ICT and discretion: An "up-to-date" view of what we want to know and how it can be studied[1]

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The discretion of street-level bureaucrats is increasingly affected by public sector digitalisation. The aim of this study was to provide a scoping review with "state of the art" of research about information and communication technology (ICT) and discretion for the period January 2017–October 2022. The specific emphasis was on the methodologies used in research targeting ICT and discretion to provide ideas for future research. Street-level bureaucrats' managing and copying, surveys of their attitudes and the more direct influence of ICT on discretion and literature reviews in various contexts often related to public values were common themes in research. A repertoire of research approaches was used: case studies with or without empirical data, more and less structured literature reviews, surveys with or without experiments and document analyses. In contrast to an oft-cited literature review of digital discretion from 2018, the far most common types of technology were artificial intelligence. A number of approaches for describing technology were often based on sociotechnical theories or similar. Few studies provided detailed descriptions of the more specific role of technology. However, inspiring examples were found of how to bring forward aspects of the full decision process or the infrastructure with all the appearing technologies. This result could serve as an inspiration for reflections about what we should describe and what we should want to understand in studies about ICT and discretion, as well as to highlight gaps in research. Important examples are the ´design dimension´ of discretion both in terms of the being specific about the full repertoire of the appearing technologies and the humans that influence the design. A critical mass of studies with more detailed descriptions of technologies is needed to generate a theoretical understanding.

CCS CONCEPTS • Computing in government • E-government • Collaborative intelligence • Artificial intelligence

Additional Keywords and Phrases: ICT, discretion, digitalization, public sector

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1 INTRODUCTION

Public sector digitalisation, with the multifaceted increased use of information and communication technology (ICT), affects citizens as well as the decision making of street-level bureaucrats. The situation of street-level bureaucrats and their right to decide based on laws and regulations has for decades been discussed in terms of the concept of discretion (Lipsky, 2010), but during the last decade, it has also incorporated digitalisation. A core problematisation is what is often denominated as the enablement and curtailment thesis, which targets the positive and not-so positive influence of ICT on discretion (see e.g., Buffat, 2015). Busch & Henriksen (2018) published an oft-cited, systematic literature review of ICT and discretion with a data collection ending in January 2017. Its focus was on the "state of the art" of research about "digital discretion", defined as when "computerized routines and analyses [used to] influence or replace human judgements" (Busch & Henriksen, 2018, p. 4). The more specific focus was on the relationship between the technology in the studies and the well-established discourse on ethical, democratic, professional and relational public values (Busch & Henriksen, 2018) in the public sector.

The ICT in the 44 included papers, in turn, were discussed in terms of pertaining to categories such as telephones, multifunctional computers, databases, websites, case management systems and automated systems. The more pragmatic roles were defined as telephones by which to receive claims, databases to register client information, websites by which to make decisions based on collected data, automated systems by which to make decisions based on collected data and so on. Busch & Henriksen (2018) carried out a study that mostly involved databases and case management systems, but artificial Intelligence (AI) was seen as a technology that in the future might have a more significant role and capacity to influence discretion. However, for obvious reasons, there were no in depth descriptions or analyses of the more specific roles of ICT in the papers.

Digitalisation based on various types of ICT, with their respective influence on, or even replacement of, civil servant discretion, is thus a significant and increasingly important phenomenon. Moreover, from January 2017 onward, many developments have occurred in practice and research with relevance to the collaborative intelligence that is enabled. One of the most apparent things is perhaps the new wave of interest in AI (for a recent overview, see Madan & Ashok, 2022). An additional important issue is methodological issues in the which is related to research about ICT and discretion that delves deeper into the decision process and technology. "Being specific about the technology" has long been encouraged in oft-cited publications (cf. Monteiro & Hanseth, 1996; Orlikowsky & Iacono, 2001), and more recently by studying all involved humans and ICT or the "full sociotechnical assemblage" in decision processes with algorithms as well (cf. Kitchin, 2017; D´Adderio, 2021). Moreover, taking a closer look at ICT or, what is often today is denominated as the IS artifact (Chatterjee et al., 82021), has been encouraged in empirical studies related to discretion (cf., Petersen, 2021; Ranerup & Henriksen, 2022; Verne, Oskarson & Bratteteig, 2022). In a recent article, Berg (2022) discussed methodologies for investigating automation in different areas, among those public sector administration. Here, the suggested focus was on the technologies as they develop, emphasising the contexts from which they emerge and promotion material. Pink, in turn, raised the importance of "a shared understanding of what automation is as a social and political (as opposed to just technological) phenomenon" (Pink, 2022, p. 748).

