



# Digitization or equality: When government automation covers some, but not all citizens

Karl Kristian Larsson

*OsloMet – Oslo Metropolitan University, Postboks 4, St. Olavs plass, 0130 Oslo, Norway*

## ARTICLE INFO

### Keywords:

Bureaucracy  
Civil registry  
Administrative exclusion  
Administrative burdens  
e-Government  
Digitalization  
Public value  
Digital divide  
Process mining  
Red tape  
Digital welfare  
Digital government

## ABSTRACT

This paper presents an empirical study of automation in government digital systems. Previous studies have found that automated systems are not suited to cover all citizens equally and may cause administrative burdens on excluded citizens. The case presented in this study is the automated system for awarding child benefits in Norway. Based on data from the national registry, most recipients are awarded the benefit automatically. However, some citizens are not covered by the automation and must apply manually. The theoretical framing of the study combines modern and classic views of how citizens access public services by combining theory from recent literature on administrative burdens and the older theory of access. The data analysis is done with process mining, an innovative method of sorting and understanding data. The findings support previous findings of how registry data and automated computer systems in government can create inequality in service quality. Furthermore, the findings also show that low-income citizens are disproportionately required to apply manually. The study addresses questions concerning why automated systems fail to cover all citizens and the potential challenges generated by this exclusion when governments rely on computer systems in delivering welfare programmes. These are important considerations, as government digitalisation is increasingly innovating with automated systems to deliver public services.

## 1. Introduction

A frequent measure of the maturity of a government's digital services is how effectively it uses government data to proactively create public services (Dunleavy, Margetts, Bastow, & Tinkler, 2006; Janowski, 2015; Scholta, Mertens, Kowalkiewicz, & Becker, 2019). This, and similar uses of information and communication technology (ICT), is often characterised as "digital government". While the most visible part of digital government is the one-way relationship between government and citizens through web pages, digital government has come to encompass a wide range of digital tools for creating and delivering public services (Katsonis & Botros, 2015). At the forefront of government digitisation are fully automated services (Scholta et al., 2019). Using government databases, public services can be delivered by digital systems without the active participation of either citizens or bureaucracy.

However, recent studies have argued that the application of government data in delivering public services and programmes may create unfair and discriminatory barriers. These barriers prevent citizens from accessing the benefits or services they are entitled to (Lindgren, Madsen, Hofmann, & Melin, 2019; Peeters & Widlak, 2018). It follows that the

value a citizen receives from automated government systems also varies. Recipients on the low-end are required to make up for the lack of automation by their own efforts. Because it burdens some more than others, automation may enforce social norms to the detriment of the atypical (Lindgren et al., 2019; Wihlborg, Larsson, & Hedström, 2016). Such exclusion has greater adverse effects on citizens who have weaker socio-economic status. Hence, in this regard, digital services do not differ from non-digital services. As previous studies have found, the rules and practices of welfare organisations can erect barriers to welfare for some citizens (Brodkin & Majmundar, 2010; Moynihan & Herd, 2010; Moynihan, Herd, & Harvey, 2015).

The purpose of this study is to examine an automated digital system that delivers public services. It explores how the limits of such systems may lead to unequal service quality and additional burdens for citizens who are not covered by automated systems. The following research questions are addressed:

1. What citizens are not covered when public services are delivered by automated digital processes?

E-mail address: [karlkris@oslomet.no](mailto:karlkris@oslomet.no).

<https://doi.org/10.1016/j.giq.2020.101547>

Received 31 March 2020; Received in revised form 12 November 2020; Accepted 28 November 2020

Available online 16 December 2020

0740-624X/© 2020 The Author. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

2. What additional burdens are placed on those that apply manually compared to those that have an application generated automatically?
3. Does exclusion from automated systems match other socio-economic divisions?

In this study, the case is the child benefits programme in Norway. Because the child benefits programme is universal, caregiving parents living in Norway with a child under the age of 18 is eligible. The process by which the benefit is awarded has also been automated. By using data in the national registry, the Norwegian welfare organisation (NAV) can automatically award the benefit to parents when a child is entered into the registry. However, not all eligible citizens are covered in the automated process; instead, they must apply manually.

This study is relevant for two main reasons. The case is particularly interesting because of the simplicity of the programme's eligibility rules. First, because little discretion is necessary, the benefit programme is ideal for automation. Therefore, the findings of this study could be useful as a benchmark, as more complex eligibility rules would be more difficult to automate. Second, fully automated systems are gradually becoming more important in how governments deliver their services. Nevertheless, there is a gap in the research on the use and effects of such systems in public administrations. This study also aims to address this gap.

This paper is organised as follows. It begins with a discussion of the relevant literature on administrative exclusion and burdens. It also revisits the classic theory of access (Schaffer & Huang, 1975). This theoretical framework was developed to understand policy failures in developing countries, but it can also be applied to examine the new digital channels utilised by government to interact with citizens and how such channels may create administrative burdens. After the review, the case and the methodological approach used to answer the research questions are described. Much of the analysis is conducted on data collected from the digital system used to handle and decide child benefit claims. Process mining techniques and tools are used to order and analyse the large amount of data from the case handling system. Finally, the results are presented and discussed.

## 2. Administrative burdens and exclusion

The government's efforts to assist citizens in need are futile if citizens are unable to access the help to which they are entitled. Particularly troublesome are barriers created by the government itself. While such barriers are problematic in general, previous studies have shown that they disproportionately affect citizens with low socio-economic status and demographic groups already suffering from other types of discrimination (Brodin & Majmundar, 2010; Moynihan & Herd, 2010). The most extensive theoretical work concerning such barriers is in the literature on administrative exclusion and administrative burdens. The terms administrative exclusion and administrative burdens are complementary and are used to describe related phenomena. Administrative burdens are non-monetary costs placed on citizens when they acquire government services. When these costs are too high, exclusion is the result. These terms are related to Bozeman's concept of "red tape" (Bozeman, 1993; Bozeman & Feeney, 2014, p. 45), who defined it as the rules and tasks in a bureaucratic process that are imposed on the participants and stakeholder although they have no legitimate social or organisational value. While Bozeman's concept of red tape is most frequently viewed as a problem affecting the performance of an organisation, administrative burdens and exclusion affect citizens and others who interact with the organisation (Heinrich, 2016).

Burdens are not uniform. The common understanding of red tape is that it is the bureaucratic trappings that needs to be sifted through in order to achieve the desired result, but there are other types of administrative burdens governments place on citizens. In addition to the compliance cost of spending time, Moynihan et al. (2015) identified two

more types. The first type is the cost of learning about a government programme and how to access it. The second type is the psychological stress and stigma, which can be associated with participation in unpopular or restrictive government programmes.

