: Illness benefits, Work retention, Agricultural subsidies, and Property value assessment. Case 1 (Illness benefits) consists of two embedded sub-cases (two municipalities), the design is a combination of what Yin (2009) labels holistic and embedded designs.

	Focus of administrative decision-making	Circumstances of usage
Illness benefits Case 1 Municipality 1A Municipality 1B	Determination of citizens' obligation to be available for employment after periods of long-term illness (serve as basis for citizens' rights and duties of public benefits, compulsory job training etc.).	Approx. 15 public servants operate new decision-system. Decision-system is fully automated and public servants solely step in when individual cases are complex or essential data are missing.
Work retention Case 2 Municipality 2	Determination of citizens' obligation to be available for employment after periods of long-term illness which influence citizens' rights and duties of public benefits, compulsory job training etc.	Approx. 120 public servants operate well-established decision-system. Decision-system suggests relevant procedural steps for public servants.
Agricultural subsidies Case 3 Government agency 3	Determination of farmer's access to agricultural subsidies.	Approx. 50 public servants operate well-established decision-system. Decision-system is fully automated and public servants solely step in when individual cases are complex or essential data are missing.
Property value assessment Case 4 Government agency 4A Government agency 4B	Determination of value of homeowners' real estate (serve as basis for annual property tax).	Approx. 500 public servants will operate new decision-system (in Government agency 4B). Decision-system is fully automated and public servants solely step in when individual cases are complex or essential data are missing.

***Figure 1**: Case study design including description of cases.*

Following the research questions, the design was chosen to support the understanding of how AADM usage and good administration relate empirically. Each case represents a particular example of administrative bodies' AADM usage and its relations to good administration. Rather than attempting to identify general mechanisms, we aim to support nascent theory building by providing for possible transfer of selected context-specific tendencies of the four cases to outside contexts (Chenail, 2010).

The selection of the four cases was based on purposive sampling (Patton, 2002) aiming for variation in relevant contextual aspects of each policy area. This allows to cast light on context-specific causal tendencies underlying relations of AADM and good administration within each case and across the four cases. To ensure relevance of the findings over time, we pursued variation not only in terms of current use of AADM, but also in terms of more deeply rooted characteristics.

To this end, the four cases (policy areas in which administrative bodies employ AADM) were chosen based on variation in their professional and political complexity inspired by Thompson & Tuden (1959). While professional complexity can be understood as the level of disagreement of cause and effects of relevant policies among stakeholders, political complexity can be understood as the level of disagreement of preferred policy outcomes. We assumed the complexity of each policy area influences usage of AADM as well as the attention of administrative bodies to regulations and norms of good administration thus representing relevant deeply rooted characteristics.

3.2 Empirical setting

Table 1 lists key characteristics of the four cases including the complexity of each policy area. In cases 1 and 2, AADM usage were studied in two and one municipalities (local government authorities) respectively, while cases 3 and 4 included one and two central government agencies.

Case	**1. Illness benefits**	**2. Work retention**	**3. Agricultural subsidies**	**4. Property value assessment**
Policy domain	Business and social policy	Labour market policy	Agricultural policy	Tax policy
Administrative bodies	Two municipalities	One municipality	One government agency	Two government agencies within one ministry
Government level	Local	Local	National	National
Decision	Citizen	Citizen	Firm (farmer)	Citizen

Case	1. Illness benefits	2. Work retention	3. Agricultural subsidies	4. Property value assessment
addressee	(employee) and firm (employer)			(property owner)
Type of decision for addressee	Rights	Duties	Rights	Duties
*Professional complexity**	Low	High	Medium	Very high
*Political complexity**	Low	High	Low	Medium
Volume (approx., annual)	40,000 administrative decisions	120,000 administrative decisions	37,000 administrative decisions	1,700,000 administrative decisions
*Level of automation***	Decision system compiles data and suggests procedural steps or make fully automated decisions	Decision system compiles data and suggests procedural steps	Decision system compiles data and suggests procedural steps or make fully automated decisions	Decision system compiles data and suggests procedural steps or make fully automated decisions
Primary techniques	Rule-based expert system	Robotic process automation (RPA); rule-based expert system	Image recognition; unsupervised machine learning; rule-based expert system	Supervised machine learning; rule-based expert system
Status of decision system	Under implementation	In operation	In operation	Under implementation

***Table 1**: Key characteristics of cases. * Assessment of complexity inspired by Thompson and Tuden (1959). ** Assessment of level of automation based on Roehl (2022).*

In general, Denmark is considered a high trust society characterised by a modern, extensive and decentralized welfare state as well as social cohesion, low corruption and high equality (Andersen, 2018).

In terms of automated decision-making, cases 1, 3, and 4 involve decision-systems making administrative decisions in a fully automated manner. Being part of wider algorithmic systems, the sophisticated decision-systems compile and assess relevant data (partly fed from addressees via citizen portals, partly from internal and external databases), and carry out administrative decisions notifying the relevant addressees (most often by secure email), updating databases etc. without the interventions of public servants. In this manner, 70 – 80% of administrative decisions in cases 1, 3, and 4 are fully automated.

Where individual administrative cases are complex (e.g., necessitating the exercise of administrative discretion) or essential data are missing, the decision-systems suggest relevant procedural steps to the operating public servant for her to carry out before a case is "returned" to the decision-system to be processed further. Case 2 represents sole use of such semi-automated decision-making, but nevertheless entails shared decision authority between public

servant and decision-system. Here, all cases are handled by public servants based on the system's suggestion of relevant procedural steps just as public servants have relatively frequent online and real-life communication with addressees in order to assess addressees' capability of returning to employment after long-term illness.

While cases 2 and 3 represent use of well-established decision-systems, cases 1 and 4 represent administrative bodies implementing new and rather advanced decision-systems. While the motivation for the introduction of the decision-system of case 1 is primarily compliance with regulation on public procurement and ambitions of efficiency improvements. The motivation for the introduction of the system of case 4 is primarily tied to a previous public "scandal" involving wide discrepancies in the property value assessment of almost neighbouring properties (Danish National Audit Office, 2013) leading to an ambition of establishing a decision-making process primarily relying on so-called objective data regarding the property in question. None of the administrative bodies studied are, however, foreign to technology usage, and even the well-established decision-systems of cases 2 and 3 are continuously extended and refined to cope with changes in regulation as well as new technological possibilities. Although differentiating in exact set-up, all administrative bodies are also relying on products and services of commercial ICT suppliers. As algorithmic bureaucracies, the administrative bodies examined here are imperfect examples of what of Bovens & Zouridis (2002) termed system-level bureaucracies.

3.3 Data collection

The administrative bodies of each case were approached through partly different channels based on personal contacts of the first author. Generally, contact was made to a top-level manager to secure solid interest and commitment. Following this, a letter of understanding of participation was finalised.[3] Each administrative body further named a contact person with whom research activities were coordinated. None of the contact persons took a strong interest in the task, though, and no requests for data were a priori rejected by the administrative bodies.

