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# Automation hesitancy: confidence deficits, established limits and notional horizons in the application of algorithms within the private rental sector in the UK

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**ABSTRACT**

Drawing upon a qualitative research project examining the use of algorithms in decisions relating to access to housing, this article develops the concept of automation hesitancy. It reflects on the emergence of automation and considers the need for detailed accounts of the implementation of algorithms within specific sectors. In particular, it looks at the confidence deficits that exist. From this starting point it then considers how established limits and notional horizons shape and define the use of algorithms in decision-making processes. The concept of automation hesitancy is used to explore the reaction of those who make decisions concerning access to housing to the presence of algorithmic processing. This central concept of automation hesitancy highlights the hesitations that occur over the implementation of algorithms. The article looks at why this hesitancy exists, what its limits are and also at the role of future horizons in continually reshaping those limits. Overall, the article uses detailed analysis of the UK private rental sector (PRS) to challenge notions of the slickness and frictionless integration of algorithmic decision-making, offering instead a series of insights into the types of liminality and reservations that create variegated algorithmic social landscapes.

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It would be easy to assume that algorithms, machine learning and artificial intelligence are applied wherever possible, and without hesitation – especially when we consider the volume of coverage, the seeming power of the technology and the sense of inevitability embedded within their discursive framings (as identified recently by Markham, 2021, p. 384). There would seem to be an ongoing race to be ever more algorithmic. Yet a closer perspective reveals the variegated and uneven pace and distribution of algorithmic processes. By looking closely at individual sectors, in this case the UK housing sector, we are able to identify the subtleties, differences and resistances that are shaping the integration

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of algorithms into social life. In the private rental sector (PRS) the move towards the implementation of algorithms to automate aspects of rental decisions, including referencing and landlord selection outcomes, might give the impression of an ability to use data to automatically and objectively make decisions about tenants and tenancy. Envisioned as a rapid process of perfect selections, an ideal is presented of a market in which data-informed and algorithmic-produced decisions are quick, efficient and ever more accurate. Platform real estate firms (Shaw, 2020) promise transformational support to landlord practices from investment, tenant selection and digital agreements through to property management and beyond (Fields, 2022; Nethercote, 2023). Tenant referencing tools are one aspect of the increased data processing in the sector, designed to mitigate the financial risks landlords face, from non-payment of rent and the protracted eviction process, with 'fast and thorough' checks to bring greater confidence to tenant selection decisions. These digital tools, of which some examples would include Homelet, LettingsHub or LetHQ, explore credit histories, perform identity and former address checks, verify income and prior rent payments and appraise rental affordability, often using open banking technologies where prospective tenants give consent for third parties to access their current account transaction histories. Through these devices the algorithm would appear to have become an automated gatekeeper of the PRS.

This article draws upon data collected as part of a qualitative project designed to explore the use of algorithms in decisions relating to access to housing across the tenures. This particular article examines the role of automation within the PRS in the context of the UK housing sector and develops the concept of *automation hesitancy*. We show here how limited confidence and established limits – including the defence of human discretion, professional expertise and the unquantified 'feel' for a good decision – along with notional impressions of future horizons, together shape and in some cases restrict, direct and confine the spread of algorithmic decision-making. Rather than rejecting these systems though, what we find with *automation hesitancy* are attempts to navigate the potentials, utilities, and possibilities of algorithms in balance with the perceived risks, established trusted practices and notions of how things will develop.

Adding to this, and with the wider picture in mind, in their expansive overview of the literature on the social impacts of algorithmic decision-making, Gerdon et al. (2022, p. 9) have made the case for more detailed explorations of specific parts of what they refer to as algorithmic decision-making 'pipelines'. Indeed, we have found that those engaging with such systems are developing ways of managing and handling the meshing of human agency with automated algorithmic systems. As Fisher (2022) has argued, new concepts of subjectivity emerge from the application of algorithms. This article notes some of the subtleties of the integration of algorithms within the subjectivities of the housing sector. The findings we explore under the concept of automation hesitancy emerge from a focus on housing but are likely to have wider pertinence as algorithmic systems continue to be established in different sectors. In particular, we note how an awareness of the potential 'fissures in algorithmic power', to draw on Ferrari and Graham's (2021) concept, are becoming a part of the everyday application of, and adaptation to, algorithmic processes and possibilities. There is a sense amongst those applying such systems that algorithms may not always do what is expected or have the exact power that they were initially thought to have. In other words, there exists a wariness towards automation and a

sensitivity to the potential problems and limitations that algorithms and automated decision-making might bring.