Recently, the issue of administrative exclusion and burdens has emerged as a topic in studies on government digitalisation. The digitalisation of government services has been frequently framed as a means of making government more efficient, accessible and responsive (Lips, 2019, pp. 4–5). However, Peeters and Widlak (2018) argued that although digitalisation might remove problems of bureaucratic discretion, they risk that the structure and contexts of government databases might influence policy implementation. They call this phenomenon "legal contamination via ICT". Their concept is based on the classical discussion on how governments shape society by imposing standardisation, which is a theme in the works of classic theorists such as Foucault and Weber (Foucault, 1980; Weber, 2019).

In the recent literature, the origins of administrative exclusion have been subject to some academic contention. From the perspective of the organisation, Peeters (2020) argued that administrative burdens exist along two axes: the degree of intent and the degree of formality. With high formality and intent, Herd and Moynihan (2019) argued that government agencies can actively pursue exclusion as a policy goal beyond what is legally supported. In particular, such exclusion can affect marginalised groups even though the law demands equality.

Before the Internet, street-level bureaucrats and the apparatus that surrounded them were seen as gatekeepers who could prevent a citizen from acquiring the services or benefits to which they were entitled (Goodsell, 1981; Lipsky, 2010; Schaffer & Huang, 1975). In that sense, administrative burdens could serve the purpose of discouraging citizens from seeking government services fraudulently or frivolously. Although the topic of these earlier studies was bureaucrats and public encounters in physical spaces, their analyses and findings are still relevant in the digital context. The theory of access, which was first proposed by Schaffer and Huang (1975), is a significant example. It is a forerunner of the administrative burdens literature with which it shares several similarities. It offers a framework for understanding citizens' process of accessing government services that is clear and simple. It especially well-suited for studying both how governments fail to provide adequate access and for comparing different methods of providing access. As administrative burdens in digital government can be characterised as an emerging issue, the clear and basic approach of the theory of access is particularly appropriate. Additionally, it enables a discussion of access to government services as a process with the possibilities of multiple barriers, rather than a singular encounter.

### 2.1. Schaffer and Huang's theory of access

Based on their observation that much of the money allotted to a government benefit programme for farmers in India was unspent, Schaffer and Huang (1975) concluded that the problem was not a matter of policy but of access. In their opinion, the issue was caused by the government's need to regulate distribution without the use of monetary-based mechanisms. In private markets, a person buys access by spending income. In government distribution, access is not regulated by the expenditure of money but needs an administrative system to decide who receives government help and in what order. The main claim in the theory of access is that complex rules in accessing government services increases the burden on the applicant.

Schaffer and Huang's (1975) model has been used to explain why government programmes might fail even when they are supported by seemingly sound policies (Bleiklie, 1997, pp. 15–17). The theory provides a framework for analysing the process of acquiring government aid. The core concept of this framework is the queue, which is the path a citizen takes in the attempt to acquire a government good. According to Schaffer and Huang, the queue is divided into three parts: gate, line and counter. In the queue, the gate consists of the rules of admission

controlling if a citizen is allowed to apply. The line decides when and in which order applicants' requests are handled. The counter is where a bureaucrat decides on an applicant's claim (see Fig. 1). Each part of the queue is organised by rules that regulate the progress and order of applicants. An important distinction in this model is that the rules of the queue are not the same as legal eligibility rules; the rules of the queue have an administrative function.

Schaffer and Huang (1975) also described an ideal model for how government could regulate access to public services. They called this ideal the "simple queue". In a simple queue, all rules are applied routinely and reliably, and they are understood by all parties. Under such conditions, an eligible citizen's attempt to acquire a public service would always be successful. There would be no exclusion because the result of the public encounter would be known and understood from the beginning. A similar argument was made by Herd and Moynihan (2019), which associated complexity with burdening citizens in ways that decreased their access to government help. However, a public administrator's motivation for keeping a queue suboptimal was not explored by Schaffer and Huang (1975); they only mention briefly that a queue can systematically discriminate against particular groups. Instead, they framed their model as a tool for understanding why government services can fail to be accessible.

## 2.2. The theory of access in digital government

Theoretical frameworks contemporary with Schaffer and Huang (1975), such as Goodsell's public encounter (1981) and Lipsky's (2010) street-level bureaucracy, are hard to apply directly in the digital age. Although the purposes of public encounters are the same, many fundamentals have changed (Lindgren et al., 2019). Nevertheless, because digital innovation in public services is meant to enhance and facilitate citizens' interactions with government, it is worthwhile applying the early models of how citizens access government goods and services to the new digital channels. In the theory of access, the elements of the queue might have real physical counterparts, but as a metaphorical representation, they are just as present. There will always be a gate, line and counter. Interestingly, in a case of accidental foresight of digital government, Schaffer and Huang even used the term "servers" to describe rank-and-file civil servants.

An important difference between Schaffer and Huang's (1975) formative case of rural India and modern digital governments is the immediate reason for exclusion. For Schaffer and Huang, as well as Lipsky (2010), the exclusion was the consequence of physical environments and personal interactions. People literally waited in line, and bureaucrats could discriminate between individual applicants. Nevertheless, it was recognised by Bovens and Zouridis (2002) that the transition to digital systems without human bureaucrats did not necessarily benefit the citizen. Digitalisation has distanced bureaucrats from the citizenry by relying on digital systems and platforms to facilitate interactions. In screen-level bureaucracy, the citizen and the bureaucrat remain, but the public encounter is mitigated by computer screens and internet connections. In a system-level bureaucracy, the process is done entirely by digital systems that are programmed to execute public policy. According to Bovens and Zouridis, this removal of discretion has potentially negative consequences for the government programme the system supports.

A review of the empirical literature on digital government revealed exclusion in all stages in Schaffer and Huang's (1975) queue. At the gate, the citizen might not be included in the digitalised system and thus barred or rejected even before the process of acquiring a public service begins. By not being entered into the national registry in the proper manner, the citizen might have difficulty in acquiring government services (Peeters & Widlak, 2018). Many nations also demand that citizens log on or provide identification when using government services online. In the Nordic countries, the lack of digital identity verification prevents some foreign workers from applying for benefits for which they are

eligible (Jaakkola, 2018). A deficiency in digital skills might also make it more burdensome for some citizens to access government services as they require assistance to do it correctly (Madsen & Kræmmergaard, 2016). On the other hand, because the gate is also meant to bar ineligible citizens, an ineffective gate could cause some citizens to spend time on frivolous or incomplete claims (Mandal, Dyrstad, Melby, & Midtgård, 2016).

Having made it past the gate and allowed to make an application, government may progress with demands. Even when the interaction is digitalised, governments burden citizens by demanding they fill in forms online, navigate webpages, or provide more documentation (Scholta et al., 2019). As a result, citizens spend more time in the line before reaching the counter. Finally, the importance placed on various data can cause an applicant to be rejected at the counter. An increasingly important example is the use of algorithms in making or supporting government decisions, such as in child protective services or sentencing (Coglianese & Ben Dor, 2019; Keddel, 2019).