With this as a background, the present study provides a scoping review of how ICT and its roles are investigated in the very latest (January 2017-October 2022) research about ICT and discretion representing an important type of collaborative intelligence in the public sector. The aim is to provide "state of the art" research about ICT and discretion, with a specific

emphasis on the role of ICT and the need for future research based on this. Our more specific research questions are as follows:

a.	How are ICT and street-level discretion studied, and what is the "state of the art" in terms of studied themes, appearing types of technologies and contexts in today´s research?

b.	What is the result in terms of studies that view the technology more in depth in the decision processes and their used methods?

c.	What future studies are needed?

2 METHODOLOGY

A scoping review of research was conducted to obtain a "state of the art" and overarching view of the very latest qualified research into ICT and discretion. The more specific intention was to highlight ICT and how it is researched, as described above. The review targeted one qualified and broad database: the Web of Science. Search terms used were the concept of "discretion" combined with "ICT", "information technology", "Artificial Intelligence" and "automated decision-making" respectively. In addition, the search terms "digital discretion" and "artificial discretion" were used. All combinations of search terms and their respective results are listed in Appendix A. Due to the choice of database, all manuscripts were contributions to international journals or (to a much lesser degree) certain scientific conferences. The initial set of contributions amounted to 190. Manuscripts were excluded if they were recurring articles or written in a non-English language. The abstracts of the remaining contributions were read, which rendered 79 articles for more detailed review, that is, reading the full papers. Of these, 45 were considered as addressing aspects of ICT and discretion. The further analysis of these was pursued through coding of core themes, methodologies used, appearing technologies and contexts. Thereafter, an inductive coding, grouping and regrouping within each category was made. The results were outlined in terms of a broad overview of themes. In addition, a table (Table 1) was provided where all 45 articles and the methodologies they used were depicted, with a few examples more extensively described in each of the sections below. Shorter overviews of appearing technologies and contexts were also provided. One category was more challenging: the studies that more closely examined the decision process and the appearing technology. These were analysed, grouped and described with details about their hopefully useful methods, including core issues and theories used when studying the more specific roles of ICT for civil servant discretion (Table 2).

3 RESULTS

3.1 A brief overview of core themes

Broadly speaking, in the distilled articles treating various aspects of ICT and discretion, a few dominating themes were found. A first theme was studies about *civil servants managing and coping* in relation to their technology uses and situations. For example, Devlieghere & Roose (2018) discussed how practitioners tried to preserve discretion in technology use in social work, whereas Breit et al. (2021) investigated specific strategies of coping more directly related to citizens. Other authors have discussed *discretion in relation to transparency* (McKay, 2020) and *explainability* (Brayne & Christin, 2021). The more direct *influence of ICT on discretion* was another prominent theme (cf. Chorev, 2019; Lindgren et al., 2021). Some studies talked more directly about the issue of standardisation through technology and its influence on discretion (Håkansta, 2021; Meilvang & Dahler, 2022). Investigating *attitudes among street-level bureaucrats* through surveys related to more or less concrete forms of technology use was another major theme. Here, surveys could be more general about attitudes or contained a specific experiment (for more specific examples, see the section about the

methodologies used in studies about ICT and discretion below). A last dominating theme was literature reviews with different core issues related to discretion, contexts (Bullock et al., 2020) and public values (Bell, 2021; Busch & Henriksen, 2018; Johansson et al., 2022) (for more specific examples, see the methodologies section 3.2).

Apart from these rather more common themes, our selected articles discussed issues about innovation and the development of civil servant roles (Andersson et al., 2022; Giest & Klievink, 2022) or the distinction between algorithmic and human decision making related to ICT and discretion (Enarsson et al., 2022; Peeters, 2021). Another more unique theme treated discretion as a partly negative phenomenon mainly in Addo's study (2022), which involved a case within Ghana customs, in a technology infrastructure to work against deforestation in Amazonia (Vurdubakis & Rajao, 2022) or in service centres in an anonymous country (Alshallaqi, 2022). Street-level bureaucrats' discretion in supporting clients' technology use was yet another unique theme (Bernhard & Wihlborg, 2022).