In the case of this particular article, we show how decisions about access to housing reveal a hesitancy towards full automation and an interest in both the limitations of the algorithm and the retention and sometimes implicit defence of the human within the 'human-data assemblage' (Lupton, 2019, p. 13). As Bucher (2018, p. 159) has pointed out:

> If the machine is involved, then people are too. The notion of algorithmic power and politics is not about the ways in which algorithms determine the social world. Nor is it about what algorithms do in and of themselves. Rather, we must ask *how* and *when* different aspects of the algorithmic are made available or unavailable to actors in a given setting.

In general terms, that is what we ask here. We are looking at *how* and *when* the algorithm becomes available to actors. In this particular article we look at the hesitations that occur *when* the algorithmic becomes available to actors in the setting of housing decisions.

Drawing upon a broader project covering the wider UK housing sector, including interviews with over 111 stakeholders in a sample created to enable a range of perspectives to be gathered on the role of algorithms within decision-making in the sector. This article draws directly on a corpus of 50 qualitative interviews with participants from across the PRS, including a variety of landlords, individual letting agents, organisations representing letting agents, tenants, other rental market stakeholders, and directors of (either fully or partially) automated tenant referencing platforms. Ethical clearance was gained from the host university and the semi-structured interviews were conducted over Zoom conferencing platform throughout 2022 and into 2023, with the recruitment targeted at specific subfields within the sector, including tenants as well those working in different parts of private and social housing. The fieldwork aimed to understand the 'complex socio-technical assemblages' that surround computer code and its use, as the code is 'relational, contingent, and contextual in nature' (Kitchin, 2017, p. 18). So the range and content of the conversations were framed to address the construction, operation and impacts of the applications. Nvivo software supported the thematic analysis of the interview data.

In the case of this article, the focus was upon the PRS as the space in which automation was expected to be particularly advanced and so allowed for an examination of the limits of algorithmic intervention as they are currently experienced. In the UK the PRS, through which renters access housing, is a site of change due to the wider shifting political economy (see Kemp, 2015; Migozzi, 2020; Rugg, 2022) and the regionally specific processes of financialisation (Migozzi, 2020) of which it is a part. At the same time it has also become subject to the potential inequalities and injustices of wider 'data politics' and the more specific impacts of 'tenant screening as a data-capture process' (McElroy, 2023, p. 57) – with the use of algorithmic screening techniques that, in some cases in the US, 'manifests the larger systems of racial exclusion in which it is situated' (Rosen et al., 2021, p. 816). Within this varied context, private rental is subject to technological transformations that pose important questions about housing access and potentially about exclusion too, especially as algorithmic systems are integrated and subsequently take aspects of judgement and decision-making out of human hands. Cleary situated and specific forms of analysis are needed to explore these developments as they unfold in a variety of ways.

In this article we look directly at how algorithms are operating within the UK PRS and how they are being implemented by those involved. To focus and engage with the participants' understanding of these processes, in this instance, and to be able to compare across the sector, the researchers focused the analysis for this article directly upon the way the participants discussed and articulated ideas around the key terms of automation, auto, automatic and similar variations.

To develop the concept of automation hesitancy, which is its key finding, the article looks at why this hesitancy exists, what its limits are and at the role that future horizons are playing in reshaping those limits. Beginning with what we will call confidence deficits, we look at how a lack of trust can impact upon the extent to which participants were willing to implement algorithmic systems within decision-making. The article then explores how those confidence deficits lead to a retention of what is widely thought of as humans in the loop. We focus on how limits are established to manage senses of risk. We then look at the ongoing and temporal features of automation hesitancy by bringing out the future horizons that orientate it and which inform its directions. We explore here how participants articulate that future and the type of durations of change within which they are situated. Overall, the argument uses detailed analysis of the PRS to challenge any existing notion that the integration of algorithmic decision-making is slick and frictionless, offering instead a series of insights into the types of liminality and reservations that are creating variegated algorithmic social landscapes.

## Confidence deficits

Within a broader analysis of the way that data take on a type of 'afterlife', Ebeling (2022, p. 44) has identified 'asymmetries of trust' as being a key factor in how and 'where data divides'. The key question raised by Ebeling concerns how trust is cultivated in data to build confidence – this is a particular challenge because, it is identified, 'mistrust is at the core of the legislative and technical systems of personal data management' (Ebeling, 2022, p. 44). On one side then, we have the potential for a lack of confidence in data and data systems. On the other side, there are also questions of trust concerning AI, algorithms, and automation more generally. Markham's (2021) analysis of the seeming inevitability of AI shows how those futures are questioned even if the visions prove to be obdurate. And, of course, there are many accounts of the need for trust where human judgement and decisions are side-lined in favour of emerging forms of AI (Collins, 2018; Dyer-Witheford et al., 2019). These create complex questions about what is meant by discretion in the context of algorithmic interventions (see Hall, 2017). It has even been questioned whether *trust* is the right term or whether we should be thinking instead of 'reliance' (Ryan, 2020). Of course, there are wider questions here about the role and presence of trust in the integration of data informed algorithmic systems. We aim to deal with the specifics of our particular case in order to reveal some of the subtleties that occur in the material and routine integration of such systems.