The examples of exclusion described above are products of digitalisation. Nevertheless, they fit the conceptual framework described by Schaffer and Huang (1975) (see Fig. 2). Digital government has enabled new types of exclusion that did not exist in the classic street-level bureaucracy (Bovens & Zouridis, 2002; Reddick, 2005); in addition, many of the barriers of the pre-digital era also remain. Based on the typology developed by Peeters (2020), digitalised discrimination may not be intended, but by embedding it in digital systems, it becomes highly formalised.

## 3. Method and data analysis

### 3.1. Case selection

In Norway, child benefits were enacted nationally in 1946. First, the benefits were only for citizens with more than one child, but they were later extended to include all residents with children (Skevik, 2003). Hence, child benefits are one of Norway's most expansive and universal government programmes. They are awarded beginning in a child's first calendar month until the month before they turn eighteen. In 2016, there were a total of 673,818 recipients. Because only one parent per child can receive the benefit, the majority of recipients are women (Ministry of Children and Families, 2017). On average, child benefits make up 2% of the combined household income of Norwegian families with children although this percentage is higher in single-parent and low-income households (Epland & Kirkeberg, 2016; Grødem, 2017).

The basic child benefits programme requires no means testing and is entirely rights-based. The eligibility rules are therefore straightforward, as there is little discretion in determining whether an applicant should receive the benefit or not. There are also provisions for a means-tested extended benefit. Because the means-tested extension of the programme is not automated, only the basic part of the programme is included in this study.

#### 3.1.1. Two methods of applying for child benefits<sup>1</sup>

The process of applying for child benefits was largely automated in 1998. The welfare organisation's computer systems are triggered when a child is entered into the national database shortly after birth (Andresen, 2008). After the systems are triggered, they automatically check the mother's eligibility for the benefit. If the registry data indicate that the citizen qualifies for the benefit, a benefit claim is generated in the case handling system on behalf of the potential recipient. These automatically generated applications are reviewed frequently and regularly by caseworkers. For the applications that are not rejected in review, the rest

<sup>1</sup> Several experts in the Norwegian welfare organisation were consulted in order to ensure that the technical aspects of the application process were described correctly.

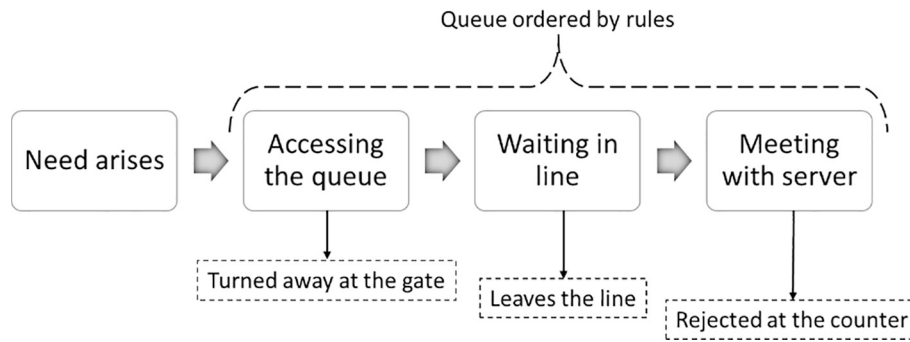


Fig. 1. Schaffer and Huang's queue.

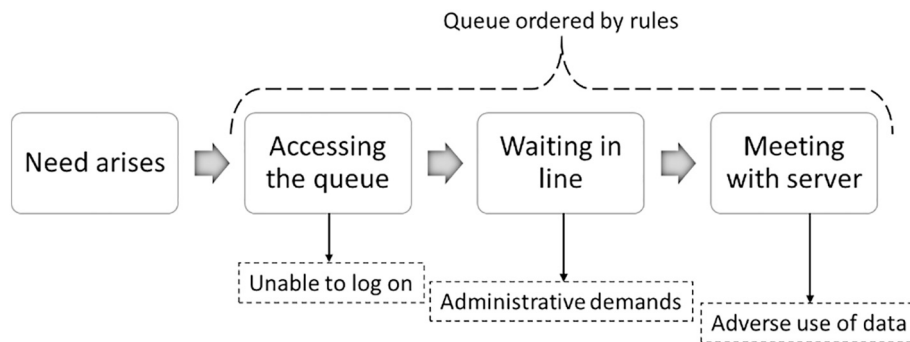


Fig. 2. Schaffer and Huang's model applied to digital services.

of the process is entirely automated. First, a letter is sent to the recipients informing them of their entitlement. If no further action is taken, payments begin, and the case is closed after 28 days. If the caseworker rejects the application upon reviewing it, the automated process ends. However, the applicant can make a manual application.

Citizens who are not covered by the automatic system must apply manually (see Fig. 3). The application process has been moved entirely online, but it is still much the same as the pre-digital application process. Although an applicant does not need to visit a government office, they must know about the benefit and where to apply for it. Applicants must fill in online forms and, in some instances, upload additional documentation. On the welfare organisation's webpage, applicants can log in using a digital ID and submit their applications digitally or they can send them by mail. The applications received by the welfare organisation are then processed in the order in which they arrive. Eligibility is usually checked by referencing data in government registries. If not, the caseworker requests the applicant by mail to provide additional information regarding residency or the right to claim benefits for a particular child. If the applicant is eligible, the caseworker awards the benefit; if not, the application is rejected.

A decided upon application, both manual and automatic, may be reversed. This occurs when the applicant appeals a rejection or when the government is uncertain if the recipient is eligible. In these instances, applicants may need to provide additional documentation to prove their eligibility. Therefore, the eligibility decision on a claim can receive contradictory results during the application process.

### 3.2. Data

Similar to most modern computer systems, the system used to handle claims for child benefits logs key events about the claims it handles, both for the benefit of the system and for future reference. These system events are suitable for process mining and are the basis for the present study. The data set consisted of claims made and decided on in 2018 and the events generated by them. The cases from 2018 are representative of

those in previous years and were chosen because they are the most recent full year of cases at the time of this study. However, by limiting the dataset to 1 year, some claims might be incomplete because they either began the year before or continued into 2019. However, child benefit applications are usually processed quickly, which reduces the implications of the limitation for the analysis. In total, the dataset consisted of 109,724 events.

The dataset contained two main types of dated events. The first was created when there was a need for a decision to be made concerning a benefit claim. The second type was created when the decision was made. In addition to these two event types, complex coding captured several types of decisions and outcomes. This granularity is relevant for the welfare organisation, but it introduced noise into the data analysis in this study. The dataset was therefore pre-processed to remove this noise (see Fig. 4).

First, the dataset was modified to separate events related to new claims and previously decided claims. The former group was divided into claims that were generated automatically and those that were made manually. The latter category did not separate between claims revisited by the government and appeals from the applicant. It also included cases when an applicant reapplied after a caseworker rejected an automatically generated application. Second, the dataset was simplified to separate only between outcomes when an applicant received the benefit and when it was not awarded.