Table 1: Methodologies used in studies about ICT and discretion

Methodology	Articles
Case study with empirical data	Andersson et al. (2022), Bernhard & Wihlborg (2022), Brayne & Christin (2021), Busch (2020), Busch et al. (2018), Criado et al. (2020), Devlieghere & Roose (2019), Giest & Klevink (2022), Håkansta (2021), Meilvang & Dahler (2022)
Case study with empirical data as well as a closer view of ICT and/or the decision process	Addo (2022), Alshallaqi (2022), Breit et al. (2021), Chorev (2019), Dekkers et al. (2019), Fowkes (2020), Meijer et al. (2021), Pedersen & Pors (2022), Ranerup & Henriksen (2022), Thunman et al. (2020), Vurdubakis & Rajao (2022)
Case study with unprecise empirical data	Considine et al. (2022), Devlieghere & Roose (2018), Enarsson et al. (2022)
Survey with questionnaire	de Boer & Raaphorst (2021), Nowacki & Willits (2018)
Survey with experiment	Alon-Barakat & Busuioc (2022), Huang et al. (2022), Nactegaal (2021), Schiff et al. (2022), Wang et al. (2022)
Systematic review	Busch & Henriksen (2018), Lindgren et al. (2019), Peeters (2021)
Narrative review	Plantinga (2022)
More undefined search for literature in a review	Bell (2021), Blount (2022), Bullock (2019), Bullock et al. (2020), Bullock et al. (2022), Johansson et al. (2022), McKay (2020), Young et al. (2019), Young et al. (2021)
Document analysis	Germundsson (2022)

3.2 Methodologies used in studies about ICT and discretion

In the selected articles, a repertoire of research methodologies was used (Table 1). The following analysis is of a pragmatic descriptive character. The most common was perhaps unsurprisingly qualitative case studies. However, there were important differences between the approaches used. A comparatively frequent type were case studies at a high or distant level from a more concrete decision process and its content, albeit based on unique collected empirical data from one or several contexts. Bernhard & Wihlborg (2022) discussed discretionary aspects of decision making as well as in supporting citizens, which is why the implemented RPA was not central in the analysis. Other studies, such as Bush et al. (2018) and Bush (2020), investigated several cases through interviews with a focus on slightly more abstract phenomena, such as adaption to institutional complexity or policy implementation. Studies also foregrounded the issue of algorithms, which may explain why the ICT itself may have been perceived as being somewhat more in the background (Brayne & Christin, 2021; Criado et al. 2020; Giest & Klievink, 2022 and Meilvang & Dahler, 2022). Interestingly, there were also case studies that looked more in detail at a specific decision process and the ICT herein (see Table 2 below). They were often based on some theory about technology. In the last part of the results section (3.4), we explore these studies further in terms of how technology is represented and theorised.

In addition, there were also outright case studies not using their own collected empirical data from defined contexts (cf. Devlieghere & Roose, 2018) (Table 1). Interestingly, among those Enarsson et al.'s (2022) study with its focus on a "legal perspective on hybrid human/algorithmic decision-making in three contexts" actually suggested future research with a more qualified and precise empirical data from specific contexts since "legal and socio technical perspectives often need to be combined" (Enarsson et al., 2022; p. 152).

An additional methodology used was surveys with questionnaires, which, in contrast to case studies, can focus on a number of research questions and thereby data from a representative cohort of people with experience of ICT and discretion. In this manner, de Boer & Raaphorst (2021) used a survey of 549 inspectors at the Dutch food and safety authority and three defined hypotheses to test the central issue about the curtailment thesis, finding some support for it, albeit relatively limited. Other researchers used more outright experiments as part of the survey. For example, Alon-Barakat & Busuioc (2022) investigated what they defined as overreliance on algorithmic advice by AI from other sources (the so-called automation bias) and selective adoption of algorithmic advice when this corresponded to stereotypes. They did so in three experiments with 3000 participants civil servants and citizens, including replication. Huang et al. (2022) tested whether staff and managers evaluated AI differently in the public sector in Taiwan, including pre-intervention and post-intervention attitudes towards the use of AI. Lastly, Nactergaal (2021) tested how what was denominated as algorithms for managerial decisions affected procedural justice as viewed by public employees, whereas Schiff et al. (2022) tested the perception of citizens in relation to public values at risk when AI replaced human decision making.