As we have indicated, one factor that provokes and defines *automation hesitancy* might be thought of as a tangible but shifting set of *confidence deficits* that exists around automation. These confidence deficits find particular form in the specific contexts where decisions are being made, such as in the housing sector. This is where a limited trust in the systems, along with a gap in what is considered trustworthy, acts to dampen, and

contain the application of algorithms within decision-making. Confidence deficits are found where the actors involved are not fully convinced of the outcome of an automated process and so limit its application and usage. This is where trust is yet to be established and so the expansion of automated processes is restricted. Such a boundary is not fixed, it is highly elastic. There are changing senses of confidence in such systems. For instance, one respondent, working in tenant referencing in the PRS, explained that:

> I would say every report is reviewed by a human before we send it. We assess everyone individually. We are automating more of the process as we go, but only when we're confident in it. Only when we have a very high degree of confidence in whatever we're automating. Automating is helpful because you are, even potentially, you know, theoretically more prone to human error than technical error, though you can also have technical error. (TR1)

The presence of potential 'technical errors', as it is put here, adds a degree of caution in implementation – even though there is also a competing notion of human error articulated within this. This and other types of risk have led this respondent to seek out other forms of security, saying that 'we actually have an insurance policy on ourselves for human and technical error in case we mess up' (TR1). There are confidence thresholds that need to be reached – which themselves might be subject to automated risk profiling – in order for the practices to change and for deficits to be resolved to a sufficient enough extent for action to be taken. Even here though, as we will explore later, there is depiction of automation as an ongoing set of processes in which more automation is pursued and where algorithms are seen to be an increasingly helpful presence. These futures are balanced in a present form of automation hesitancy where confidence needs to be built for thresholds to be crossed in terms of the depth and extent of automation in these decisions.

We find this type of confidence deficit restricting the expansion of automation elsewhere. In the assessment of another respondent, who is involved in lettings within PRS and working in an organisation representing letting agents, 'when you really start to look into the products that are out there, the digital ones, purely digital, with no human intervention at the moment, are not good enough' (Stakeholder 7). The extent of confidence deficits are not universal but appear to be contingent on the role of the individual actor within the sector, and also on the experience of the existing systems. The more profound automation hesitancy of this stakeholder will clearly be ingrained and less readily resolved. In other places confidence deficits are to be found but in less pronounced form, such as the observation made by another respondent who also worked within a representative organisation involved PRS Lettings, that 'it's not automatic that high-tech is more thorough' (Stakeholder 6) – though views, as we will see, contrast sharply on this. Another concern is with what the automated system might miss, which, as we will show, is a common thread in the assessment of risk, as articulated in the claim by the same respondent that 'I just don't think that any automated system would have picked that one up' (Stakeholder 6). Beyond this a further concern is the type of security issues that an automated system can expose an organisation to, with a further interviewee from a property platform pointing out that 'the other downside is security. It's becoming a really big one. When I say security, I mean fraud, ransomware, information security' (Stakeholder 3). It is clear that a number of competing worries inform these confidence deficits.

In other cases, it is the notion of trust that is central to the confidence placed in algorithmic processes. As this same respondent working for a property platform explained, of all the downsides 'one is trust' (Stakeholder 3). They go on to explain how the value within a letting agency is the control over the books. Anything that jeopardises or reduces aspects of that control can impact upon value. As such, there is a heightened sense of protecting that control of value. A high level of trust is required to automate such systems, especially if that system is then managed by another party. Putting the details to one side for the moment, it is clear that there is a deficit here in the confidence placed in such systems. High levels of trust are required for automation hesitancy to be reduced. A similar issue was raised by participants in relation to regulation and the potential for there to be a need to be able to explain decisions. The need to adhere to regulation created a sense of risk concerning the need to fully understand the process and decision in order to be able to explain it. This is something our project has observed beyond the PRS with one mortgage broker we interviewed explaining, for instance, that

> the only thing we do struggle with as brokers is that we're heavily regulated and we have to make sure that we are doing what we're doing, and when we go to a lender, and they question whether we've done it correctly. (Mortgage Broker 1)

The risk here is in not being confident of compliance with regulation as a result of the integration of automation.