A drawback of administrative system data in general is that they are not designed for research purposes. Nevertheless, administrative data offer a unique opportunity to directly examine the workings of governments because it tracks actual outcomes and behaviours (Dunleavy, 2016).

### 3.3. Methodology

To address the research questions, the following methods and research strategies were applied. Question one asks what citizens are not covered by the automated awarding of benefits. This question was



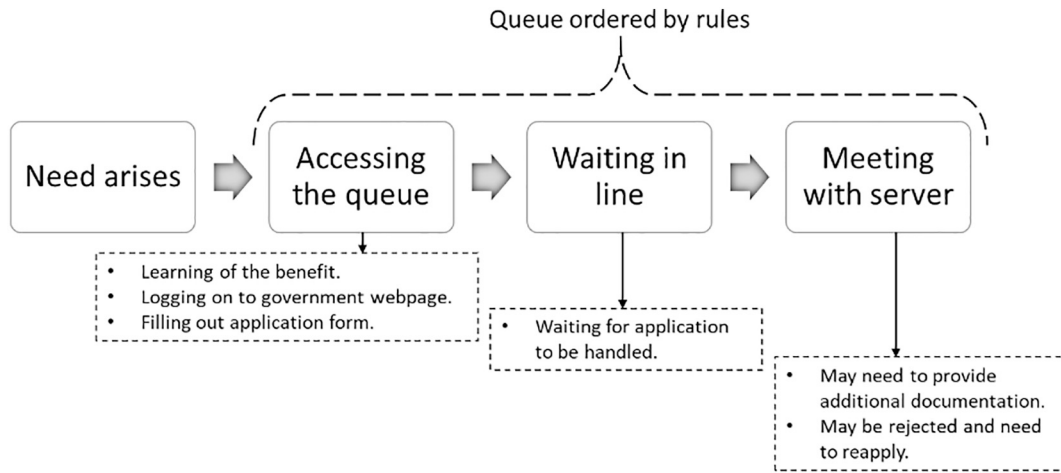


Fig. 3. Schaffer and Huang’s model when applying manually for child benefits.

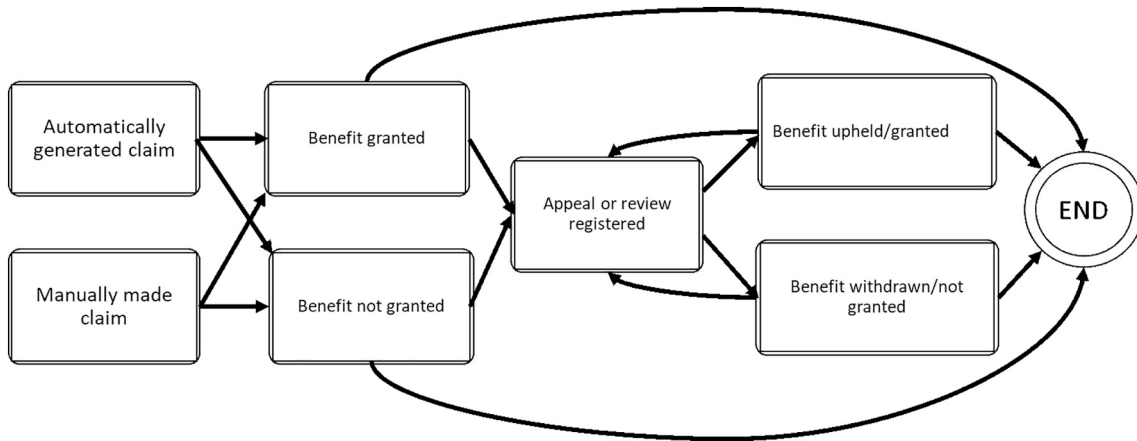


Fig. 4. The simplified application process.

addressed by comparing the eligibility rules of the benefit with the criteria a citizen must meet to be awarded the benefit automatically. The second research question was answered by using process mining to identify the differences in service between those who applied manually and those who were awarded the benefit automatically. Finally, a correlation analysis was applied to find socio-economic differences. In this part of the analysis, automation and poverty levels were aggregated to the municipality level.

3.3.1. Process mining

Process mining is a recently developed method of sorting data and examining digital event logs to calculate the various routes and conditions for a series of events. The origin of process mining as a distinct field is in computer development and process optimisation (Van Der Aalst, 2011). This method requires a dataset of timestamped events in nominal categories with a variable to identify events belonging to the same sequence.

The process mining terminology, as used in this paper, distinguishes between unique events and event types. The events in the dataset were divided into seven event types (as shown in Fig. 4). A sequence of chained events constitutes a case.<sup>2</sup> Similarly, a particular order of event types is called a trace. Having ordered a dataset into traces, it is possible

<sup>2</sup> In this context, “case” should not be confused with how the term is used elsewhere in this paper to describe the case of study, child benefits in Norway and its automated delivery.

to determine the reason cases follows a particular trace as well as other performance characteristics of the trace. In this study’s dataset, the 109,724 events belonged to 50,463 cases, each of which with a unique applicant. Each case belonged to one of 197 possible traces.

In this study, process mining were conducted using the R-package *bupaR* developed by a group at Hasselt University (Janssenswillen, Depaire, Swennen, Jans, & Vanhoof, 2019). All data analyses were done using R version 3.6.1. and *bupaR* version 0.4.3.

3.3.2. Measuring burdens

To address the second research question, the process-mined dataset was analysed to determine the burdens placed on the applicant in the process of acquiring the benefit. Using process mining, the analysis identified where the exclusion from being handled automatically created additional burdens for the applicant. In the words of process mining terminology: cases belonging to traces where the first event was an automatically generated claim were compared with cases where a claim was made manually.

For the purpose of this study, burdens were defined as the additional tasks applicants had to perform to have their case resolved or additional waiting time before the case was resolved. These burdens on an applicant were considered cumulative. For instance, if applicants were subject to appeals or reviews, they re-entered the queue since additional time and work were required before they could receive the benefit. It is important to note that although the dataset was used to find burdens placed on applicants, it could not be used to measure outright exclusion.

Citizens who were not able to apply did not appear in the dataset. Furthermore, it was not possible to separate between applicants who were rejected because they were not eligible from those unwilling or unable to complete the application process.

### 3.3.3. Measuring inequality

Supplementary data gathered from two sources were used to answer the final research question. First, the main dataset was aggregated from the person-level to show the ratios of automation at the municipality-level. These ratios were then combined with poverty data drawn from Norway's national bureau of statistics (Statistics Norway). The inclusion of these data made it possible to perform a simple bivariate correlation analysis between a municipalities rate of automation and the level of poverty. A limitation of using correlation analyses was that there is no direct causality between poverty and exclusion from being automatically awarded the benefit. Instead, as predicted in previous studies, there was an expectation that the application of administrative burdens or unfavourable automation challenged equality (Herd & Moynihan, 2019; Wihlborg et al., 2016).