[3] Based on the Danish Code of Conduct for Research Integrity (Danish Ministry of Higher Education and Science, 2014) and Guidelines for promoting responsible research practice of Aalborg University (Faculty of Social Sciences, 2020), letters of understanding included rules of anonymization and confidentiality, freedom of inquiry and freedom of publication as well as the option of gaining access to confidential data as 'background information' thereby obliging the anonymization of such data by the authors.

Empirical data was collected in relation to each case in the form of interviews, documents, and observations in the period of October 2019 – December 2020 as described in Table 2:

- *Interviews* were the primary form of data and were made with top and mid-level managers, specialists and caseworkers of the administrative bodies. While managers and specialists typically provided overview of relations of AADM usage and good administration as well as access to managerial considerations of trade-offs and dilemmas; caseworkers represented detailed knowledge of administrative decision processes as well as use of decision-systems. All interviews were semi-structured, designed according to the position of the interviewee, took 45 – 90 minutes and were conducted in Danish either physically or by video by the first author.
- *Documents* included internal guidelines and checklists for use of decision-systems as well as decision processes, public fact sheets, software documentation, internal teaching material, examples of decision-system templates etc. Access was not gained to a handful of potentially interesting documents across the four cases due to lack of response from individuals – although impossible to fully assess, this seemed more a question of work pressure than a deliberate act of non-disclosure.
- *Observations* were used as a supplementary data source via shadowing and stationary observations (Czarniawska, 2017). Observations included following caseworkers for entire working days focusing on their operation of decision-systems as well as communication with addressees and colleagues plus participation in educational activities regarding decision-systems. In a literal sense, this primarily meant looking over the shoulder of the shadowed and asking questions when the situation allowed Notes were made during and immediately afterward for all observations and were supplemented with photos, screenshots etc., of interior, artefacts and decision systems.

Case	Interviews	Documents	Observations
1. Illness benefits	21	21	7
2. Work retention	9	56	2
3. Agricultural subsidies	17	37	2
4. Property value assessment	13	45	2

Table 2: *Numerical overview of empirical data*

3.4 Data analysis

A thematic analysis (Boyatzis, 1998) based on within-case and cross-case analysis (Miles & Huberman, 1994) was carried out searching for patterns in the data. We applied Boyatzis' (1998) hybrid approach, which blends inductive coding with existing theoretical assumptions in the identification of themes in the data. Interview transcripts, documents and observation notes were imported into "NVivo" (version 12) qualitative data analysis software, where short summaries were created for relevant sources using the "memos" functionality.

Boyatzis (1998: vii) understands a theme as "a pattern found in the information that at the minimum describes and organizes possible observations or at the maximum interprets aspects of the phenomenon". Such themes are based on initial coding of simple, but likeminded, topics in data. Summaries of topics were then compared to determine thematic similarities focusing on descriptive, interpretive and pattern-based themes (Miles and Huberman, 1994), with each theme becoming a code. Where necessary, meta-summaries were used to handle the complexity across cases. At first, coding was done of a pilot sample of data across the four cases and the three types of empirical data. Based on this, codes were redesigned, and then applied to all sources. Although this served as a strong starting point, some codes were added and refined during the coding of topics following the constant comparison approach (Bernard et al., 2017).

To seek patterns, the initial themes were then revisited iteratively both within and across cases, updating their descriptions and seeking to explain apparent causal tendencies (Fryer, 2020). This was done via the analytical techniques of "clustering", "scaling" and "pattern seeking" (Boyatzis, 1998). In total, the analysis resulted in 86 simple, descriptive topics (first order), 18 themes (second order) and 6 aggregate dimensions (third order) of which the latter are presented in the following section as empirical relations of AADM usage and good administration.

4. Relations of Automated Decision-making and Good Administration

The four cases all illustrate how AADM relate to issues of good administration. Following the first research question, we identified six primary empirical relations via a detailed examination of work practices, bureaucratic procedures, responsibilities of public servants, management practices, and organisational structures across the four cases. The six relations are summarized in Table 3.

4.1 Giving accurate and comprehensible reasons

Being able to offer addressees an accurate reason for administrative decisions including reference to underlying relevant regulation is a widespread obligation of good administration across most jurisdictions and is in Denmark rooted in the General Administrative Law Act. This obligation of reason-giving is intended to facilitate addressees' understanding of administrative decisions, and provide accountability and legitimacy to administrative bodies' exercise of authority (Mashaw, 2007).

Existing research has particularly focused on the algorithmic opacity of decision-making based on unsupervised machine learning. Due to the reliance on patterns (correlations) in data rather than a priori programmed cause-effect relations it becomes difficult to provide a firm, factual reason for the decision (e.g., Cobbe, 2019).

Although two of the cases examined here do involve use of machine learning, the obligation of reason-giving manifests itself differently. The decision-systems either provide the full decision memorandum (the formal document stating the administrative decision including its reason) to the addressee or predefined "boilerplate text" which is supplemented by manually entered information by public servants. Across the cases this seems to support formal completeness and, to some extent, comprehensibility of decision memoranda.

Empirical relation	Giving accurate and comprehensible reasons	Informing addressees' expectations	Combining material and algorithmic expertise	Achieving effective oversight	Continuously ensuring quality	Managing high complexity
Description	AADM usage influences ability to provide addressees with reasons for administrative decisions.	AADM usage influences ability to inform addressees' expectations of automated decision-process and likely decisions with forecasts etc.	AADM usage increases importance of algorithmic expertise vis-à-vis material expertise.	AADM usage creates new possibilities and challenges of managerial oversight of automated decision-processes.	AADM usage necessitates new forms of continuous quality assurance and control of automated decision-processes.	AADM usage necessitates management of multiple petite decisions across wider algorithmic systems that influence automated, administrative decisions.
Case 1: Illness benefits	Automated reasons and predefined "boilerplate texts" support formal completeness and comprehensibility of reasons.	No initiatives to align addressees' expectations etc. of automated decision-process beyond simple submission receipts.	Some public servants lack algorithmic expertise and do not fully understand logics of decision system.	Managers struggle to oversee quality and quantity of decision-making in a meaningful manner.	Neither administrative bodies nor ICT supplier seem to be aware of need to ensure and document quality.	Low level of common governance across algorithmic system exposes decision-processes to unforeseen consequences of petite decisions.
Case 2: Work retention	Predefined "boilerplate texts" supports formal completeness and comprehensibility of reasons.	No initiatives to align addressees' expectations etc. of automated decision-process beyond simple submission receipts.	Coincidental initiatives at individual level to bridge algorithmic perspective with material perspective of addressees.	Managers struggle to oversee quality of decision-making but utilize novel avenues for quantitative oversight.	Quality assurance based on comprehensive, formal audit scheme. "Blind spots" in relation to tangible operation of decision system.	No specific activities by administrative body to manage internal or external petite decisions. De facto reliance on ICT supplier.
Case 3: Agricultural subsidies	Automated reasons and predefined "boilerplate texts" support formal	Provisional "traffic light" indicators of compliance are accessible to	Public servants tend to lack understanding of material world of addressees.	Managers struggle to oversee quality of decision-making but utilize novel avenues	Quality assurance based on comprehensive, formal audit scheme.	Internal organisational initiatives to manage petite decisions.