Literature reviews are an increasingly popular genre in scientific writing. Systematic reviews were used by Busch & Henriksen (2018) in their study about digital discretion and public values and by Lindgren et al. (2019) in their study about the interaction between citizens and government through digital means when viewed as a "public service encounter". However, the later authors used the structured principles of the hermeneutic circle for analysis and interpretation, which included reading, mapping, classifying and searching (Boell and Cecez-Kecmanovic, 2014). Peeters (2021) carried out an informal, albeit structured, search for literature on algorithms and humans in the public sector, whereas Plantinga (2022) conducted a formal narrative review of AI and digital discretion in Africa.

More open or undefined approaches were used by Bell (2021) in an essay of principles of administrative law and how they were affected by AI. Bullock (2019), in turn, probed into the relationship between AI, discretion and bureaucracy with a specific focus on the roles of humans and technology, as well as differences between contexts. Somewhat more

structured approaches were used for creating a model of different phenomena: Johansson et al. (2022) outlined a model for public value and RPA in public administration with normative, descriptive and prescriptive dimensions. In a similar vein, a group of connected researchers outlined different analytical models based on current research literature. Bullock et al. (2020) focused on the relationship between AI, discretion and bureaucratic form outlining and testing a theoretical framework. Bullock et al. (2022) treated machine intelligence and its strength enlightened by Weber´s ideal type bureaucracy, and Young et al. (2019) launched the concepts of artificial and human discretion and studied the risks and advantages of the former more in depth. Lastly, Young et al. (2021) focused more on the dark side of AI and artificial discretion, which was related to what they called administrative evil, which they interpreted as information problems in the form of adverse selection and moral hazard. A last type of approach was used by Germundsson (2022). She made a qualified document analysis of a Swedish public sector agency´s strategies to enhance understanding of why RPA was promoted. This is highly relevant for the issue of ICT and discretion.

3.3 Technologies and contexts in studies about ICT and discretion

The focus in this literature review was, as mentioned, on the state of the art of ICT and discretion and how it can be studied. Of the 45 papers selected, some addressed the issue of discretion and more traditional case management systems or planning and follow-up systems (Busch et al., 2018; Breit et al., 2021, Devlieghere & Roose, 2018;2019 and Thunman et al., 2020). RPA was studied in a few papers (cf. Bernhard & Wihlborg (2022); Germundsson, 2022; Johansson et al. 2022) or in the form of a combination of RPA and case management systems (Ranerup & Henriksen, 2022). Addo (2022), Alshallaqi (2022) and Considine et al. (2022), in turn, all addressed specific platforms for service delivery to citizens. Lindgren et al. (2019) studied a more general phenomenon of digital service encounters based on various platforms. Last, Peeters (2021) investigated more unprecise or principal types of technologies in the public sector, with algorithms serving as a central part of decision making.

However, the far most common types of technology in our studies were those representing a category of AI. Studies like Bell (2021), Bullock (2019), Plantinga (2022) and Young et al. (2022) took a broader and more general perspective when talking about AI in the public sector. AI used in the area of policing and customs was represented by Brayne & Christine (2021), Bullock et al. (2022) and Meijer et al. (2021), with a focus on risk assessment, fraud detection or predictive policing all using AI. Dekkers et al. (2019), in turn, focused on AI in more direct boarder control related to migration.

Regarding the contexts where the studies are situated, there are of course also a repertoire of those: Police, customs and courts were, as indicated, one comparatively common type of context. In addition to the mentioned studies about AI in the area of policing, ICT and discretion in courts was discussed by Busch (2018), Busch et al., (2018) and Brayne & Christine (2021). Aspects related to ICT and discretion in the context of social services and welfare to work was another common context or area. For example, Ranerup & Henriksen (2022), Meilvang & Dahler (2022) and Schiff et al. (2021) focused on the more direct decision making of street-level bureaucrats, whereas Breit et al. (2021) and Devlieghere & Roose (2018; 2019) emphasised more general administration and follow-up activities. Fowker (2020) and Bernhard & Wihlborg (2022), in turn, focused on citizen services and perspectives in these contexts.

