Design and Evaluation of a Tool to assist Small-Medium Organisations (SMOs) to implement Automated Decision-Making (ADM)

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ABSTRACT

We present a new prototype tool intended to enable SMOs without specialist expertise in the area to implement Automated Decision-Making (ADM) with confidence. We report on the design and (briefly) evaluation of the tool, demonstrating the potential utility of a simple tool, implemented using easily accessible software (Microsoft Forms), to improve trust in the implementation of ADM.

CCS CONCEPTS

• **Applied computing** → Law.

KEYWORDS

Trust, Data Protection, GDPR, Small-to-Medium Sized Organisations

1 INTRODUCTION

We present a new prototype tool intended to enable SMOs without specialist expertise in the area to implement Automated Decision-Making (ADM) with confidence. For the purposes of this paper, ADM means decisions taken about an individual without human intervention. ADM can be used by SMOs in a wide variety of business contexts, such as risk assessment, price calculation and content recommendation. We report on the design and (briefly) evaluation of the tool, demonstrating the potential utility of this simple tool, implemented using easily accessible software (Microsoft Forms), to improve trust in the implementation of ADM.

1.1 Motivation

ADM is now a part of our everyday lives and continues to grow exponentially. ADM technologies are used in many ways daily, whether to guide us with seemingly innocuous matters such as what to watch on TV or more important matters such as assessing our capabilities or medical conditions. The different technologies, and the constantly emerging ones, combined with the varying context use, make for such a broad and evergreen topic that it is impossible to capture accurately in the written word with any level of longevity. The existential capacity means it is understandable that many organisations will want to reap the benefits of ADM technology [1]. However, adopting ADM technology is not without its risks. These risks include discrimination and bias and the possibility of economic and consumer harms. Other currently unforeseeable risks might develop as technology improves.

SMOs need to assess the risks of ADM, be compliant with the law and be able to show these by being accountable for their decisions. If they fail to undertake this exercise, they are exposed to regulatory risk, and individuals who have decisions made regarding them may suffer detriment. Organisations looking to implement ADM technology must balance the potential growth and their future against the existing uncertainties and the additional challenges the advancement of technology brings. SMOs must understand how to interpret the law and ethics to balance the benefits and risks to make an informed choice on whether to proceed with implementation.

SMOs are a valuable part of our economic structure. Small to medium-sized enterprises make up 99.9% of the UK business population [2] and such organisations often have fewer resources, such as finance and personnel, than larger organisations. Such businesses often do not have the in-house expertise to assess the regulatory requirements that apply to their implementation of ADM technology, and resources used to obtain external advice may be more productively spent elsewhere. Therefore, a method of support for them in responsibly implementing such technologies is necessary.

1.2 Context

The overarching research concerns looking at ways to aid SMOs in fulfilling accountability in ADM. While accountability is a difficult concept to define, we chose accountability as our focus because it is the overarching principle in the General Data Protection Regulation (GDPR). Many ADM technologies fall within the scope of the GDPR, thus meaning organisations will not be GDPR compliant if they lack accountability is missing or falls short. Secondly, there is evidence to suggest that boosting accountability can improve trust [3].

We appreciate that much work is being undertaken creating international standards [4], but this work is distinctly different. The output reported in this paper is designed to be an accountability tool that benefits smaller or newer organisations where international standards could be out of reach for several reasons, such as finance, resources, or complexity.

We set the context of the research on the premise that organisations and their workers desire to do the right thing by their organisation and by the people they serve as well as society.

1.3 Research Problem

There is a need for workers in organisations making decisions about the implementation of ADM to understand and navigate ADM and know "'what good looks like" [5]. Therefore, there is a need to create some certainty and uniformity in how organisations record their decision-making when implementing ADM technology, or it will soon create multiple issues for all parties. Due to uncertainty and confusion, organisations failing to understand the law may face sanctions when implementing the technology. There is also a risk that organisations may suffer reputational damage, affecting their survival ability. Individuals may find themselves subject to unfair or discriminatory decisions, and owing to ADM's opacity, it might be difficult to seek redress. The more issues arise, the more likely society will reject ADM, as they will lose trust, and we will lose out on all the benefits the technology can provide.

2 THE PROTOTYPE TOOL

2.1 Existing tools

We appreciated that neither our idea of creating a tool to support organisations with decision-making [6], or more explicitly, supporting decision-making in ADM [7] may not be original in itself, but we always intended our originality here to be based on looking and reflecting on existing tools to propose our unique solution to help SMOs with accountability in ADM. We ensured the prototype's uniqueness by collating, reviewing and comparing the existing types of tools, such as questions, checklists, etc. We then considered how they functioned, such as whether they required face-to-face contact, had a physical document, or contained programmed logic, e.g., a decision tree. We used this information combined with our own professional experiences and expertise to develop our creation as a proposed solution to the Research Problem.