Empirical relation	Giving accurate and comprehensible reasons	Informing addressees' expectations	Combining material and algorithmic expertise	Achieving effective oversight	Continuously ensuring quality	Managing high complexity
	completeness and comprehensibility of reasons. Memoranda often contain lengthy detailed text and maps.	addressees allowing them to, e.g., supply supplementary data.		for quantitative oversight.	Results are seldomly utilized to improve future decision-making.	Over time, management of algorithmic logics weaken.
Case 4: Property value assessment	Automated reasons and "boilerplate texts" support formal completeness and comprehensibility of reasons. Reference to customized, supplementary information.	Large-scale citizen portal allows addressees to access and – to some extent – correct faulty data of later administrative decisions.	[Relevant data have not been observed due to implementation stage of decision system]	Minimal focus on formal responsibility to oversee quality of decision-making but utilize novel avenues for quantitative oversight.	Extremely comprehensive formal scheme assessing the quality of all administrative decisions before their finalization.	High complexity of algorithmic logics weakens future control and exposes decision process to consequences of petite decisions.

***Table 3**: Empirical relations of usage of automated, administrative decision-making (AADM) and good administration.*

The administrative bodies of cases 3 and 4 struggle with communicating the complexity and volume of data forming the basis of decisions. The formal memoranda to farmers providing the reason for decisions on agricultural subsidies in case 3 thus often consists of 10-15 pages of detailed text and maps making the reason de facto incomprehensible for the average addressee.

Case 4 most clearly reflects the focus on "black-box" algorithms in the literature. Here administrative decisions on the value of property for tax purposes are based on more than 100 detailed data points which are processed based on a supervised machine learning model comparing the property in question to 15 nearby properties. Such a complex assessment is likely to be incomprehensible for all but a few addressees. The decision memoranda are therefore designed with a graphic reference to nearby properties describing the most significant differences. Each memorandum further includes reference to an online portal providing both personalized, supplementary information and general information on underlying regulation etc.

> *"We could have reached higher quality with more aggressive [machine learning] methods. We have tested that. But we have chosen this because we can explain it. It is a pretty strong communication tool towards the citizen: You get the decision memoranda with your "pluses and minuses" compared to the 15 nearby properties. It is just as much communication [as it is statistics]."*
>
> (Head of department; interview 4.2.2; case 4)

4.2 Informing addressees' expectations

Our findings show that usage of AADM provides possibilities for administrative bodies to align addressees' expectations of automated decision-process with forecasts of the decision process. Such initiatives can be considered to reflect "soft" norms of good administration helping addressees to navigate the decision process based on increased transparency.

Existing research on this issue is scarce, but Deng et al. (2018) for example mention the use of online case-tracking being available for citizens using certain digital government services in Sri Lanka. A recent survey of online government services in the European Union mentions different related initiatives to "manage user expectations" ranging from simple submission receipts upon application, to forecasts of expected and/or maximum time limits of decision process (European Commission, 2021: 18).

Across the cases, administrative bodies rarely seem to take the possibility of increasing transparency in this manner into consideration. If they do, it tends to be in an underdeveloped way, where initiatives are not systematically connected to a holistic approach to transparent decision processes. This is particular the fact in cases 1 and 2, where no such initiatives have been traced.

Cases 3 and 4, however, represent singular initiatives giving addresses access to certain provisional results of the decision process. Following European Union regulations, agricultural subsidies to farmers in case 3 is dependent on their planned patterns of production. If support is given for growing rye on a specific plot, then the farmer is obliged to grow rye or the subsidy will subsequently be annulled. Historically, this entailed a rather large operation of on-the-ground inspection, but the administrative body is increasingly relying on fully automated, satellite-based image recognition. While this approach raises questions of proportionality and surveillance (is the monitoring of all Danish farms by satellite proportional to the need for inspection?); what is interesting in relation to transparency of the decision-process is the feature farmers have access to via a smart phone application. On a digital map, fields are thus marked green, yellow, and red indicating whether the field is registered as complying with the basis of a given subsidy or not. The registration can change over time (e.g., as plants grow, they become observable by satellites), but the application also enables farmers to supply the administrative body with supplementary information to document a given production.

> *"…the monitoring by satellite is also meant to be kind of a cooperative system. It is meant to be a system which the farmer can access for a status. And maybe so we [the administrative body] continuously can issue notices and warnings."*
>
> (Geographical information specialist; interview 3.2.15; case 3)

4.3 Combining material and algorithmic expertise

Despite the differences in distribution of decision authority between public servants and decision-systems across the four cases, they all represent administrative bodies where administrative decision-making by public servants is done in front of a screen operating a complex decision-system. This means that "algorithmic expertise" (the ability to operate and understand decision-systems) is of outmost importance for public servants. However, the

cases illustrate this might happen at the cost of "material expertise" (the ability to navigate and understand the world of addressees).

How does this relate to good administration? The increasing primacy of algorithmic expertise among public servants risks detaching them from the material world of addressees. This endangers their ability to advise and assist addressees within the purview of the administrative body (phrased as a hard regulation or a soft norm depending on jurisdiction). In a larger sense, it might weaken the ability of public servants to exercise administrative discretion and assess unusual aspects of complex cases.

In a study of technicians' work practices, Barley (1996) speaks of the transformation of the "material world" (biological, physical and – one might add – social systems) by way of technology to the "symbolic world" (data, results, images etc.). What we observe in the cases is that public servants are increasingly solely navigating the symbolic or what we term the algorithmic world. Barley (1996: 418) warns of possible consequences: "When important symbols represent material phenomena, symbolic work will lack accuracy unless the symbolic and the material are linked." In their study of automated administration of housing subsidies in The Netherlands, Jorna and Wagenaar (2007: 211) speak of informal "signalling systems" of bureaucracies being weakened as public servants do not share the world of addressees and can therefore not provide early warnings of possible low-quality data and decisions mistakes.

In case 2, some of the addressees are vulnerable citizens having been without employment for a long time. Referring to such citizens, an experienced public servant explains how she often orally notices addressees of the meaning of future automatically generated messages as they tend to be "cold" and rigid. The servant thus navigates across material and algorithmic expertise in order to advise and assist the citizen. Asked if this is a common practice among her colleagues, she remarks:

> *"I think some of my colleagues do it as well sometimes, but it is not something we really speak about or discuss with our manager."*
>
> (Caseworker; observation 2.3.2, case 2)

4.4 Achieving effective oversight

Traditional Weberian arrangements of accountability places formal responsibility for administrative decisions in the hands of heads of administrative bodies (local councils, agency administrators etc.), who delegates such responsibility to mid-level managers (Bovens, 2010).