ICT and discretion in healthcare was represented in this literature review by Chorev (2019) in the context of clinical testing in cancer care. A more common context was municipal administration in general, for which Andersson et al. (2022) Germundsson (2022) and Johansson et al. (2022) all discussed ICT and discretion herein related to RPA. Some authors used a general public sector context with many different examples (cf. Bell, 2021; Bullock, 2019; Busch & Henriksen, 2018; Young et al., 2021). However, Huang et al. (2022), Wang et al. (2022) and de Boer & Raaphorst (2021) studied

perceptions of ICT in the form of AI and other technologies related to ADM and discretion among civil servants in specific countries, namely, China and Holland, respectively. Interestingly, a few studies were more unique in terms of studied contexts. Håkansta (2021) treated ICT and discretion related to mobile labour inspectors, Vurdobakis & Rajao (2022) foresting inspection in Amazonas and Plantinga (2022) different representations of AI in the African public sector.

3.4 Methodology in studies with a somewhat closer view of technology

In Table 2, we can see that many authors used some kind of technology-oriented theory such as socio-materiality or Actor Network-Theory (ANT) when studying discretion. However, despite the relatively closer view of technology compared to other case studies, some only briefly described the technology, and it appeared occasionally in the analysis. This notwithstanding, in a few papers there was more extensive description of technologies (eg., Breit et al. 2021; Chorev, 2019; Dekkers et al. 2019; Meijer et al., 2021). Here, some of the functions and/or parts of the appearing technologies were described, and technology featured occasionally in the analysis (Table 2 below).

Even fewer papers used different and more developed measures to do this. Addo (2002) provided extensive pictures, descriptions of previous and present decision processes, as well as subprocesses in the Ghana customs paperless clearance, including the role of technologies and human discretion in the activities. In this manner, a ground for abstract discussions, such as the (practical) articulation of the incongruent institutional logics of ICT and administration, which also served as an emergent source of modernisation and more limited corruption, was enabled. Through photos and descriptions, Vurdobakis & Rajao (2022) pictured the whole infrastructure, including satellite images and GIS, by which to combat deforestation, with its different involved contexts and people. In this manner, they provided qualified ground for discussing the habit of "Looking but not seeing" by civil servants and, hereby, the contradiction between documenting unregistered properties at the expense of other goals in combating deforestation. Ranerup & Henriksen (2022) provided a detailed picture and description of various appearing technologies and humans in the decision process as a whole, with a focus on economic support to clients in need. In this manner the input of information by clients, the further role of the RPA as well as the visibility of result that are of relevance to discretion were connected to concrete technologies and situations in the case management process. As such, an analysis of public values could be made with high relevance to civil servant discretion and its influence on the actual situation of clients enabled by technology.

Worth noticing is also the way in which Meijer et al. (2021) described technology, albeit briefly, in their analysis of discretion and algorithms in predictive policing. In this manner, algorithms and technology were brought together as components of this "non-human actor" in the organisation of discretion. However, Alshallaqi (2022), in turn, made a detailed analysis of the relations between material and social (human) actors in terms of "imbrications" or joint work while still being independent and specific, mentioning the technologies and their roles and effects in relation to humans, but this was done without "being specific about technology" since he argued, "a specific artefact […] arguably might change or be […] abandoned over time" (Alshallaqi, 2022, p. 7).