The basis of the review was to understand the tools available to an SMO online, so we excluded literature behind a paywall, as it is unlikely they would pay for these services. We searched on Google because we wanted to follow the pathway of SMOs, and while other search engines are available, we thought this would give me sufficient insight into what SMOs can easily find.

Our keywords were: "automated decision-making tools for organisations", "AI tools", "automated decision-making impact assessment" and "AI impact assessment". We conducted each of these searches with and without including the word "accountability".

After choosing our keywords, we concentrated our search on tools for use by SMOs based in the UK but could be subject to either or both UK and EU laws. The law here was not our primary focus, though, as it focused on finding examples of practical tools to help organisations with ADM. We also only focused on horizontal-style tools, i.e., in that they are not sector-specific. As we emphasised tools, we did not consider recommendations, guidance and reports as they did not add to this part of the analysis for the design and construction of the prototype.

We initially found the main concentration of information surrounded the approach countries were taking to advance their management of AI [8] or recommendations on how they should seek to do so [9]. We also saw several threads with a topical focus, such as documentation to assist government [10] and healthcare sectors [11]. We also found a Global Map of AI Assessments [12], which provided a more extensive database of results and an overview of current activity.

Overall, we found various focuses in this area, such as ethics, algorithmic, transparency, accountability, equality, human rights, data protection, and privacy. The overall results also showed mixed threads related to using AI to automate decision-making rather than our focus on designing and constructing a tool to enable better accountability when looking to implement ADM [13].

We then reviewed some existing frameworks we had found to provide deeper insights. This selection demonstrated tools from different author fields, including a UK regulator [14], an EU expert group [15], CDT is in the US [16], Future of Life Institute is an EU NGO [17] and Microsoft, a private organisation [18]. We allocated the advantages and disadvantages based on our experience in industry of what we believe might work well and not so well in SMOs. We also based all advantages and disadvantages on factual aspects to limit the subjective bias. For example, we kept the comments objective and factual, such as the ICO accountability tool, that the guidance is readily available because this featured in the top of the Google search results.

2.2 Designing the Prototype Tool

Following the review of existing tools, a prototype tool was built. The prototype was intended to be useable by inexperienced users within SMOs and was built to provide sufficient information to enable such organisations to responsibly implement ADM with confidence. We also wanted to provide SMOs with documentation that gave consistency of record-keeping, thus assisting accountability, with aspects such as product lifecycle and queries. This tool was built to be used by SMOs as part of the process of making decisions about the implementation of ADM.