Through managerial oversight mechanisms, the latter have responsibility for securing decision processes follow both external and internal policies and guidances. While the overall principle might be regulated by general administrative law acts in some jurisdictions, details of the responsibility of managers will often be rooted in soft norms of good administration.

Authors routinely point out how AADM can help ensure consistency (e.g., Jansson and Erlingsson, 2014) thereby to some extent reducing the need for oversight. Other authors point to the role of ICT suppliers that risk undermining the "chain" of delegation as they convert legislation, case law and guidance into algorithms (Bovens and Zouridis, 2002) thereby circumventing the responsibility of managers.

Our findings support but also nuance those existing understandings. All cases exhibit an unclear distribution of formal responsibility of administrative decision-making. Relevant managers are thus only to a limited extent aware of their formal responsibility and tend to believe responsibility in placed with internal ICT units or similar. Further, no official documents were traced that defined divisions of responsibility for oversight between units in the administrative agencies. If aware of the formal responsibility, managers – often having a background in a business unit of the agency – struggle to oversee automated decision-making in a meaningful manner, and does not seem to receive assistance from internal ICT units or external ICT suppliers:

> *"…as a manager, I think it is difficult to assess the quality. I am struggling with how to achieve effective oversight of automated decision-making when we use systems where a large proportion of the administrative decisions are made in a fully automated manner. Do you [actually] have to?"*
>
> (Head of department; interview 1.2.15; case 1)

This is, however, not the case when it comes to oversight in quantitative terms. "Production facts" (Jorna and Wagenaar, 2007) such as number of incoming cases, number of cases processed, individual caseloads, etc. are available to managers as such information is automatically generated by the decision-system. Case 3 represents the most proficient use, where managers share quantitative case-handling targets and accomplishments of units on informal daily "stand-ups" with groups of public servants just as the information is displayed on internal white boards. To some extent, case 3 thus illustrates how administrative decision-making shares traits with the tendency of datafication in other sectors (e.g., Christin, 2017).

While this enables managerial oversight and knowledge sharing, it also risks replacing attention from quality to quantity.

4.5 Continuously ensuring quality

The obligation of administrative bodies to ensure non-erroneous administrative decisions is a basic norm of good administration. To our knowledge, the obligation is rarely codified in regulation, but is nevertheless recognisable across multiple jurisdictions. The topic is described by interviewees as being somewhat related to managerial oversight described in section 4.4, but being of a more specialised kind describing activities to assess and control the quality of administrative decision-making. Organisationally, such activities are often seen as "external" to business units with direct responsibility for administrative decision-making, and regards general elements of decision-making processes rather than individual administrative decisions.

Empirically, we observe three broad tendencies across the cases although they vary considerably with the resources available to the administrative bodies (the more resources, the more advanced quality assurance procedures). Our findings indicate that administrative bodies struggle with ensuring effective procedures of both quality assurance and audit of automated decision-making. Secondly, they struggle with ensuring that results of quality assurance and audit activities are 'fed' into future decision processes to improve those. Thirdly, all administrative bodies of the cases seem to have an underdeveloped sense of the potential benefits for transparency and public trust of making the results of such activities public.

At one extreme, case 1 illustrates administrative bodies and associated ICT suppliers that are caught by surprise when external stakeholders (media, supervisory authorities, national ombudsman) question whether the new decision-system's fully automated decisions are correct. While the decision-system in case 1 has certain simple technical controls (e.g., to stop decisions of clearly excessive illness benefit reimbursements), neither administrative bodies nor ICT suppliers seem to have considered the need to continuously assess final administrative decisions or the tangible operation of the system by public servants.

Case 4 represents another extreme. Here automated quality assessment of all administrative decisions is an integrated element of the work practices aimed to ensure that the property value assessment of properties in the same district are broadly similar. Each administrative decision is thus not finalised before being compared to a pool of same-district-properties based on an advanced machine learning model. The activities are the responsibility

of a separate internal unit, and potentially result in re-assessment of either individual properties or the full pool of same-district-properties. While this scheme appears very comprehensive, it is also resource intensive owing its existence to the previously mentioned public "scandal" involving wide discrepancies in the assessment of roughly similar properties.

4.6 Managing high complexity

The embedment of automated decision-systems as part of wider algorithmic systems often results in extensive complexity. Continuous technical updates and improvements, adjustments in types or quality of data, or changes in legislation and case law – combined with the sheer scope of algorithmic systems – result in a complex web of mutual dependencies, where a minor change somewhere else can have unforeseen consequences for the operation of automated decision-systems. Minor changes to systems, government databases, citizen portals and intertwined networks may thus ultimately result in erroneous administrative decisions.

Existing literature has labelled such mutual dependencies chain decisions and automated network decisions, describing how formally independent organisations exchange data etc. as an integrated part of the administrative decision-making process. While chain decisions are relatively well governed, automated network decisions are characterised by no agreed process, definitions of data etc. (Widlak et al., 2021) – in short, low levels of common governance.

Across the four cases, administrative bodies struggle with the management of such internal and external "petite decisions" potentially characterised by unforeseen consequences. What seems particularly difficult is the ability to identify and assess decisions with potential effects for administrative decision processes. One challenging aspect is the high number of such decisions, another is the cross-disciplinary skills often necessary to gauge potential consequences and a third is the number of both public and commercial actors having a role in the wider algorithmic systems. Despite widespread use of professional best practice such as, e.g., "DevOps", the cases illustrate great difficulties in the effective management of petite decisions.

Case 1 exhibits an algorithmic system characterised by a rather low level of common governance and a diverse group of actors incorporating both local level and central level government bodies as well as a high number of commercial ICT suppliers. This particularly exposes the automated decision process in the administrative bodies of the case to unforeseen consequences of externally made petite decisions. A mundane example: Following Danish legislation, access to illness benefit reimbursement depends on the salary level of the long-

term ill citizen. Information on citizens' salaries is automatically supplied by the Danish tax authorities to relevant administrative bodies and are marked by technical signifiers categorising the type of salary. Without clear warning, tax authorities sometimes adjust categories of signifiers, which results in missing or faulty data on salary levels transmitted to the decision-system. Potentially, this results in erroneous automated decisions on illness benefits formally taken by the administrative bodies in question but heavily influenced by external actors of the wider algorithmic system.

The government agency of case 3 is the only administrative body where top management seems to have attempted to respond the challenges of petite decisions: Inspired by "agile release trains" within software development, they have recently redesigned parts of the classic hierarchical agency into a matrix organisation with a number of cross-sectional tight-knit internal teams. Each team is responsible for the operation and continuous improvement of clearly segmented parts of the decision-system in collaboration with relevant ICT supplier(s) and staffed by public servants with expertise within decision-process, regulation, and ICT.