The poverty indicator used in this study was the European Union's at-risk-of-poverty threshold (EU60) (Atkinson, Guio, & Marlier, 2017, pp. 66–67). The EU60 indicator rates the percentage of households in the municipality falling below 60% of the national median income. The number was provided for all municipalities in Norway. Additionally, three major cities—Bergen, Oslo and Stavanger—were divided into boroughs. In total, the analysis was conducted using data on 416 municipalities and 34 boroughs.

## 4. Findings

### 4.1. What citizens are not covered when public services are delivered by automated digital processes?

A complete list of groups not covered by the automatic system was provided on the welfare organisation's webpage.<sup>3</sup> These groups are required to apply manually. Groups not covered by the system are characterised by deviations from the norm in three ways:

- The recipient or child is not registered as a resident in Norway.
- The parents of the child are separated or have children from previous relationships.
- The recipient is not the child's natural parent.

The reasons for excluding these groups are related to the two eligibility rules in the programme. Foreign residents in Norway can claim the benefit but only if they intend to stay in the country for an extended period. Similarly, while child benefits are usually awarded to the mother, they can also be given to the father, split between the parents, or even given to foster parents or a residential institution.

The national registry has data regarding these statuses, though they are less common than the typical residential or civil situation. Those covered by the automatic system are therefore long-time residents in typical civil circumstances. The groups are excluded to avoid making erroneous payments. Unlike applications handled by the computer, with manual applications bureaucrats can make discretionary decisions and the applicant can provide additional documentation.

### 4.2. What additional burdens are placed on those that apply manually compared to those that have an application generated automatically?

The dataset consists of 16,094 cases made manually and 34,369 cases

<sup>3</sup> The complete list can be found at <https://www.nav.no/en/Home/Benefits+and+services/Relatert+informasjon/child-benefit#chapter-5>

generated by the automatic system. Ordering the events using the bupaR process mining tool into process maps yielded the following computer-generated maps (see Fig. 5). The first map shows claims made by an applicant manually, the second map shows cases in which the automatic system generated a claim, and the third map shows all cases. A map containing the nearly two hundred trace types, would have been unreadable. Instead, the maps were limited to the 10 most frequent traces, which still yielded 97.6% of all cases. The process maps show the importance of each event and the transition between them. On the first two maps, they are shown as the absolute number of cases. In the third map, percentages are provided to facilitate the comparison. These percentages indicate the ratio of cases in an event type or transition compared to all cases in the map. Considering the whole dataset, not just the most common traces, a total of 32,682 cases—that is, 64.8% of all cases—were handled completely automatically. Benefits were paid without placing any burdens on the applicants.

#### 4.2.1. The gate

Although most claims were handled automatically, in a significant minority, some degree of burden was placed on the applicant. Among those who applied manually, 11,354 cases (i.e. 70.4% percent of manual applications) passed through the process and received the benefit without issues. However, unlike citizens who were awarded the benefit automatically, the manual applicants had to both learn about the benefit and take the time to apply for it. Moreover, the manual process did not dissuade applicants who were ineligible for the benefit from spending time to apply. The results showed that 2121 (i.e. 13.2% of the manual cases) applications were rejected without the applicant reapplying. In comparison, only 422 applicants (i.e. 0.8% of the automatically generated cases) needed to apply manually after their automatically generated claim was rejected by a caseworker.

#### 4.2.2. The line

A descriptive analysis of the throughput time of the two types of claims yielded the results shown in Table 1. When the automatic case handling worked as intended, it opened a case when it received a digital message from the national registry and then closed it 28 days after payments begun.

The manual claims, even though they did not have a 28-day latency period, had a mean average of almost a week longer than the automatically generated claims. The manual claims also had more variety of processing times. Insecurity about when a benefit would be paid could place a psychological burden on applicants waiting to receive the benefit. Additionally, the automatic cases were generated at the earliest possible moment the applicant qualified for the benefit. In contrast, the manual cases were registered only when the applications were received.

#### 4.2.3. The counter

At the counter, an applicant's right to a benefit is assessed according to the eligibility rules. Even though the rules for receiving child benefits are simple, many applicants are evaluated multiple times either because they appeal rejections or the government reviews a decision. Each time the applicant reengaged with government more time was spent waiting in line and logging onto government webpages. The comparison of applications that were reviewed more than once yielded the results shown in Table 2.

Having an application either approved or rejected without the need for appeal or review, placed the least burden on the applicant, especially for the automated claims. Among the applicants covered by the automated system, 97.3% fell in this category, with only 2.2% being rejected. Regarding the manual applications, 84.4% were completed after the first application. However, in 13.3% of cases, the application was rejected. All the work, but none of the benefit.

Regarding appeals and reviews, the manual applications performed worse than the claims automatically generated. The manual applicants were 9 times as likely to be subject to review and more than twice as

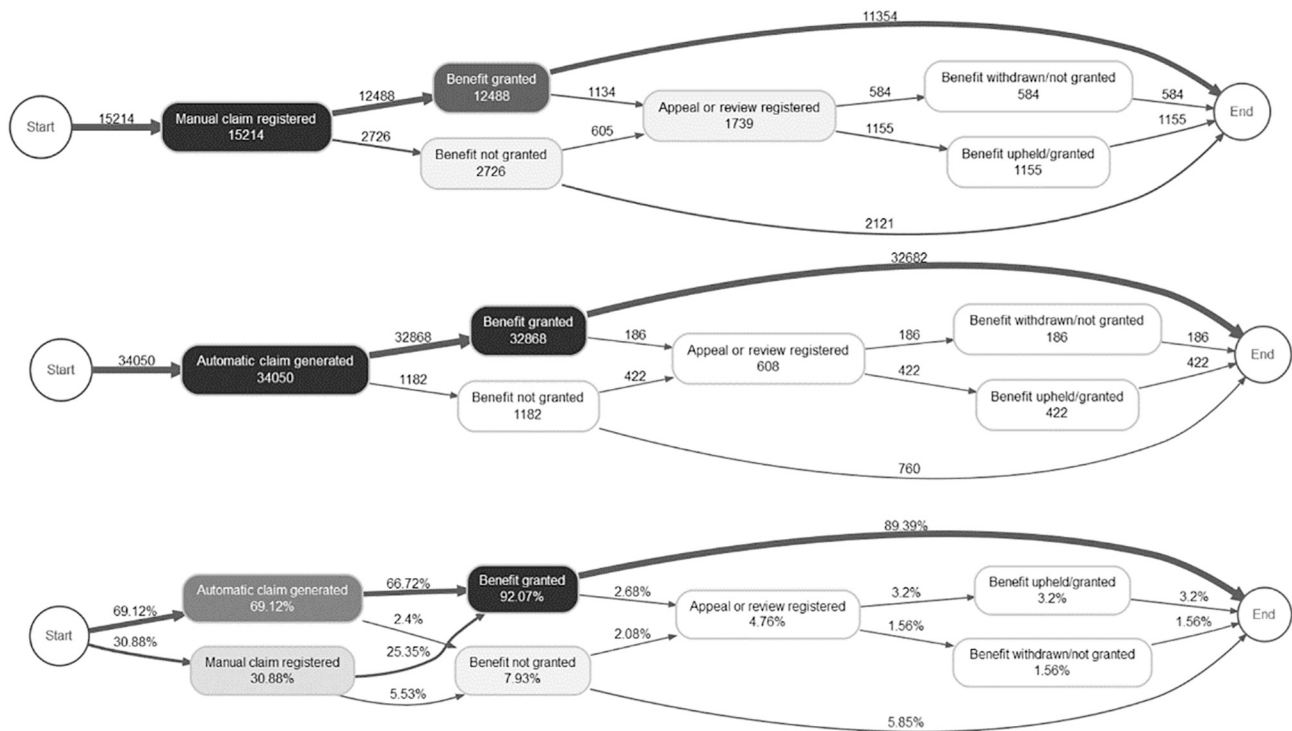


Fig. 5. Top ten traces and relative percentage of cases.  $N = 49,264$  of 50,463.