Yet confidence deficits are not always communicated directly in quite such explicit terms or within the same framing of concerns and worries, they can instead appear in notions of risk and trust found in descriptions of particular processes. That is to say that confidence deficits are embodied in accounts and practices. Confidence deficits shape and drive automation hesitancy in different ways, some of which are embedded in how decision-making is understood. Confidence deficits can also be implicit in accounts of the way that the human is retained within the loop and in how established limits around automation are communicated.

## Establishing limits and keeping humans in the loop

As the above indicates, automation hesitancy and confidence deficits can be managed through the retention of the human within decision-making processes. This is often presented as a balance of roles between the human and the algorithm in which the level of human and algorithmic influence are quite tightly managed. As one respondent representing the interests of landlords described:

> I think it's always a balance. It's always a balance to be sought. Some of the information you get from the automated processes is delivered so much more efficiently and so much quicker than you would doing it manually, and it's of the same quality and that's great. I just think in a lot of use cases it needs to be allied with a bit of judgement. (Stakeholder 1)

Again, this balancing, to use their imagery, is depicted as ongoing and open to change. A rebalancing can occur depending on the circumstances. One key aspect of this description is about the speed of decision-making facilitated in this balancing of human and algorithm. Speed alone though is seen to be risky and so a key aspect of the retention of the human is the 'judgement' they can bring (we will return to the questions of

accelerated decisions later). In almost all cases importance is placed on a human aspect in these housing decisions even if it is equipped with the technical. As another respondent working in the tenant referencing industry described, 'you have to dissect each of these sections one by one, to see what side can be done automatically, what side can't be done automatically' (TR2). In this case the components of the processes are picked apart to make decisions about which bits to automate. Statements such as 'we certainly experience a lot of human input into the referencing process' (Agent 1), which was from one letting agent, or that 'not much is automated' (TR5), from someone working in tenant referencing, or that 'it's automated but yes, effectively it's manual' (TR7), indicate the reality of the retention of the human within these decision-making processes. These observations are not uncommon and show how retaining the human within processes is seen to be valuable, even if this is in complex balance with the automated. These are also indicative of the variation in the depth and extent of automation in the sector and the varied but defining presence of different forms or levels of automation hesitancy that shape them. Often there are various types of combination of human and algorithms already embedded in housing decisions, it is this balancing that again is to be found in the accounts. For instance, another respondent working in tenant referencing pointed out that in 'tenant referencing, our view is that the right combination of technology and humans gives the best view of a tenant in terms of obviously, whether they should or shouldn't move into the property' (TR4). A narrative of the ongoing stabilising of the human and the machine seems, for now at least, to have established itself.

We have seen mention already of the concern that automated systems might miss things that humans are deemed to be able to spot. The perception is that keeping the human actor means that the process can be more responsive to the details and more flexible in finding useful outcomes. Implicitly it is thought that expertise and a feel for a good decision are important. Systems, it was pointed out by the respondent working for a property platform,

> can make a recommendation, and whether it's a physical recommendation from an individual, or it's an automated system that, based on the algorithm … In either way, they're only ever a recommendation at the end, it's up to the agent and the landlord to decide. (Stakeholder 3)

The human here has the discretion whilst being informed by a recommendation – the algorithmic input is circumscribed and limited through its labelling as a 'recommendation'. Within this it is the judgement of the human that is suggested to be of value and that is not yet considered to be replaceable by the algorithm. As it was explained by this respondent, 'the only difference, I suppose, between the automated and the real person doing it, is a *real referencer* [*sic*] will be able to question if something doesn't look right' (Stakeholder 3). Spotting something that doesn't appear 'right', having that type of sensitivity, is a property attached to the human actor here. In another instance, after indicating that fully automated processes are not desirable, another participant working for an organisation representing landlords, provides an example of a missed detail adding that

> I don't think an automated system would have picked that up. That's why I say that you need a human to look at this. There is always human intervention required, because you're

> looking for the unusual transactions, because that tells you whether there's a problem. (Stakeholder 6)

For now, the human is deemed uniquely capable of spotting the unusual.