> *"…we did not know what we did but I think it is very, very good […]. We have actually put the decision-process experts, the lawyers, and the ICT people together in agile trains. They are all there when the legislative guidance is written and then they configurate the decision-system at the same time. In that manner we actually achieve a 360-degrees perspective that allow us to consider legal consequences and consequences for addressees up-front…"*
>
> (Agency head; interview 3.2.18; case 3)

5. Managing relations of automated decision-making and good administration

Our findings show that AADM usage both relate to good administration in a supportive and undermining manner. Each relation manifests itself empirically in ways that both support and undermine good administration. Looking across the cases and reflecting the second part of the research question, this section illuminates the diverse way administrative bodies seek to manage the identified relations.

In the following, we distil six key capabilities for administrative bodies to manage the relations. Simple said, a capability is an organisation's capacity to deploy resources to achieve

a desired outcome (Piening, 2013). In this context, capabilities describe administrative bodies' capacity to achieve supportive relations between AADM usage and good administration. For each identified relation, Table 4 lists the relevant key capability, and exemplifies how good administration is both supported and undermined by AADM usage.

Revisiting *giving accurate and comprehensible reasons*, the cases illustrate how administrative bodies are struggling to transform not only the logic of complex algorithms but also the detailed, high-volume data that often form the basis of automated, administrative decisions into comprehensible reasons for addressees. While AADM usage appears to support the formal completeness and, to some extent, comprehensibility of decision memoranda, it also risks creating "information overload" for addressees. What is at stake is thus to what extent decisions appear as reasoned for addressees and, in a deeper sense, to what extent addressees thereby can hold administrative bodies accountable for decisions made.

The key capability for administrative bodies appears to be the ability to transform complex algorithms and high-volume data to reasons that balance accuracy with comprehensibility for the addressee. On top comes the obligation to refer to underlying relevant regulation which – given often complex regulation(s) – has the potential to work against addressees' ability to effectively understand the reasons given. Case 3 represents an example of detailed, voluminous data being "passed on" almost unfiltered thereby most likely resulting in information overload for many addressees, while case 4 represents an example of reason-giving where varied forms of communication and "layered" levels of supplementary information are utilized to strike a more suitable balance.

Looking at *informing addressees' expectations*, some administrative bodies apply AADM in a manner that does not only enhance transparency of the decision process for addressees. It also provides addressees with a chance to change faulty data thereby potentially correcting otherwise erroneous administrative decisions. Such initiatives support what authors of good administration have termed the value of carefulness (Addink, 2019) as it potentially increases the quality and care of administrative decision-making.

Across the cases the key capability seems to be how systematically inform addressees' expectations of automated decision-process and likely decisions via novel uses of technology (e.g., information drawn from data-mining of previous decision-processes). While case 3 and

Empirical relation	**Giving accurate and comprehensible reasons**	**Informing addressees' expectations**	**Combining material and algorithmic expertise**	**Achieving effective oversight**	**Continuously ensuring quality**	**Managing high complexity**
Key capability	Capability to transform complex algorithms and high-volume data to reasons that balance accuracy and comprehensibility.	Capability to inform addressees' expectations of automated decision-process and likely decisions via novel uses of technology.	Capability to continuously combine and balance material and algorithmic expertise among public servants.	Capability to effectively oversee automated decision-processes in terms of both quality and quantity by mid-level managers.	Capability to ensure effective procedures of continuous quality assurance of automated decision-processes.	Capability to manage the complexity of petite decisions across wider algorithmic system and ensure resilience to effects of such decisions.
Supportive example	Varied forms of communication and levels of detail are utilized giving addresses access to "layers" of supplementary information (case 4).	Provisional "traffic light" indicators of compliance prepare addressees for possible later decisions and allow them to adjust behaviour (case 3).	Formal and informal communication to addressees is combined to bridge material and algorithmic perspectives (case 2).	Daily "stand-ups" among public servants to share and inform overview of decision-making (case 3).	Advanced machine learning assess quality by way of comparison with similar cases. Outliers are reassessed by public servants (case 4).	Attempt to manage petite decisions by internal organisational initiative bringing expertise of decision-process, legislation and ICT close together (case 3).
Undermining example	Detailed, voluminous data is "passed on" to addressee most likely resulting in information overload (case 3).	[Example of undermining relation have not been observed.]	No systematic initiatives to strengthen material expertise among public servants operating decision system (case 3).	Apparent lack of attention and tools in relation to managerial oversight (case 1).	Underdeveloped grasp of expectations of quality assurance from external stakeholders etc. (case 1)	Ineffective governance across wider algorithmic system may result in erroneous administrative decisions (case 1).

***Table 4**: Key capabilities regarding effects of automated, administrative decision-making (AADM) for good administration including examples of supportive and undermining examples.*

4 represent large-scale singular initiatives, none of the cases show a systematic approach to transparent decision processes where administrative bodies actively consider how information on expected administrative decision processes as well as likely decisions can be provided to addressees.

Cases 1, 2, and 3 show the same tendency regarding what we above termed *combining material and algorithmic expertise*. Public servants only to a limited extent manage to connect the daily, ubiquitous algorithmic perspective to the material perspective of addressees, and no examples of systematic initiatives to counteract this tendency has been traced among the administrative bodies. This tendency relates to several values of good administration of which responsiveness and carefulness are the most obvious: E.g., the ability of administrative bodies to sufficiently advise addressees (necessitating the material perspective of the addressees as a starting point) as well as the ability to carefully assess cases characterised by unusual aspects that cannot be processed solely based on algorithmic expertise.

Use of AADM clearly necessitates algorithmic expertise, so the key capability for administrative bodies is how to combine and balance this type of expertise with material expertise among public servants. Based on the cases, it primarily seems a question of stressing this aspect in the training and formal responsibilities of public servants, just as continued managerial attention to the balance appears valuable. If not, the risk of administrative bodies with insufficient material expertise is likely to increase as AADM usage also increases.

Across all four cases, administrative bodies including mid-level managers struggle to *achieve effective oversight* of automated decision-making. On the one hand, this in effect weakens the traditional chain of political-administrative delegation thereby undermining values such as accountability and rule-of-law. On the other hand, automated decision-making also provides managers with novel avenues for quantitative oversight of the "production" of decisions thereby arguably supporting the efficiency of administrative bodies.

The key capability for administrative bodies seems to be to ensure effective managerial oversight of AADM not only in quantitative terms but also in qualitative terms. While this might be a technical question of developing decision-systems with better oversight functionalities, the cases indicate it is first and foremost a question of management practices in administrative bodies. Mid-level managers must be both helped and held accountable by their superiors to exercise both qualitative and quantitative oversight of automated decision-making.