Table 1

Process throughput time in days, beginning to end.

	Min	First quartile	Median	Mean	Third quartile	Max
Automatic	1	28	28	29.9	28	358
Manual	0	5	14	35.9	42	345

Note.  $n = 50,463$ .

Table 2

Results of application claims.

	Manual application	Automatic application
No reviews or appeals		
Benefit awarded - no review	11,436 (71.1%)	32,683 (95.1%)
Benefit not awarded - no appeal	2144 (13.3%)	761 (2.2%)
Reviews or appeals		
Benefit awarded - upheld after review	966 (6.0%)	187 (0.5%)
Benefit awarded - withdrawn after review	621 (3.9%)	210 (0.6%)
Benefit not awarded - given on appeal	668 (4.2%)	480 (1.4%)
Benefit not awarded - appeal rejected	259 (1.6%)	48 (0.1%)
Total	16,094 (100%)	34,369 (100%)

Note.  $n = 50,463$ .

likely to have to apply multiple times. The heaviest burden was placed on the 1.6% of applicants who had both their first application and subsequent appeal rejected. Among the automatic cases that were appealed or reviewed, the majority of cases, 1.4% were applicants who applied manually after having been rejected by the caseworker in the automatic process. Because they did not suffer any burden during the automatic case processing, they were on par with applicants who received the benefit after one manual application.

### 4.3. Does exclusion from automated systems match other socio-economic divisions?

This final research question considers automation at the municipal level and its relation to poverty. The results of the bivariate correlation analysis showed a significant negative correlation between a municipality's degree of automatically granted claims and the ratio of households below 60% of the median income (see Fig. 6). As discussed in the methods section, not being offered child benefits automatically was not caused by poverty, but the groups not covered disproportionately comprised lower income families, which might explain the relatively weak Pearson's  $r$  value.

## 5. Discussion

### 5.1. The two paths to child benefits

The results of the present study showed that governments proactively being able to ensure citizens' rights goes even further than what

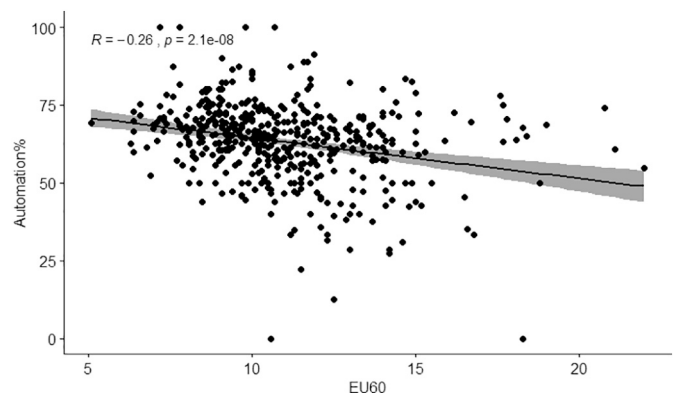


Fig. 6. Scatterplot of automation and EU60 in municipalities and boroughs.  $N = 450$ .

Schaffer and Huang (1975) envisioned in their concept of the simple queue. When a citizen was given child benefits through the automatic process, almost all their burdens were removed. However, for the simple queue to be realised through automation, some eligible applicants had to be excluded and given burdens as described by Moynihan et al. (2015). The limits of the automatic process required some citizens to both learn about the benefit and comply with the demands of the process, while others were spared these burdens.

Data that are organised for one purpose cannot always be put to other uses without trade-offs (Bowker & Star, 2000, p. 108). Despite the simple rules for receiving child benefits, it was not possible to make a perfect match between the eligibility rules of the government programme with the content of the government registry. This is the inverse of Schaffer and Huang's rule, appropriate for the digital era: the more complex the rules of government programmes and services are, the more unequal the value of using registry data becomes for citizens. When these factors are considered, it seems impossible to implement full or semi-automated systems for public services covering all citizens equally. As eligibility rules become more complex, exclusion from automation is harder to avoid. As digital government moves from a "one-stop shop" to a "no-stop shop" (Scholta et al., 2019), it will not benefit everyone. What remains is a "some-stop shop" that is inferior in quality.

To some extent, this study reinforces the findings of Peeters and Widlak (2018) regarding the unintended effects of using registry data in government service delivery. The growing bureaucratic infrastructure of conjoined government agencies means that greater care is needed in their construction. As a growing body of literature shows, sensible choices in the information architecture of one part of the government can have harmful effects when they are used in other parts of the government.

## 5.2. The social inequality of access

Solutions to complex social issues and the uneven distribution of public goods have been studied and discussed for as long as governments have attempted to solve them (Le Grand, 2018; Marshall, 2006; Titmuss, 1958). As the results of the present study showed, public digitalisation could become another venue of inequality. If governments digitalise based on the goal of being more accessible to most people, it would be problematic if those left behind were those that needed government services the most. Digital government has seen the reduction in street-level bureaucracy in favour of screen- and system-level bureaucracy (Bovens & Zouridis, 2002). If citizens who are most reliant in the street-level bureaucracy are also excluded from the automated systems, the burdens of digitalisation are increased on those who are the least able to carry them. However, the issues must also be weighed against the alternative. In this study, two types of digital methods of applying for benefits were compared. It is likely that even the citizens who apply manually online were more heavily burdened by the pre-digital application process.

Government digitalisation increases the creation and consumption of structured data. Even minor discrepancies in quality and availability, as in the case above, can have significant consequences for the outcome. According to predictions of the progress of digital government, digital services will become "citizen holistic" (Dunleavy et al., 2006) and rely more on the context of the service (Janowski, 2015). These are data-heavy innovations and prone to the issues discussed in this paper. Moynihan and Herd (2010) asked if the burdens placed on some citizens could be tolerated even if they prevented fraudulent claims. The word fraud infers criminal intent by the citizen, but the question remains equally relevant without it. How heavy a burden could be placed on citizens who might be eligible for benefits to discourage those who are ineligible? Moynihan and Herd did not provide an answer to their own question. Moreover, the answer is also outside the scope of this study. A sensible discussion about the ratio of inclusion to exclusion in digital services requires a multidisciplinary approach. It must also be

considered by public administrators themselves as government digitalisation continues to advance.