The human actor is perceived to be able to spot such issues and to be able to adapt to information more readily. In one instance a respondent working in tenant referencing described this in terms of the presence of a 'human' or 'personal touch'. They explained that

> some of the time, like on the rare times that you come across someone who's not that easy to understand the circumstances of, then it becomes a human touch, a personal touch, to understand what their actual story is, and it's about telling that story to the landlord. (TR2)

The coldness of mass processing is contrasted with a more personal assessment. The human actor here is understood to be able to narrate the data and understand the individual's story. Automation is seen to lack that kind of narrative and to only place things into boxes. This respondent continued, putting this in the following terms:

> The reason why I don't particularly like … doing a tick-box activity. So they have an approach in their head with certain things where they believe should be checked, and certain indicators, and they follow that by heart without actually applying human intelligence to it, because this is not an area where I believe you can do everything 100 percent automated. You have to apply human intelligence. (TR2)

It is the concept of 'human intelligence' here that becomes the means of articulating a key lack or absence in the perceived automated system. They are clear that you have to apply 'human intelligence' in order to be flexible to the circumstances. Aside from sense checking, humans are required to intervene as landlords' risk and business models may vary and the proprietary software is not customisable.

Human intelligence and an analytical eye define how automation is approached in the sector. Another participant this time involved in tenant referencing was asked about using fully automated decisions that might occur if a tenant is obviously strong. Even in such instances the human is retained to check and review the decisions. They described how they

> would still review it with a person, top to bottom, yes. It doesn't take necessarily too long to do that. It might take a minute or two just to go through it, but we would still do that, just because we want to ensure it looks right. (TR1)

Again it is the spotting of what might not look quite right within the data where the limits of automation are placed and where the hesitancy is to be found embodied. In a recent project Waldman and Martin (2022, p. 11) explain how they found that:

> governance of algorithmic decision-making matters significantly for legitimacy. Greater perceived legitimacy was associated with human-in-the-loop governance compared to the other form of governance studied … More specifically, human-in-the-loop governance increased the perception of legitimacy of algorithmic decision-making across the board, while notice governance is only sufficient to legitimise non-pivotal decisions.

As with their findings, we see in our case how legitimacy is placed in forms of algorithmic decision-making that retains the human in the loop. This retention of the human within the systems was important in ensuring the perception of the legitimacy of outcomes.

Similarly, we found that this human involvement reinforced the decision and reduced a sense of riskiness whilst also maintaining a sense of expertise and discretion.

Even in instances where automation has been more fully embraced – and where automation hesitancy is less pronounced – the human is retained for the types of properties that they can bring. Asked about referencing as being fully automated one response was

> Yes, the computer does all of that. … If it's a borderline, it needs a bit of investigation. Most will pass; some will instantly fail and some will then go to human review, but it's a very quick human review. It doesn't take too long, so I would be as bold to say of that whole process, 95-plus per cent is tech-driven. (TR4)

Even where automation is more central to the process, with algorithms being actively used already, the human actor is there to review and oversee decisions in borderline cases. The levels of automation vary across the sector. As one stakeholder working across the PRS explained, it is clear that it 'varies between the companies', and that 'it's not always that accessible because some of it is completely automated, and I don't fully understand everything that I've read in some of those reports' (Stakeholder 1). Taking an extreme example, they added that 'I think they were so automated, they were so process-driven, that actually there just wasn't someone there, there wasn't a human at the end of the phone, to give them an answer. It really does vary on that spectrum' (Stakeholder 1). Here the human is almost fully excluded, it seemed, yet this was presented as one example within a spectrum across which the extent of automation varied.

It is clear that there are a variety of levels of automation – defined by varying levels of automation hesitancy – within the PRS, but that these all seek to retain some role for human discretion, checking and judgement. Another way this was put to us, by the same respondent, was that where the aim was something closer to integration, the notion of a hybrid system was articulated:

> The one that we currently use is a bit of a hybrid, so it has more of a manual element in there, but then you've got a tiered basis. We offer people a fairly straightforward automated process or a higher-tier comprehensive service where a person is actually checking documents. So far as the market is moving towards those platforms, there's an increase in people using the automated systems. (Stakeholder 1)

According to this assessment the direction is towards this hybrid type model. Here we see both the limits in action and also the sense of ongoing change in a certain direction – and also the premium level service being attached to greater human involvement too. Similarly, a further respondent in tenant referencing gives this impression of the impending move towards greater automation that is tempered by the need for human intervention:

> Again, thinking about moving towards more automated process. We'll still have a referencer, so a manual person looking over that data and saying yes, we definitely feel confident in that. So, there's still always going to be some sort of manual intervention to make sure we're interpreting that data correctly, but actually getting that validation, and that back and forth, isn't going to take us long. (TR8)

Validation of the decisions remains important. The correct interpretation of data remains the core aim that informs the balance of algorithm and human within decision-making processes – this is indicated to be something that will persist and that will shape the future extent of automation. Automation will advance, it is suggested

here, but there will always, it is also suggested, be human intervention within that process. This human intervention is seen as necessary to add validity to the outcome. In their survey-based project into the perceptions of algorithmic decisions, Lee (2018) found that it was the nature of the task that was important in the trust placed in the algorithm. In particular Lee (2018, p. 13) found that the 'task characteristic' was important in perceived decisions and particularly whether the task is better suited to human or mechanical skills. We may be seeing some of this judgement over the relation between task and skills to be part of the retention of the human in such housing decisions. This interest in change also points to the types of future horizons to which we will turn in a moment.