Table 2: Studies with a closer view of technology

Authors	Core issues	Theories	Description of technology
Addo (2022)	IT and modernisation in developing countries	Lipsky discretion, Avgerou bottom-up perspective on IT, modernisation and in1stitutional change	The technology (a single window system for customs declarations) thoroughly described in form of Appendix with prior manual process, graphical descriptions of process and subprocesses with clients, civil servants and technology, and appears in the analysis
Alshallaqi (2022)	How street-level discretion and digitalisation interrelate	Leonardi socio-materiality, imbrication	"Data focused on the social processes […] rather than a specific artefact that arguably might change or being abandoned over time" (Alshallaqi, 2022, p. 7). Socio-material, material-social imbrications with the role of technologies feature in the analysis
Breit et al. (2021)	Digital coping in digitally mediated employment services	Lipsky discretion, Tummers, Rocco et al. coping, Lindgren et al. digital service encounters	The technology (a portal with patient data used by oncologists) and the workflow somewhat more extensively described, as well as appears occasionally in the analysis of the cases
Chorev (2019)	Decision making and digitalisation in personalised care	Orlikowski & Leonardi socio-materiality	The technology (a digital follow-up system) somewhat more extensively described and appears occasionally in the analysis of the cases
Dekkers et al. (2019)	Objectivity and discretion in risk assessment	Lipsky discretion, Ballucci risk theory	The technology (two systems for risk assessment with smart cameras etcetera in boarder control) somewhat more extensively described and appears occasionally in the analysis of the cases
Fowkes (2020)	Production and use of administrative data framing help-seekers in form of Indigenous people	Henman information technology as "non-human actors"	The technology (a system for remote employment services) briefly described and appears occasionally in the analysis of the case
Meijer et al. (2021)	Reorganisation of bureaucratic organisations working routines around the use of algorithms	Orlikowski socio-materiality, algorithms "in-practice"	The technology (a predictive policing system for temporal-geographical analyses of crime patterns) somewhat more extensively described and appears occasionally in the analysis of the two cases

Authors	Core issues	Theories	Description of technology
Pedersen & Pors (2022)	Discretionary responses in social work and hospitals	Weber ethics of office, Lipsky discretion	The technology (cancer pathway technology, Electronic Patient Record, standardised self-service solution) briefly described and appears occasionally in the analysis of three cases
Ranerup & Henriksen (2022)	Digital discretion and the consequential pubic values in social work	Latour Actor-Network Theory, Busch & Henriksen digital discretion, Kernaghan public values	The technology (an infrastructure with e-application, RPA, internal case management system) somewhat more extensively described in terms of process and appearing technologies and humans, as well as appears occasionally in the analysis
Thunman et al. (2020)	Responsiveness towards clients callers in low-discretion contexts through offers of assistance	Howstetter & Stokes Offers of assistance	The technology (a standardised case management system and a system for answering calls) briefly described and appears occasionally in the analysis
Vurdobakis & Rajao (2022)	Sociotechnical infrastructures of deforestation, knowledge and ´un-knowledge´	Latour Actor-Network Theory, Lipsky discretion	The technology (a satellite 'en-visioning' system of rain-forests in Amazonia) somewhat more extensively described and appears occasionally in the analysis of the two cases

4. CONCLUDING DISCUSSION

4.1 Themes and technologies

This scoping review was conducted to assess recent research about ICT and discretion against the background of an interest in technology in current problematisation of this important type of collaborative intelligence and how it can be studied. Then, how are ICT and street-level discretion studied and what is the "state of the art" in terms of core themes, technologies and contexts in today´s research? Our review showed that many methodologies were used, including experiments, something that might serve as an inspiration (Table 1). More precisely, we showed how case studies can provide experiences of ICT and discretion from concrete specified contexts. Here various dimensions of the situation of real civil servants are penetrated which is highly relevant for discretion. We also saw that ICT is not always described in depth, with a few exceptions and possibilities treated below. Surveys can also be used and be recommended for broader studies of representative cohorts of both civil servants and citizens in relation to ICT and discretion. Reviews of the systematic and narrative type might of course provide an overview of knowledge with a specified focus. This in contrast to, we argue, the more unspecified, albeit timely and relevant, reviews with an additional potential innovative theoretical and conceptual development. Document analysis was the least used methodology, but could be used more. This since it is a convenient approach and very relevant for more close and distant policy analysis in relation to ICT and discretion.

There were a repertoire of appearing themes, technologies and contexts in our studies as previously described. A major difference between Busch & Henriksen (2018) and the present study was the larger role of various representations of AI. However, other types of technologies still featured in these more recent studies about ICT and discretion, such as RPA, platforms for service delivery to citizens and case management systems.