Recent studies of administrative burdens have shown they can impact more severely people who have less resources to carry them (Christensen, Aarøe, Baekgaard, Herd, & Moynihan, 2020; Chudnovsky & Peeters, 2020). As this study has shown, administrative burdens created by digital government can also reinforce social inequalities. These are questions who are increasingly being asked within the digital divide literature, where the relation between existing socio-economic inequalities and being unable to benefit from digital technology, including as part of government services, has become evident (Van Deursen & Helsper, 2015; Van Deursen & Van Dijk, 2014).

## 5.3. Limitations and future research

This study is limited by being a quantitative study based solely on administrative data. Its findings do not say anything about how the applicants themselves experienced the application process. Furthermore, the issues raised in this study should be included in established theoretical discussions of public digitalisation, public value, and exclusion. The following two approaches could be particularly fruitful. First, as noted by Giddens (2013) in his discussion of modernity, technology removes the obstacles of time and space in social interactions, which affects who and how we trust. The limits of the automated child benefits system show where trust has been placed. The trust placed in automated systems is a product of the trust placed in bureaucrats and citizens. In this triangle, the automated system examined in this study is trusted to make decisions about many claims, but not all claims. The digital system is trusted to award benefits only to some citizens, leaving more nuanced decisions to humans. Furthermore, and perhaps more significantly, those who receive the benefit automatically receive a letter first, which enables them to stop the payment if they realise that they are not eligible. The groups of recipients on the list of excluded applicants are not awarded this trust. Previous research examined citizens' trust in digital government (Reddick, 2005). However, in the context of automated systems, it is more relevant if governments trust their citizens. Public digitalisation could be slowed if governments do not trust citizens to correct mistakes. Even more problematic, exclusivity could become systemic if governments only trust some citizens to make corrections.

A second path for future research is to investigate the relation of government digitalisation to precariousness. A claim made in the precariousness literature is that public policy has pushed many citizens into a precarious situation where they are in constant danger of acute poverty (Bourdieu, 1998; Standing, 2011). The general understanding of the precariat is that they are atypical compared with the established working classes. Many government programmes are structured to aid the traditional working poor but not the new precariat (Standing, 2011, p. 52). If being atypical increases the possibility that a citizen is excluded from government digitalisation, the precariat is particularly at risk. Because government programmes and services are less beneficial for the precariat, government digitalisation might have the same effect. Since this paper is limited by not being able to find citizens who were completely excluded from the programme by its digital methods of delivery, this could benefit from further study.

## 6. Conclusion

This study showed that the creation of automated government services must necessarily separate citizens whose applications and service delivery can be automated from those who cannot. The case, child benefits in Norway, provided ideal conditions for full automation. Nevertheless, many citizens are not awarded child benefits automatically. The consequence is unequal service quality, as "un-automatable" citizens experience a higher degree of administrative burden. Because government registries favour typical cases, the atypical are at the highest risk of experiencing administrative burdens. The more complex the rules



of a programme are, the more difficult it would be to award it automatically.

As digital government continues to evolve, it is important to ask how much social disparity is tolerable in government services. Is it acceptable that services improve for most citizens but exclude those who would benefit the most from easy access? The case examined in this study illustrated the value of automated public services, but it also showed how that value is not extended to all citizens.

It should not be surprising that governments encounter the issues examined in this study. The problems facing governments are old, and while digitalisation offers “new-ish” solutions to them, they are applied in familiar ways. In the field of digital government research and, more importantly, in its implementation, attention should be removed from how the next iteration of digitalisation will improve upon the previous iteration. After all, the purpose of digital innovation in public services is not to improve itself but to improve society.

## Disclosure

This research for this paper was co-financed by the Norwegian Labour and Welfare Administration (NAV) and the Research Council of Norway [grant number 289920] as part of the Public Sector Ph.D. scheme.

## Authorship statement

There are no other persons than the author who meet authorship criteria of this article. The author certifies that he takes public responsibility for the content, including the concept, design, analysis, writing, or revision of the manuscript. Furthermore, the author certifies that this material or similar material has not been and will not be submitted to or published in any other publication before being considered by Government Information Quarterly.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

The author would like to thank Siri Risnes, Birgitte Terjesen, Ingrid Prøsch and Lene Bergstrøm Brittain for providing me with detailed descriptions of the process of handling claims for child benefits.