Our findings are varied when it comes to how administrative bodies seek to *continuously ensure quality*. Very simple put, and emphasising the value of carefulness, it appears that the administrative bodies of all four cases are simply "not careful enough" by standards of good administration. With the notable exception of case 4, they do not have schemes in place that assess *both* tangible operations of decision-systems by public servants *and* final administrative decisions. Particularly the former appears to be rooted in a somehow naïve belief in the quality of public servants' operation of decision-systems not taking into consideration behavioural issues such as automation bias (Cummings, 2006), inappropriate training or high work pressure.

Building on this, a key capability for administrative bodies is to ensure effective procedures of continuous quality assurance of automated decision-processes. Such procedures must have a suitable diverse scope to cover both technical and behavioural elements. Further, procedures should ideally include systematic internal utilization of results for future improvement of decision processes as well as the publication of results to support transparency.

Finally, administrative bodies and their ICT suppliers are struggling with *managing high complexity* of the wider algorithmic systems in which decision-systems are embedded. This is a struggle that is destined to increase as decisions systems become more advanced and comprehensive, and underlying data points likely multiply in the future. The more difficult it will be to manage what we above termed petite decisions, the more difficult it will be to adhere to the underlying value of carefulness and avoid compromising the quality of automated, administrative decisions.

Even in case 3 where organisational changes have been made to attempt to manage petite decisions effectively by bringing expertise of decision-process, regulation, and ICT close together in tight-knit internal teams, the administrative body struggles. Instead of solely attempting to completely *avoid* unforeseen consequences of petite decisions, the four cases point to the importance of administrative bodies strengthening their ability to *identify* and *handle* possible effects of both internal and external petite decisions. In short, a key capability for administrative bodies is to manage the complexity of petite decisions across wider algorithmic system and ensure the resilience of automated decision-processes' to effects of such decisions.

6. Conclusions

Based on a case-study of the actual usage of AADM in four policy areas, this article supplements existing more theoretical and conceptual contributions on AADM and good administration.

As a response to the first research question's focus on primary relations between AADM usage and good administration, we identified six such relations, illustrating how AADM usage could have both supportive and undermining effects for good administration. While three of the relations (giving accurate and comprehensible reasons; informing addressees' expectations; managing high complexity) are partly known from existing literature, all six relations encapsulate a rich level of empirical detail adding new insights to both effects of AADM as well as how administrative bodies struggle to manage its use.

Although the four cases differentiate in terms of complexity of policy areas, the level of automation ranges from semi-automated (the decision-system suggests procedural steps) to fully automated (the decision-system makes final decisions), and only two out of four decision-systems incorporate machine learning techniques, all but one relation can be observed in all cases. Put in other words; across policy areas, administrative bodies face roughly the same themes (relations) vis-à-vis good administration when applying AADM. Context, nevertheless, matters a great deal for how administrative bodies manage the relations including to what extent they appear supportive or undermining to good administration.

Our conclusions thus seem to confirm the importance of the actual *function* of technology (here, AADM) as well as surrounding work practices and organisational context for effects of technology in public administration. Despite the considerable interest for machine learning in recent literature (Schartum, 2020), the conclusions also point to the importance of the wider algorithmic systems which decision-systems are nested in. Those algorithmic systems are almost by definition complex, partly opaque and non-static, no matter the mix of established and new technologies the actual decision-systems incorporate.

This is significant in two ways: Firstly, and as an answer to the second research question's focus on the management of relations of AADM usage and good administration, we identified six key capabilities for administrative bodies. Those capabilities are necessary to achieve supportive relations between AADM usage and good administration. While the capabilities might look simple on the surface, it is noteworthy that they all cut across technology, work practices and organisational aspects thereby making their intentional advance complicated. Further, as automated decision-systems most likely become more advanced and wider

algorithmic systems become even more far-reaching, the identified capabilities must most likely be continuously renewed if administrative bodies are to adhere to hard regulations and soft norms of good administration.

Secondly, the scope of values of good administration affected by AADM usage seems broader than often assumed in existing literature. Here, concerns over data bias, transparency, accountability, equity, and an overtly focus on efficiency dominates. While we do not suggest neglecting those, we wish to draw attention to the values of carefulness, responsiveness, and resilience as well. Several of the identified relations – most notably *continuously ensuring quality* – point towards if administrative bodies apply sufficient carefulness when using AADM. Another relation, *combining material and algorithmic expertise*, most clearly draws attention to responsiveness, as one-sided focus on algorithmic expertise risks hollowing out administrative bodies' ability to, e.g., advise addressees in a responsive manner. Finally, the relation, *managing high complexity*, indicates that administrative bodies need to develop a stronger focus on resilience in the form of being able to identify and handle possible effects of both internal and external, petite decisions.

Moving on to the practical implications of our findings, administrative bodies should ideally be more consistent and systematic in their considerations of relevant values of good administration when applying and operating AADM. That said, the cases also illustrate how AADM usage can also support good administration.

Another important implication for practice is that we have not found deterministic relations between real-life AADM usage and good administration. If administrative bodies strive to master the key capabilities laid out in Table 4 in a context sensitive manner, we believe they will come a long way in applying AADM in a manner that not only supports but also strengthen good administration. This, however, calls for the aforementioned combined managerial attention to technology, work practices and organisational aspects just as it occasionally necessitates considerable resources.

This article responds to calls for empirical research on emerging forms of algorithmic bureaucracy and the values that guide their emergence. The six identified relations each represent a causal tendency linking AADM usage to good administration. While those tendencies are observable across all four cases, the context of each case influences the precise outcome. Building on this, future research ideally examines if those tendencies can be transferred to other contexts (that is, other policy areas and other administrative traditions)

and how such contexts contribute to them being supportive or undermining to good administration. Related and advancing the implications for practice of the six identified key capabilities for administrative bodies, future research should also seek to explore and elaborate on management practices being either supportive or undermining to good administration in relation to AADM usage.

Lastly, this article has largely maintained an "inside-out" focus on administrative bodies and builds on empirical data from within such bodies. While we have nuanced and broadened the understanding of how good administration is affected by AADM usage vis-à-vis existing literature, we do not know if the identified relations will appear in data stemming from citizens and firms being subject to AADM. Turning the spotlight to citizens and firms, and their experiences with algorithmic bureaucracies employing AADM thus appear a logic next step for research. The six identified empirical relations between AADM usage and good administration could serve as open-ended inspiration for such research. Likewise, the six related key capabilities for administrative bodies to support good administration of this article are ideally scrutinised and nuanced by investigating what capabilities for administrative bodies citizens and firms perceive as key to good administration.

Declaration of conflicting interests

The research, which this article is based on, has been carried out as part of a PhD fellowship partly financed by the Danish public sector company, KOMBIT Ltd. After the authors' best consideration there are no conflicts of interests.

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References

- Addink H (2019) *Good Governance: Concept and Context*. Oxford: Oxford University Press.
- Andersen RF (2018) Trust in Scandinavia: Findings from Moving Borders between Denmark and Germany. *Scandinavian Political Studies* 41(1): 22–48.
- Appel SM and Coglianese C (2020) Algorithmic Governance and Administrative Law. In: Barfield W (ed.) *The Cambridge Handbook of the Law of Algorithms*. Cambridge Law Handbooks. Cambridge: Cambridge University Press, pp. 162–181.