Yet it is important to show caution in attempting to assess how automated a particular decision or process might be. A decision can appear more automated than it actually is. A process can seem to be algorithmic when it is not. So, we need to be cautious about assumptions based on appearance. As one respondent pointedly remarked:

> you would probably think that [this] … is an automated reference flow, because it looks like an automated reference flow. It actually isn't. There are 50 people sitting in a room in [a UK city], who spend all day, every day, actually doing them. From a tenant, they will think that it's entirely automated. (Stakeholder 3)

They added in a separate exchange that 'It will still look like it is entirely automated, but no, there will be a real person that will be receiving the information and checking its accuracy, in our hub' (Stakeholder 3). The level and balance of automation can be part of how a decision or process is represented as a part of an outward facing representation of organisational or brand values. This needs to be factored into any assessment of the extent to which automation has occurred. A company may wish to appear more automated whilst wanting to retain a highly human form of assessment.

Fisher (2022, p. 6) has argued that 'it is not human beings as such that are being relegated by algorithmic decision-making; more specifically, what is being relegated is their critical faculties'. It would seem that this is something that is sometimes resisted if not fully rejected in these housing decisions – there is then a kind of 'algorithmic interpellation' (DuBrin & Gorham, 2021) in operation in which we are hailed and incorporated into new subjectivies by the systems and their logics. The above indicates how a type of balancing is occurring in which the perceived properties of human assessment are seen to represent a solution to the limits of trust and confidence deficits placed in algorithmic systems. The suggested need to retain human actors in some capacity is wrapped up with the integration of automation. These established limits are important for understanding the ongoing changes and the way that automation hesitancy is a tangible part of the expansion of algorithmic processes.

## The notional horizons of automation

The above sections begin to illustrate the way that a sense of a future horizon comes into view as participants reflect on the changing role of algorithms within housing decisions. The near future continues to largely retain human intervention, as encapsulated in the observation made by one stakeholder that 'in terms of the decision bit, I think there's still people want to be in control of that' (Stakeholder 2). An element of control is protected, but there are also barriers in terms of habit and established practice that create

limits. The embedded nature of existing processes can act to reinforce the more active focus on the integration of automation and the limits presented by automation hesitancy. Yet there exists a moving horizon beyond that in which the balancing act of human and machine is thought to be changing towards something more automated. The human might be retained in the system because that is how things have been done in the past, yet there is also a sense of ongoing change. One participant, with a wide knowledge of the prevailing sensibilities of UK landlords, noted that

> some landlords, or quite a significant amount of them, they are sceptical about these tools … They've got their tried and trusted method that they've used for years; they're not going to budge from it. I call it *landlord inertia*. Landlords are very set in their ways. (Stakeholder 4)

There may be a reticence whilst also being a notion that things will progress towards greater automation, breaking with established practices.

Markham (2021) has recently found that despite critical and questioning attitudes, an impression of an inevitable future in which automation and algorithmic processes continue to advance has solidified and become somewhat immovable. In the case of the housing sector, we found that although there are strong established limits and a clearly articulated need to keep humans within decision-making processes, there was also indication that change is continuing and that this would advance automation and the use of algorithmic systems even if this was seen as unlikely to ever reach full automation. Noting that decisions are currently reliant upon teams of staff, one stakeholder participant noted that 'I think the automated processes, they're emerging' (Stakeholder 3). Another in the tenant referencing field that 'if you think what is still missing, so we want to make it more' (TR3). There is a sense of continuing change and the increase of processes of automation. Embedded here is a hesitant, tentative and cautious 'will to automate' (Beer, 2023, pp. 128–130). One way this takes form is in the retention of the ideal of human decisions within expanding automated systems. As one interviewee working in tenant referencing underscored:

> Our main objective was to, obviously, automate as much as possible, but not in the sense of automating decision-making, so we don't have to do it. It wasn't particularly like that, it was at a level where we were utilising technology to enhance human decisions, so it wasn't to automate everything to make the decision. Further down the line, it wants to go to that direction, but we need to be 100 percent sure that the technology-enabled human decision is the correct one before you move that. (TR2)

We see here further echoes of the confidence deficits that are present and are causes for hesitancy about full or expanded automation, yet there is an interest in more automation that is seen to 'enhance' human decision-making rather than replace it – professional judgement is preserved (see Pasquale, 2019, 2020). It is a sense of direction rather than a jump to full automation that is articulated here and elsewhere. A kind of incremental change is envisioned in which steps are taken towards greater automation.