## References

- Andresen, H. (2008). Systemintegrasjon i e-forvaltningen og følgene for dokumentasjon av systemenes rettslige innhold. In A. Jansen, & D. W. Schartum (Eds.), *Elektronisk forvaltning på norsk: statlig og kommunal bruk av IKT*. Bergen: Fagbokforlaget.
- Atkinson, A. B., Guio, A.-C., & Marlier, E. (2017). *Monitoring social inclusion in Europe*. Luxembourg: Publications Office of the European Union Luxembourg.
- Bleiklie, I. (1997). *Service regimes in public welfare administration*. Oslo: Tano Aschehoug.
- Bourdieu, P. (1998). *Acts of resistance: Against the new myths of our time*. Cambridge: Polity.
- Bovens, M., & Zouridis, S. (2002). From street-level to system-level bureaucracies: How information and communication technology is transforming administrative discretion and constitutional control. *Public Administration Review*, 62(2), 174–184. <https://doi.org/10.1111/0033-3352.00168>.
- Bowker, G. C., & Star, S. L. (2000). *Sorting things out: Classification and its consequences*. Cambridge: MIT press.
- Bozeman, B. (1993). A theory of government “red tape”. *Journal of Public Administration Research and Theory*, 3(3), 273–304.
- Bozeman, B., & Feeney, M. K. (2014). *Rules and red tape: A prism for public administration theory and research: A prism for public administration theory and research*. London: Routledge.
- Brodtkin, E. Z., & Majmudar, M. (2010). Administrative exclusion: Organizations and the hidden costs of welfare claiming. *Journal of Public Administration Research and Theory*, 20(4), 827–848.
- Christensen, J., Aarøe, L., Baekgaard, M., Herd, P., & Moynihan, D. P. (2020). Human capital and administrative burden: The role of cognitive resources in citizen-state interactions. *Public Administration Review*, 80(1), 127–136.
- Chudnovsky, M., & Peeters, R. (2020). The unequal distribution of administrative burden: A framework and an illustrative case study for understanding variation in people’s experience of burdens. *Social Policy and Administration*, 1–16. <https://doi.org/10.1111/spol.12639>.
- Coglianesi, C., & Ben Dor, L. (2019). AI in adjudication and administration: A status report on governmental use of algorithmic tools in the United States. *U of Penn Law School, Public Law Research Paper*, 19–41.
- Dunleavy, P. (2016). Big data and policy learning. In G. Stoker, & M. Evans (Eds.), *Evidence-based policy making in the social sciences: Methods that matter* (pp. 143–151). Bristol: The Policy Press.
- Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead—Long live digital-era governance. *Journal of Public Administration Research and Theory*, 16(3), 467–494.
- Epland, J., & Kirkeberg, M. I. (2016). *Barnefamilienes inntekter, formue og gjeld 2004–2014*. Oslo: Statistisk sentralbyrå.
- Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings, 1972–1977*. New York: Pantheon Books.
- Giddens, A. (2013). *The consequences of modernity*. Cambridge: Polity.
- Goodsell, C. T. (1981). *The public encounter: Where state and citizen meet*. Bloomington: Indiana University Press.
- Grødem, A. S. (2017). Farvel til den barne-vennlige velferdsstaten? In S. C. Bendiksen, S. Helseth, & C. Lundgren (Eds.), *Oppvekstrappporten 2017* (pp. 185–201). Oslo: The Norwegian Directorate for Children, Youth and Family Affairs.
- Heinrich, C. J. (2016). The bite of administrative burden: A theoretical and empirical investigation. *Journal of Public Administration Research and Theory*, 26(3), 403–420.
- Herd, P., & Moynihan, D. P. (2019). *Administrative burden: Policymaking by other means*. New York: Russell Sage Foundation.
- Jaakkola, D. (2018). *e-ID and digital border obstacles in the Nordic region*. København: Nordic Council of Ministers.
- Janowski, T. (2015). Digital government evolution: From transformation to contextualization. *Government Information Quarterly*, 32(3), 221–236. <https://doi.org/10.1016/j.giq.2015.07.001>.
- Janssenswillen, G., Depaire, B., Swennen, M., Jans, M., & Vanhoof, K. (2019). bupaR: Enabling reproducible business process analysis. *Knowledge-Based Systems*, 163, 927–930.
- Katsonis, M., & Botros, A. (2015). Digital government: A primer and professional perspectives. *Australian Journal of Public Administration*, 74(1), 42–52. <https://doi.org/10.1111/1467-8500.12144>.
- Keddel, E. (2019). Algorithmic justice in child protection: Statistical fairness, social justice and the implications for practice. *Social Sciences*, 8(10), 281.
- Le Grand, J. (2018). *The strategy of equality: redistribution and the social services* (vol. 13). London: Routledge.
- Lindgren, I., Madsen, C.Ø., Hofmann, S., & Melin, U. (2019). Close encounters of the digital kind: A research agenda for the digitalization of public services. *Government Information Quarterly*, 36(3), 427–436. <https://doi.org/10.1016/j.giq.2019.03.002>.
- Lips, M. (2019). *Digital government: Managing public sector reform in the digital era*. London: Routledge.
- Lipsky, M. (2010). *Street-level bureaucracy: Dilemmas of the individual in public service*. New York: Russell Sage Foundation.
- Madsen, C.Ø., & Kræmmergaard, P. (2016). Warm experts in the age of mandatory e-government: Interaction among Danish single parents regarding online application for public benefits. *Electronic Journal of E-government*, 14(1). Retrieved from <http://www.ejeg.com/issue/download.html?idArticle=447>.
- Mandal, R., Dyrstad, K., Melby, L., & Midtgård, T. (2016). Omgjøring av vedtak i Nav og Trygderetten. Retrieved from <https://www.sintef.no/publikasjoner/publikasjon/?pubid=CRISTin+1431110>.
- Marshall, T. H. (2006). Citizenship and social class. In C. Pierson, & F. G. Castles (Eds.), *The welfare state reader* (pp. 30–39). Cambridge: Polity.
- Ministry of Children and Families. (2017). *Offentlig støtte til barnefamilie*. Oslo: Departementenes sikkerhets- og serviceorganisasjon.
- Moynihan, D., & Herd, P. (2010). Red tape and democracy: How rules affect citizenship rights. *The American Review of Public Administration*, 40(6), 654–670.
- Moynihan, D., Herd, P., & Harvey, H. (2015). Administrative burden: Learning, psychological, and compliance costs in citizen-state interactions. *Journal of Public Administration Research and Theory*, 25(1), 43–69.
- Peeters, R. (2020). The political economy of administrative burdens: A theoretical framework for analyzing the organizational origins of administrative burdens. *Administration and Society*, 52(4), 566–592.
- Peeters, R., & Widlak, A. (2018). The digital cage: Administrative exclusion through information architecture—the case of the Dutch civil registry’s master data management system. *Government Information Quarterly*, 35(2), 175–183. <https://doi.org/10.1016/j.giq.2018.02.003>.
- Reddick, C. G. (2005). Citizen interaction with e-government: From the streets to servers? *Government Information Quarterly*, 22(1), 38–57. <https://doi.org/10.1016/j.giq.2004.10.003>.
- Schaffer, B. B., & Huang, W. H. (1975). Distribution and the theory of access. *Development and Change*, 6(2), 13–36.
- Scholta, H., Mertens, W., Kowalkiewicz, M., & Becker, J. (2019). From one-stop shop to no-stop shop: An e-government stage model. *Government Information Quarterly*, 36(1), 11–26. <https://doi.org/10.1016/j.giq.2018.11.010>.
- Skevik, A. (2003). Children of the welfare state: Individuals with entitlements, or hidden in the family? *Journal of Social Policy*, 32(3), 423–440.

- Standing, G. (2011). *The Precariat: The new dangerous class*. London: Bloomsbury Academic.
- Titmuss, R. (1958). The social division of welfare. In R. Titmuss (Ed.), *Essays on the welfare state*. London: Allen and Unwin.
- Van Der Aalst, W. (2011). *Process mining: discovery, conformance and enhancement of business processes* (vol. 2). Heidelberg: Springer.
- Van Deursen, A. J., & Helsper, E. J. (2015). The third-level digital divide: Who benefits most from being online?. In *Communication and information technologies annual*. Emerald Group Publishing Limited.
- Van Deursen, A. J., & Van Dijk, J. A. (2014). The digital divide shifts to differences in usage. *New Media & Society*, 16(3), 507–526.
- Weber, M. (2019). *Economy and society: A new translation*. Cambridge: Harvard University Press.
- Wihlborg, E., Larsson, H., & Hedström, K. (2016, ). “The computer says no!” – A case study on automated decision-making in public authorities. In *Paper presented at the Hawaii International Conference on System Sciences (HICSS), Koloa, HI, USA*.



**Karl Kristian Larsson** is a political scientist, currently working on his PhD-thesis at OsloMet University in Norway. Before returning to academia, he spent a decade in the Norwegian welfare organisation, where he worked as a senior analyst and business architect. Larsson uses his experience from the welfare organisation to study government digitization, in particular the digitization of welfare services. In his research, he explores the consequences of digitization, and how it can alleviate or contribute to social exclusion and inequality.