4.2 Taking a closer look at technology

What is the result in terms of studies that look closer at the technology in terms of decision processes and their used methods? The focus in this study was on the more general issues of ICT and discretion. This is in contrast to the related, albeit more specific, concepts of digital discretion (Busch & Henriksen, 2018) and artificial versus human discretion (Bullock, 2019). More specifically, our focus was on ICT in this relationship in research. Theories of discretion (Lipsky and others) and technology-oriented theories were used in the vast majority of studies. However, perhaps surprisingly, in view of the theories used, the studies with extensive descriptions of technologies were quite few. These exceptions contributed insights and examples of how descriptions of technology and interaction with humans in the decision process as a whole (Addo, 2022; Ranerup & Henriksen, 2022) and as components or devices in the situated infrastructure with a number of distant components and contexts (Vurdobakis & Rajao, 2021) with relevance to ICT and discretion could be carried out.

A simple example of the benefits of such approaches could be taken from Fowkes's (2019) study of ICT in remote employment services, where technology appears only occasionally in the analysis. However, providing a more thorough description of the appearing technologies in the infrastructure for remote employment services as a whole and/or the decision process/es with appearing technologies is possible. This perhaps may also be true of their interaction with humans in terms of civil servants and clients. This would make the technological background for the analysis clearer and less scattered and, even more importantly, also provide a ground for discussing an alternative emancipatory design for devices and processes. Moreover, we argue that the sociotechnical analysis of Alshallaqi (2022) regarding "imbrications" could have benefitted from much more concrete descriptions of the context (cf. country), as well as the detail of the appearing technologies in the infrastructure and the decision process/es, even though this would be a temporary picture as pointed out by that author. The sociotechnical theory used emphasises the interaction between humans and technologies, the latter of which were described very much at a principal level ("the enforcement of digital services" and "the e-Government channel"). However, a qualitative study of ICT and discretion in a certain situation is undoubtedly inhabited by a repertoire of present and emerging technologies that have an active role in relation to discretion, the details of which influence the more specific aspects investigated.

We believe that a more detailed description of the technologies involved, as exemplified above, is not only important in relation to the issue of ICT and discretion from a general perspective, but it is also crucial to realise the "design dimension" of ICT and discretion in practice and research. This means that ICT and discretion are not only influenced by laws and organisational contexts. The design of implemented technologies itself is also relevant, and even more importantly, is created by designers of various sorts for example in the form of those working in commercial companies and consultants that deliver standard solutions to the public sector. A more specific example would be project leaders, system developers and participating user representatives in individual projects. Politicians who make decisions about policies and the general conditions for projects might also be involved (Ranerup & Henriksen, 2019; Ranerup & Svensson, 2022). Put otherwise, there is a need to safeguard "democratic control of systems development" and the general awareness of design issues in "disciplining digital discretion" (Zouridis et al., 2020, p. 325). This is also true for the debated issue of data being part of AI development (Zouridis et al., 2020), of which Considine et al. (2022) provides a timely example in the context of "welfare-to-work", where data is used for the profiling of applicants. However, in contrast to Zouridis et al. (2020), we see a more multifaceted discussion than the issue of "what should be automated and what not?" (Zouridis et al., p. 327). The participants in this discussion should, we argue, become more qualified through an engaged methodological discourse on studying as well as designing ICT and discretion.

Our result might hopefully serve as a call for attention and inspiration about how this could be done, which is also important for several more pragmatic reasons. Concentrating on a small part of an infrastructure, such as the RPA or AI device in a decision process might be misleading, since other parts or devices might influence issues related to discretion. For example, the design and use of e-applications and systems by which citizens can follow the case management process might be important for the use of the RPA by civil servants and their discretion, as well as the perceived value for citizens (Ranerup & Henriksen, 2022). Moreover, the discretion of civil servants in case management processes is often dependent on the actual use and degree of use of the digital devices by citizens that, in turn, influences discretion (Bernhard & Wihlborg, 2022). Discretion is of course primarily about the civil servants' decision making. However, when a discussion of public values is applied in evaluations of ICT and discretion, the context in form of technologies and citizens might in this manner be relevant (Johansson et al., 2022; Schiff, et al., 2022). Considine et al.'s (2022) study of administrative discretion and automation, with the suggested necessary discussion about trade-offs between efficiency versus inclusion and consistency versus personalisation provides an additional example of this.