The prototype tool has three layers; the legal layer; the question layer; and the implementation layer. The legal layer was constructed first. It provides an end-to-end account of the considerations that apply to ADM under the EU GDPR, accompanied by references to the relevant parts of the regulation. Lawyers can be expected to use this layer to follow through the process. Above the legal layer, a question layer was constructed. This layer poses questions that a user should ask themselves when making a decision regarding the implementation of an ADM system. These questions build on the legal layer. Where the legal layer asks "does Article 4(1) apply?," (Figure 1) the question layer asks "is personal data being processed?" (Figure 2) alongside providing assistance to the user to answer the question accurately.
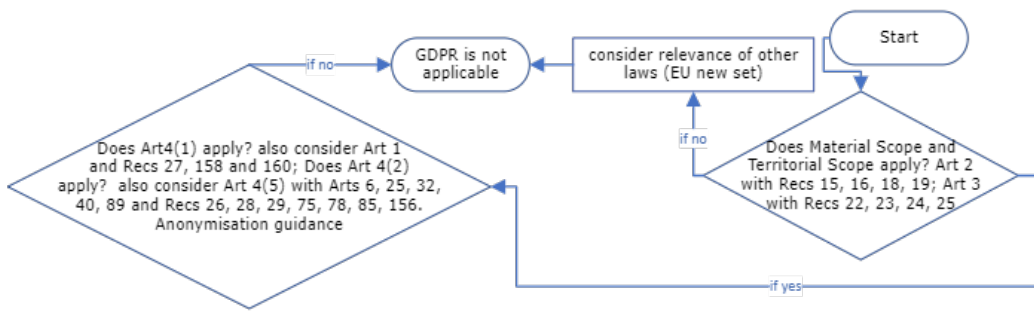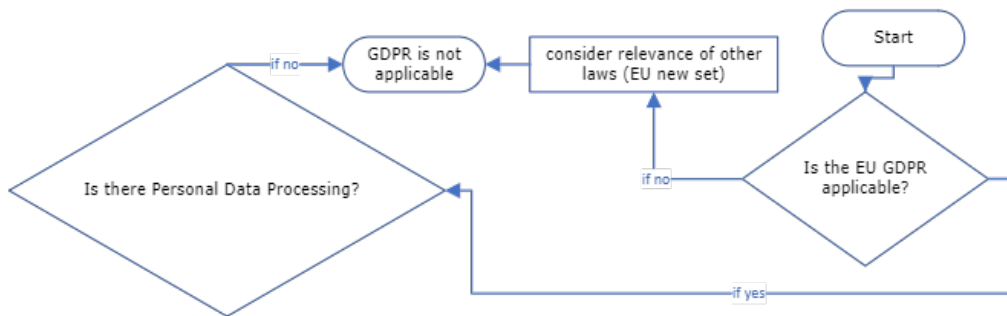
Figure 1: Legal Layer
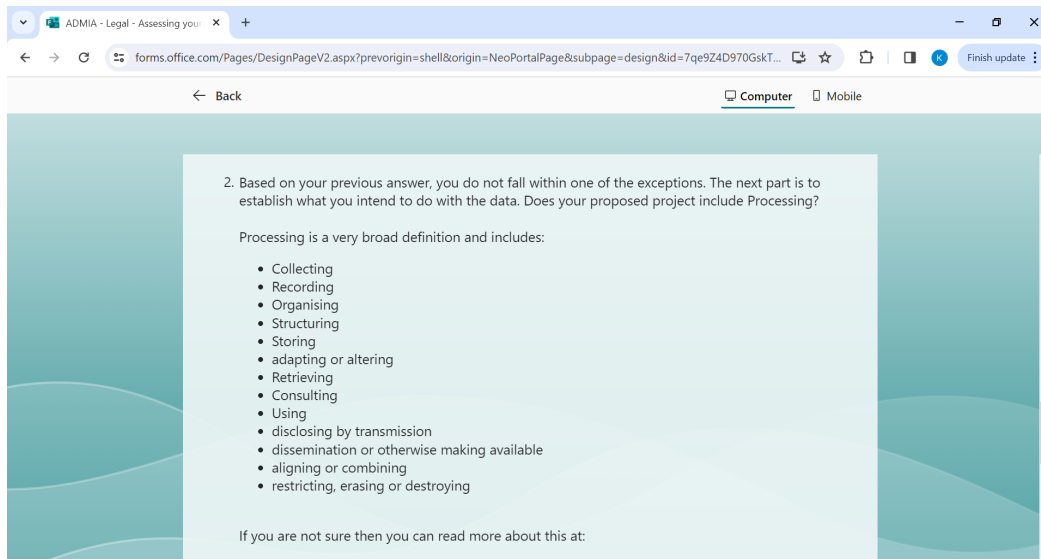

Figure 2: Question Layer

Figure 3: Implementation layer

If a user answers "no" to the questions using the legal or question layer, it will have the same effect; that the GDPR is not applicable and the user will exit the tool with guidance to this effect.

The implementation layer (Figure 3) sits above the question layer, which leads the user through the end-to-end process by asking them questions via a Microsoft Form. The questions asked at the implementation layer are designed to be answered by a person without familiarity with the regulation underpinning ADM. Taking the previous example of processing personal data it is broken down into stages, a snapshot is shown below:

The form uses branching logic to ensure that the appropriate questions are asked, mapping to the routes through the legal and/or

question layers. The tool was built so that users could not skip questions posed, as this could be problematic in creating incorrect answers and unreliable assurance. The branching logic that can be utilised in Microsoft Forms is unsophisticated, and this meant that some questions had to be repeated in order that they appear in the correct place for the user. In particular, it is difficult for the user to move backwards in the questions to answer a question that their route has previously avoided, but which becomes relevant due to their later answers.

After answering the questions posed in the Microsoft Form, the user will reach one of 14 possible endpoints via one of 81 potential routes. We calculated the possible endpoints and routes using a depth first traversal algorithmic calculation, "all paths from a given source to a destination" executed in a Python compiler available online [19]. Each endpoint and route is associated with a summary response regarding the potential adoption of an ADM technology. The response outlines the legal position based on the response to the questions posed in the implementation layer which includes action points, suggestion points, suggested reading, and accountability statements. Action points cover the mandatory aspects of GDPR compliance, for example, the need to undertake a DPIA. Suggestion points do not act strictly as a requirement but are instead best practice. Suggested reading provides the user with additional resources should they have further questions or want to learn more. These resources are drawn from official sources, such as the EDPS and the EDPB. The accountability statements encapsulate the record-keeping and decision-making responsibilities, who is authorising the project, and future monitoring and review aspects.