- Bailey DE and Barley SR (2020) Beyond design and use: How scholars should study intelligent technologies. *Information and Organization* 30(2). Elsevier Ltd: 100286..
- Barley SR (1996) Technicians in the Workplaces. *Administrative Science Quarterly* 41(3): 404–441.
- Bernard HR, Wutich A and Ryan GW (2017) *Analyzing Qualitative Data: Systematic Approaches.* 2nd ed. Thousand Oaks, CA: Sage Publications.
- Bovens M (2010) Two concepts of accountability: Accountability as a virtue and as a Mechanism. *West European Politics* 33(5): 946–967.
- Bovens M and Zouridis S (2002) From street-level to system-level bureaucracies. *Public Administration Review* 62(2): 174–184.
- Boyatzis RE (1998) *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: Sage Publications.
- Buffat A (2015) Street-Level Bureaucracy and E-Government. *Public Management Review* 17(1): 149–161.
- Cane P (2011) Ombudsmen. In: *Administrative Law*. 5th ed. Oxford, pp. 370–393.
- Chenail RJ (2010) Getting Specific about Qualitative Research Generalizability. *Journal of Ethnographic & Qualitative Research* 5(1). Cedarville University: 1–11.
- Christin A (2017) Algorithms in practice: Comparing web journalism and criminal justice. *Big Data and Society* 4(2): 1–14.
- Cobbe J (2019) Administrative law and the machines of government: Judicial review of automated public-sector decision-making. *Legal Studies* 39(4): 636–655.
- Cummings ML (2006) Automation and Accountability in Decision Support System Interface Design. *The Journal of Technology Studies* 32(1): 23–31.
- Czarniawska B (2017) Fieldwork techniques for our times: Shadowing. In: Ciesielska M and Jemielniak D (eds) *Qualitative Methodologies in Organization Studies II*. Cham: Palgrave Macmillan, pp. 53–74.
- Danish Ministry of Higher Education and Science (2014) *Danish Code of Conduct for Research Integrity*. Copenhagen. Available at: https://ufm.dk/publikationer/2014/the-danish-code-of-conduct-for-research-integrity.
- Danish National Audit Office (2013) *Report on the Public Property Assessment (summary)*. Copenhagen.
- Deng H, Karunasena K and Xu W (2018) Evaluating the performance of e-government in developing countries: A public value perspective. *Internet Research* 28(1): 169–190.
- Eubanks V (2017) *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. New York: St. Martin's Press.
- European Commission (2021) *eGovernment Benchmark 2021 - Insight Report*. Brussels.
- Faculty of Social Sciences, Aalborg University (2020) *Guidelines for promoting responsible research practice*. Aalborg. Available at: https://www.handbook.aau.dk/document?contentId=459534.
- Fryer T (2020) *A Short Guide to Ontology and Epistemology: Why Everyone should be a Critical Realist*. Available at: tfryer.com/ontology-guide.
- Goodsell CT (1981) The Public Encounter and Its Study. In: Goodsell CT (ed.) *The Public Encounter: Where State and Citizen Meet*. 1st ed.

Bloomington: Indiana University Press, pp. 3–20.

- Hasenfeld Y, Rafferty JA and Zald MN (1987) The Welfare State, Citizenship, and Bureaucratic Encounters. *Annual Review of Sociology* 13(1): 387–415.
- Henman P (2020) Improving public services using artificial intelligence: possibilities, pitfalls, governance. *Asia Pacific Journal of Public Administration* 42(4): 209–221.
- Hood C (1991) A public management for all seasons? *Public Administration* 69(1): 3–19.
- Jansson G and Erlingsson GÓ (2014) More E-Government, Less Street-Level Bureaucracy? *Journal of Information Technology and Politics* 11(3). Routledge: 291–308.
- Jorna F and Wagenaar P (2007) The 'iron cage' strengthened? Discretion and digital discipline. *Public administration* 85(1): 189–215.
- Lips M (2020) *Digital Government: Managing Public Sector Reform in the Digital Era*. 1st ed. New York City: Routledge.
- Liu C and Graham R (2021) Making Sense of Algorithms. *Big Data & Society* 8(January): 1–13.
- Mashaw JL (2007) Reasoned Administration: The European Union, the United States, and the Project of Democratic Governance. *George Washington Law Review* 76(1): 101–125.
- Miles MB and Huberman AM (1994) *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks, CA: Sage.
- Misuraca, G (2020) Rethinking Democracy in the "Pandemic Society". Proceedings of the 1st International Forum on Digital and Democracy (IFDaD2020): 1-13
- Mittelstadt BD, Allo P, Taddeo M, et al. (2016) The ethics of algorithms: Mapping the debate. *Big Data and Society* 3(2): 1–21.
- Moore, M (1997) *Creating Public Value: Strategic Management in Government*. Cambridge, MA: Harvard University Press
- Motzfeldt HM and Næsborg-Andersen A (2018) Developing Administrative Law into Handling the Challenges of Digital Government in Denmark. *The Electronic Journal of e-Government* 16(2): 136–146.
- Patton MQ (2002) *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, CA: SAGE Publications.
- Peeters R (2020) The agency of algorithms: Understanding human-algorithm interaction in administrative decision-making. *Information Polity* 25(4): 507–522.
- Peeters R and Widlak A (2018) The digital cage. *Government Information Quarterly* 35(2). Agile Government and Adaptive Governance in the Public Sector: 175–183.
- Piening EP (2013) Dynamic Capabilities in Public Organizations. *Public Management Review* 15(2): 209–245.
- Ponce J (2005) Good Administration and Administrative Procedures. *Indiana Journal of Global Legal Studies* 12(2): 551–588.
- Remac M and Langbroek PM (2011) Ombudsman' Assessments of Public Administration Conduct. *NISPAcee Journal of Public Administration and Policy* 4(2): 87–115.
- Roehl UBU (2022) Understanding Automated Decision-making in the Public Sector: A Classification of Automated, Administrative Decision-making. In: Juell-Skielse G, Lindgren I, and Åkesson M (eds) *Service Automation in the Public Sector*. Cham: Springer, pp. 35–63.