Even if things are not automated now, some communicate either a desire for or a version of this type of inevitability. One participant in tenant referencing revealed that although their 'product at least is not automated, I think … we can' (TR1). They add that 'the ideal thing would be to start automating some checks' (TR1). Another letting

agent doesn't even see this automation as representing any significant change to established practices, but a continuation of them, explaining that:

> In terms of automation I don't really see any bad thing with that. I don't really see what that's changing in terms of … Credit scores and credit history, that's always come from a third party and that's been instant for years now. That doesn't really change anything. (Agent 5)

In this case automation isn't really seen as change at all – instead it is a continuation of an ongoing process. Here there is a sense of there being very little barrier to these developments. Another agent again indicates the desired move towards further automation saying

> Yes, it'd be good to have a fully automated referencing tool where we could just trust that to tell us whether we can rent to them or not, but I think we would always still do viewings just to meet them in person as well. (Agent 3)

It may be that the type of role performed in the sector might impact on any enthusiasm for automation or for a reduced level of automation hesitancy – some aspects are either easier to automate or carry less risk and therefore require less confidence to be established before automation occurs.

Earlier we saw how speeding-up decisions could create nervousness about potential risks, yet if those risks are overcome then speed is also seen to provide opportunities for future efficiencies. One key reason for the overcoming of automation hesitancy and the expansion of automation in housing decisions concerns this combination of speed and efficiency. When asked about what automation will bring one letting agent responded:

> I think it'll speed it up, because if it's totally automated, presumably just clicking two or three buttons, the applicant can scan stuff in on their phone and send it – I could imagine that it could get really fast. I think it might reduce the amount of the personal relationship that we've got with people, and that's quite important, because we have got this long-term relationship, they could be there for four or five years, so it might dilute that a bit. I guess it could affect cost one way or the other, it could make it cheaper, it could make it more expensive. (Agent 1)

The presence of speed is pointed to as a means to overcome automation hesitancy – this is embodied in the image of only needing to 'click two or three buttons' to achieve an outcome. This agent imagines the ongoing acceleration of processing. Here also, again, is the active balancing of the presence of the human discussed previously, in this instance it is placed in relation to the speed-up that algorithms might yet bring.

Another letting agent makes a similar observation about future acceleration, concluding that:

> Yes, obviously if it's more automated in the sense that it would improve how quickly they could do things, then I think it's good because obviously tenants want to move into properties quickly and landlords want a tenant in the property as well. So, if it's automated and it does it quicker as well as at the same time delivering the same result, then I think it'd probably be a good thing, yes. (Agent 3)

The same result but quicker; this is presented as being the preferred direction, especially as this quickness might enable more rapid turnover. Another respondent also points

towards bigger organisations 'really trying to automate their processes to do volumes' (Stakeholder 2). Speed-up is again presented as being a key aspect of automation by another letting agent who adds that they:

> don't see any negative connotations to tenants or agents for further automation in that anything that speeds that process up. Ultimately, if it makes the outcome more accurate and achieved faster I don't see how that negatively impacts anyone. (Agent 5)

This agent adds in the idea of accuracy at speed in this comment, indicating that even where automation hesitancy is less pronounced there is still a sense of potential risk in the background. This is a sentiment echoed further by a respondent working in tenant referencing who added that

> I think that's the way we're going, is that it is more automation, but we'll never get to complete automation, but I think if we can get further and we can do it in a very responsible way, then it's doable. (TR1)

This is illustrative of Bucher's (2018, p. 157) observation that 'who or what is made accountable and responsible for algorithmic outcomes depends on how and where boundaries are drawn'. Here we see responsibility being allocated for outcomes and boundaries being drawn in practice. This respondent working in tenant referencing added to this arguing that when it comes to automation, they 'very much doubt it will be everything … when you break it all down, having confidence … it's certainly not going to be one day everything is manual, and this day a bunch automated. It's going to be very slow' (TR1). The horizon is present but may be some way in the distance for those involved in the quixotic logistics of decision-making and tenant referencing. There is an automation hesitancy wrapped up in this sense of slow development.