An important theme in current research is algorithms in the public sector (Kaun, 2022), albeit not often with an outright ambition of bringing in technology more explicitly found in our studies here (cf. Meijer et al. 2022). This is also an argument in favour of "being more specific about technology" since algorithms feature as part of technological contexts or even in a full infrastructure with many devices. However, a very recent study of Jacobi & Christensen (2022) reminds us that reflections on what to is important in their scoping study of what is denominated as Decision Support Algorithms with a focus on the choice of "technology type", "data" and "variables." A somewhat more philosophical argument is the need to have more profound knowledge about the technology that appears in "the world" of those who participate in our studies. However, depending on the specific context and the knowledge interest of the researcher, there is a need to decide about the degree to which technology should be included and described. For example, an interest in evaluating the algorithm from a technical or a professional and situated effectiveness perspective in medical clinical trials (Chorev, 2019) or in predictive policing (Meijer et al., 2021) might be relevant in itself as part of a larger and more holistic study of discretion. Researchers must also decide on the issue of what might be "enough detail" in describing technology and what it does to avoid making an outright "next-to computer programme" in an attempt to show the components and actions of technology.

This interest in methodologies for studying aspects related to discretion, such as algorithms or automated decision making, is part of a current discourse in form of Kitchin´s (2017) oft-cited article on a plethora of methods for investigating algorithms, as well as Berg (2022) and Pink (2022) and others´ discussion about qualitative methods for studying automation. However, the focus of Berg and Pink was, in contrast to this paper, on contexts, promotion material, and the social and political background of automation rather than viewing it as a technological phenomenon. On the other hand, the focus here was on principal methodological issues when studying ICT and discretion and not on providing detailed results and conclusions about situated "state of the art" in this relationship.

4.3 Further studies

What future studies are needed? This scoping review was limited to one (although broad and well-established) qualified database. This notwithstanding, it could serve as inspiration for research themes, methodologies, technologies and contexts that might be interesting in studies about ICT and discretion as above, including some concrete ideas about *how to* be more specific about technology. In addition, inspired by our result, we want to bring up the idea that in contrast to more general surveys, survey experiments (eg., Alon-Barakat & Busuioc, 2022; Huang et al., 2022) might rather easily produce a more

informed result. This might be so if they are constructed in a way that provides details about the tested technology that are relevant for those who participate.

A more general issue is what makes up the *de facto* decision process and its technological devices as a whole that one wants to understand in a study of ICT and discretion. More specifically, we need to go beyond the curtailment and enablement thesis (de Boer & Raaphors, 2021; Busch & Henriksen, 2018), as well as the discourse about discretion and coping versus the ethics of office (Pedersen & Pors, 2022), when we ponder this. Most importantly, research about ICT and discretion requires on-going and meaningful reflections about what the full repertoire of what technology actually is and could be from the perspective of what we want to know and perhaps also improve in the interactions between humans and machines. This is especially so in view of the enlarged role of AI also in the public sector (cf. Giest & Klievink, 2022). A more detailed view of technology in line with this is important to emphasise the design aspect of ICT and discretion in the public sector, the political responsibility in relation to this and that there might various choices of options in the design that must be made. Otherwise the hidden but powerful role of data and systems development professionals might be the dominating rule (Bullock, 2019; Zouridis et al., 2020). Last but not least, against the background of the comparatively few studies with a more detailed view and their detected models of how to focus on the technologies (cf. process, infrastructure) there is a need for a *critical mass* of studies to take a further step in generating a theoretical understanding in form of typologies of design in relation to discretion.

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A.1 Appendix A. Literature search words in Web of science 2017-October 2022

Search query	First search result	First sorted result
TOPIC (discretion) AND TOPIC (ICT)	20	16
TOPIC (discretion) AND TOPIC (information technology)	96	37
TOPIC (discretion) AND TOPIC (Artificial Intelligence)	62	16
TOPIC (discretion) AND (automated decision-making)	5	3
TOPIC (digital discretion)	5	5
TOPIC (artificial discretion)	2	2
Sum	190	79