This summary response is built using a statement library, which is used to construct a customised response based on both the endpoint reached by the user and the route taken through the end-to-end journey. The precedent paragraphs are allocated to the user in order that they receive a tailored response. In the initial testing of the tool, the transmission of the summary response to the user was not automated. Instead, we constructed the response using the statement library based on the endpoint and the route by which the endpoint was reached, and then sent to the users by e-mail. Automation of this step is the intention for the next iteration of the tool.

Whilst it is possible to use the form through the flowcharts that encapsulate the legal and question layers, the implementation layer is to be preferred, particularly if the user is inexperienced with ADM implementation. The implementation layer has the advantage of capturing the responses and storing them consistently, where a user working with the flowcharts would have to remember the route they had taken through the layer. This has the potential to lead to inaccuracies, whereas the implementation layer ensures that users who reach the same endpoint via the same route will receive the same summary response.

A number of pilots were undertaken to help iteratively develop the tool, testing the robustness and understandability of both the questions asked in the implementation layer and the advice produced by the statement library. Initial pilots took place on paper, before building and piloting the implementation layer on Microsoft Forms. A number of changes were made to the tool to improve the user journey and ensure that the summary responses were useful in implementing ADM.

2.3 Evaluating the Prototype Tool

Five users were recruited to provide feedback on the tool. One user withdrew from the study so they are denoted participant two to six. Each user completed a questionnaire prior to using the tool and then used the tool, applying it to an ADM product that they wished to implement within their business. After they had used the tool they completed a standardised questionnaire regarding the usability of the tool, and took part in a semi-structured interview. In the semi-structured interview, participants were asked about the features of the tool that they liked and disliked, changes that they would make to the tool and the implementation of ADM technologies in their organisation.

In general, all participants liked the tool and expressed that they would use the system frequently.

> (. . .) it represents a significant advance on old fashioned ways of doing it with long word documents that had to accompany things or training that you had to go on before you could fill in something. (Participant Three)

> I see it that the tool could be maybe used for companies in which they can't afford, or they don't have an expert on GDPR, and I think this tool could really be beneficial for the time, especially considering how simple it was to use and how beneficial the outcome was. I was very happy with the tool. (Participant Four)

One participant went further by emphasising the importance of having a tool like the prototype by saying:

> I think we could use something like your tool, and it would give us that level extra level of detail that we'd get without having to manually go through and do that. (Participant Six)

And:

> (. . .) if we had this wonderful tool, we've got 99% of our answers and anything else we can get as the project moves forward, and we can use it as a working document that should be. (Participant Six)

Most did not think the prototype was complex; it was easy to use and did not require a technical person, and the functionality was well-integrated and not inconsistent. The majority also considered that learning to use the prototype would be easy and not cumbersome, and they felt confident using it.

Participants provided some feedback on user experience, to make the content prettier, so "not so listy", to involve nicer looking hyperlinks (Participants Three and Four) and to provide some indication of completion time as the user goes through the prototype (Participant Four).

The participants raised as a limitation the tool, its lack of ability to handle nuances. Obtaining certainty of process and flexibility in one tool is difficult. The nuances in this situation could be addressed by incorporating a specialist human, but this could be difficult for SMOs who do not have access to such expertise. The role that such a human could play in interpreting and implementing the summary response could be part of a future iteration of the tool,

with collaboration between the tool and a human expert being one possible avenue for further exploration.

3 CONCLUSION

We have reported on the design and implementation of a prototype tool that enables SMOs to attain assurance when implementing ADM solutions. Such organisations often do not have the personnel, funds or expertise to undertake complex assessments prior to implementing such technologies. However, such assessments are essential for accountability, and to enable trusted implementation of such systems. The prototype tool enables organisations to receive tailored advice on the implementation of their system without the need for engaging with complex legal and regulatory documentation. In less complex cases, this tool may negate the need for obtaining legal advice. When tested with a small number of users, feedback was positive, demonstrating the potential for this tool (or one like it) to play a role in the trustworthy and responsible adoption of ADM. Further work is needed to provide robust evidence of the tool's effectiveness and to explore a broader range of test scenarios, with different types of ADM technologies being implemented in different types of SMO. As the tool develops, further modules will be added, including a tool to assist businesses with ethical decision-making when implementing ADM technologies.

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DATA AVAILABILITY STATEMENT

The data from this project can be found at doi:10.17639/nott.7438.

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