This focus on speed and efficiency led one interviewee to indicate that increased automation should be the norm and should be an ideal direction for housing decisions. They argued that

> that's what all landlords should be aspiring to achieve, because of the efficiency, because it saves time, because they can run their business from anywhere, because they can automate large parts of their business, because they can mitigate their risks. (Stakeholder 4)

Here the projected benefits are seen to be necessary and imperative – some ideals are forming in these visions. These future possibilities, it is claimed, outweigh any need for automation hesitancy. They also put this shift in automation in generational terms in which the passing of time will mean that inevitable increases in automation will occur as one generation of landlords moves on and a new generation with less hesitancy towards automation will dominate the sector. They imagine that 'a younger generation of digital landlords coming through, who totally get the benefits, they use these tools, and they're running very, very efficient businesses' (Stakeholder 4). In this generational account advancing automation is presented as inevitable because it is tied closely to the values of the generational differences in landlords. We are positioned, it is perceived, on the cusp of a form of what Airoldi (2022) has called 'machine habitus' in which dispositions are produced by the algorithmic structuring of social conditions. However, if a generational shift or a wider acceptance of property technologies focused within private rental is moving into a 'consolidation' (Wainwright, 2023, p. 347) period then this still

appears to be defined as a significant uncertainty and hesitancy with regard to the possibilities and risks posed by that future horizon.

## Conclusion

Of course, when it comes to the issues covered in this article, as one respondent put it, 'it depends on what you actually mean by automated' (Stakeholder 3). Clearly automation and algorithms are being made and remade as entities within the practices occurring in social spaces, such as the housing sector. Fields and Rogers (2021, p. 73) have argued that what is required is

> a digital research agenda for housing studies [that] must eschew technological determinism in favour of sensitivity to the interrelations between the digital and the wider forces that influence its role in changing the real estate industry.

The focus on the subtle details of the application and delay in the variegated application of algorithms means that this article is in part a response to Fields and Rogers' agenda. What we have shown in this article is the type of hesitancy that is apparent when algorithmic and automated processes are integrated into an established sector, in this case access to privately rented housing. Despite images of a race towards automation fuelled by the promises of what algorithms might make possible, instead we find the participants in the housing sector stepping quite gingerly towards automation. We have focused here on the private rental sector in order to bring out the required detail at the limits of algorithmic processing, but this type of automation hesitancy is also apparent in social housing, especially concerning evidential consistency and the maintenance of values. This is something we intend to develop in a dedicated future article.

As might be expected, a defence of expertise and judgement is a key part of this automation hesitancy – founded in these actors having a sense of what makes a 'good tenant' (see Bonnet & Pollard, 2021) – as are concerns about missing potential opportunities, making misjudgements or creating unforeseen problems based upon any decisions that are made out of view. In other words, there is a strong sense of risk that feeds into this automation hesitancy. We described this here as a confidence deficit that creates limits to the automation of housing sector decisions. This confidence deficit is communicated directly in some instances, and it is also present in the way that participants account for retaining the human in the loop and in how limits are established and future horizons are pictured. As such, we show here how ideals around the retention of the human, the presence of established limits and notional horizons shape how algorithms are integrated into housing decision processes. There is only a limited trust placed within automated processes in housing. The limits of this trust and the pronounced sense of risk work together as limiting factors that are embodied in this automation hesitancy. This is far from the image of slick and frictionless integration or the envisioned hurry to automate without question. Instead, there are barriers and limits that lead to a much more variegated algorithmic landscape.

Yet it is also worth noting the temporality of this automation hesitancy. Despite the hesitation and the sense of the need for humans to spot issues or enable decisions, there remains indication of an increasingly automated future. This future is based upon a mobile set of values around judgement, risk and trust in systems and in

human actors. These have changed and will continue to change further. As we found, in some instances there was a pictured horizon in which more advanced forms of automated decision-making were yet to come. This was placed in the distance, in a future where they had found ways of building-up trust in the system and where risks had been eliminated or placated. We wouldn't go as far as to say that automated housing decisions were presented as an inevitable future or where full automation was even likely in the foreseeable future. Rather this horizon acted to orientate present views on automation and to shape the direction in which things might be incrementally heading as algorithmic processes take on greater influence within this sector. These horizons gave the current form of automation hesitancy a temporary or contingent property in which it might shift at any moment should the right type of algorithmic system come along that moves things towards that horizon in ways that are deemed appropriate to established practices and modes of judgement. This appears to be a period of transition in which more change is thought to be coming, even if it is approached hesitantly.

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