- Schartum DW (2020) From Legal Sources to Programming Code. In: Barfield W (ed.) *The Cambridge Handbook of the Law of Algorithms*. Cambridge: Cambridge University Press, pp. 301–336.
- Schiff DS, Schiff KJ and Pierson, P (2022) Assessing public value failure in government adoption of artificial intelligence. *Public Administration* 100(3): 653-673
- Smith ML, Martin AK and Noorman ME (2010) Automating the Public Sector and Organizing Accountabilities. *Communications of the Association for Information Systems* 26: 1–16.
- Thompson JD and Tuden A (1959) Strategies, Structures, and Processes of Organizational Decision. In: Thompson JD, Hammond PB, Hawkes RW, et al. (eds) *Comparative Studies in Administration*. Pittsburgh, PA: University of Pittsburgh Press, pp. 195–216.
- United Nations (2020) *E-Government Survey 2020*. New York.
- Vogl TM, Seidelin C, Ganesh B, et al. (2020) Smart Technology and the Emergence of Algorithmic Bureaucracy: Artificial Intelligence in UK Local Authorities. *Public Administration Review* 80(6): 946–961.
- Widlak A, van Eck M and Peeters R (2021) Towards principles of good digital administration: Fairness, accountability and proportionality in automated decision-making. In: Schuilenburg M and Peeters R (eds) *The Algorithmic Society*. New York City: Routledge, pp. 67–83.
- Yin RK (2009) *Case Study Research*. 4th ed. Thousand Oaks, CA: Sage Publications.
- Young MM, Bullock JB and Lecy JD (2019) Artificial Discretion as a Tool of Governance. *Perspectives on Public Management and Governance* 2(4): 301–313.

Supplemental Material: Appendix A (Overview of interviews)

This appendix contains a full list of interviews, cf. the description of data collection in Section 3 (Methods).

Table A1. *Interviews in relation to Case 1 (Illness benefits).*

Interview #	Interviewee(s)	Organisation	Interview date(s)
1.2.1 1.2.7 1.2.9 1.2.15	Head of section, Citizen Service Section	Municipality 1A	December 18, 2019 January 10, 2020 February 28, 2020 June 23, 2020
1.2.2 1.2.13	Social worker (caseworker), Citizen Service Section	Municipality 1A	December 18, 2019 June 23, 2020
1.2.3[i]	Team manager, Social Security Section; and Project manager, IT Department	Municipality 1B	December 12, 2019
1.2.4 1.2.17	Project manager, IT Department	Municipality 1B	December 12, 2019 August 20, 2020
1.2.5 1.2.18[ii]	Social worker (caseworker), Social Security Section	Municipality 1B	January 13, 2020 September 10, 2020
1.2.6 1.2.19	Social worker (caseworker), Social Security Section	Municipality 1B	January 13, 2020 August 20, 2020
1.2.8[2] 1.1.12[2]	Product Owner, Project Team	Joint Municipal IT organization	March 13, 2020 March 23, 2020
1.2.10 1.2.21[2]	Chief Implementation Adviser, Project Team	Joint Municipal IT organization	May 11, 2020 May 18, 2020
1.2.11	Head of department; Labour market, Employment and Citizen Service Department	Municipality 1A	June 6, 2020
1.2.14	Social worker (caseworker), Citizen Service Section	Municipality 1A	June 23, 2020
1.2.22	Senior Legal Adviser, Project Team	Joint Municipal IT organization	July 23, 2020
1.2.25	Deputy Head of section, Social Security Section	Municipality 1B	August 20, 2020

Table A2. *Interviews in relation to Case 2 (Work retention).*

Interview #	Interviewee(s)	Organisation	Interview date(s)
2.2.1 2.2.2 2.2.3	Internal Management Consultant, Jobcentre Section	Municipality 2	October 30, 2019 November 21, 2019 December 4, 2019
2.2.4	Audit Officer, Employment and Integration Services	Municipality 2	December 16, 2019
2.2.5 2.2.8	Head of section; Jobcentre Section	Municipality 2	February 11, 2020 February 26, 2020
2.2.7	Head of department; Jobcentre Section	Municipality 2	October 10, 2020
2.2.9	Work coach consultant (caseworker), Jobcentre Section	Municipality 2	September 10, 2020

Interview #	Interviewee(s)	Organisation	Interview date(s)
2.2.11	Legal Adviser, Employment and Integration Services	Municipality 2	September 30, 2020
2.2.12[1]	Ombudsman, Local Government Ombudsman; and Deputy Ombudsman, Local Government Ombudsman	Municipality 2	October 8, 2020

Table A3. *Interviews in relation to Case 3 (Agricultural subsidies).*

Interview #	Interviewee(s)	Organisation	Interview date(s)
3.2.1 3.2.8	Head of section, Payments Section	Government Agency 3	August 28, 2019 December 20, 2019
3.2.2	Team manager, Payments Section	Government Agency 3	September 19, 2019
3.2.3[1]	Expert Adviser, Payments Section; and Expert Adviser, Payments Section	Government Agency 3	September 19, 2019
3.2.4 3.2.5	Team manager, Area Subsidies Section	Government Agency 3	September 24, 2019 December 3, 2019
3.2.6[1]	Administrative officer (caseworker), Area Subsidies Section; and Administrative officer (caseworker), Area Subsidies Section	Government Agency 3	September 8, 2020
3.2.7[1]	Head of section, Payments Section; and Expert Adviser, Payments Section	Government Agency 3	December 16, 2019
3.2.9 3.2.17 3.2.19	Head of department, IT Department	Government Agency 3	May 28, 2020 June 16, 2020 July 23, 2020
3.2.10	Head of section, Customer Support Section	Government Agency 3	September 8, 2020
3.2.11	Head of department, Department of Area Subsidies	Government Agency 3	September 7, 2020
3.2.14	Expert Adviser, Payments Section	Government Agency 3	March 11, 2020
3.2.15[1,2]	Geographical Information Specialist, Payments Section; and Expert Adviser, Payments Section	Government Agency 3	March 20, 2020
3.2.18	Agency head	Government Agency 3	July 28, 2020
3.2.20	Team manager, Data and Analysis Section	Government Agency 3	October 22, 2020

Table A4. *Interviews in relation to Case 4 (Property value assessment).*

Interview #	Interviewee(s)	Organisation	Interview date(s)
4.2.2 4.2.13 4.2.14[iii]	Head of department; Data Models Department	Government Agency 4A	January 9, 2020 February 3, 2020 February 25, 2020
4.2.3[2] 4.2.16[2]	Project manager, Process Engineering Section	Government Agency 4A	March 13, 2020 March 17, 2020
4.2.7[2]	Head of department, Office for Customer Communication	Government Agency 4B	May 14, 2020
4.2.8[2]	Head of department, Department of Property Value Assessment	Government Agency 4B	June 4, 2020
4.2.9[2] 4.2.15[2]	Head of department, Department of legal administration and implementation	Government Agency 4A	February 26, 2020 March 25, 2020
4.2.18	Head of department, Department of Operations and Planning	Government Agency 4B	June 22, 2020
4.2.20 4.2.23	Team manager, Case Processing	Government Agency 4B	November 11, 2020 November 23, 2020
4.2.22[2]	Expert Adviser, Section of Compliance and Quality	Government Agency 4B	December 8, 2020

Notes

[i] Interview with dual interviewees.
[ii] Interview by phone or video.
[iii] Not recorded due to short duration.