Investigating the potential discriminatory effects of the use of facial recognition software by the EU Settlement Scheme

Citizens Advice Liverpool

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Table of Contents

Acknowledgments

Executive Summary

Research Project Context

This research project was undertaken by an undergraduate student at the University of Liverpool and facilitated by Interchange. Interchange is a registered charity in partnership with the University of Liverpool, which connects students wishing to gain undergraduate research experience, with volunteer charity organisations that wish to commission a piece of research on an issue of their choosing. The volunteer charity organisation in question is Citizens Advice Liverpool, an organisation which has been providing advice and advocacy services to anyone in the Liverpool/Merseyside area since 1939, as is part of a nationwide Citizens Advice network, resident within most major UK cities and areas.

Research Questions

After briefing, key research questions were formulated to best analyse the situation in a concise and accurate manner as to best achieve the objectives of the interchange project. These questions were:

- Is there any evidence of a discrepancy of service experience within the EU Settlement Scheme (EUSS) for European Union (EU) citizens with BAME heritage?
- How does this fit into the government's 'digital by default' strategy?

Methodology Used

The research in this report has been compiled and analysed from pre-existing secondary data which has been provided to the researcher from Citizens Advice Liverpool. The research consists of anonymised quantitative case-notes provided to the researching student by Citizens Advice Liverpool regarding issues faced by clients going through the EUSS. This data has been analysed using IBM SPSS software and is presented to provide insights into issues being faced by clients of the EUSS project, and the kind of support needed from Citizens Advice Liverpool.

Key Findings

- There is a statistically significant correlative link between one's ethnicity and their application to the EUSS. People of BAME heritage, especially those of African

heritage are most likely to encounter issues with the EUSS than applicants of other ethnic groups.

- The software deployed by the Home Office for facial recognition and document identification for the EUSS is not fit for purpose, with 26.47% of all clients of Citizens Advice Liverpool encountering issues with the software for reasons out of their control.

Conclusions and Recommendations

- An independent review of the Home Office's deployment of facial recognition and document identification software for the EUSS despite existing evidence that these types of software were problematic in deployment.

- An immediate replacement of this software by the Home Office for one which is more diverse in its facial recognition capability.

- Pragmatic introduction of a side-by-side physical application process for the EUSS and other digitalised Home Office systems which rely on similar software to that used by EUSS to provide equal access to government services by all, regardless of ethnicity or access to digital facilities.

Introduction

Why has this project been undertaken?

This project is being undertaken as Citizens Advice Liverpool have become aware that the Home Office's EUSS project is potentially discriminatory for some people. According to Home Office, as of January 2022, 5,300,000 applications from EU nationals have been processed and have successfully been granted a status of either 'pre-settled' or 'settled', meaning the continued ability to live and work in the UK post Brexit (Home Office, 2022). Along with this number however, 227,700 applications in total have been unsuccessful, which the Home Office have only explained as due to being withdrawn by the applicant, rejected as void by the Home Office, or rejected as invalid (Home Office, 2022). This number implies that the 227,700 applicants, who make up this statistic have returned or must return to their country of citizenship or face legal action from Immigration Enforcement at the Home Office. This project hopes to offer a possible explanation for some of these voided or invalid applications, showing that the system which has been set up is not fit for purpose, that is focuses on a set archetype of applicants, and adds difficulty and barriers to others arbitrarily.

As this project will show, the EUSS is not a comprehensive system which ensures that all applicants are treated equally, and as a matter of fact creates areas of potential oversight in which applicants can become stuck in a legal quagmire with regards to their status in the UK. Many citizens who have legally lived and worked in the UK for many years may find themselves suddenly unlawful residents overnight and for reasons which are out of their control. As a dual Italian-British national myself, I found this personally abhorrent that this was in-fact a possibility and became immediately invested within this piece of research.

Citizens Advice Liverpool

The partner organisation for this project is Citizens Advice Liverpool, an organisation which was set up in 1939 before the second world war, and today acts as Liverpool's leading provider of free advice and advocacy services. They offer advice and help to all citizens of the Liverpool area ranging from benefit and debt advice to LGBTQ+ hate crime and housing

support (Citizens Advice Liverpool, 2022). This project has worked in close collaboration with caseworkers handling their EU Settlement Scheme project, which is responsible for assisting EU citizens with applying to the Home Office's EU Settlement Scheme. Citizens Advice Liverpool has helped more than 2,500 people in Liverpool secure their EUSS immigration status to continue living and working in the UK post-Brexit (Citizens Advice Liverpool, 2022).

Project Objectives and Aim

This project aims to meet the following objectives:

- Analyse data received from Citizens Advice Liverpool regarding the EUSS.
- Present this data and findings/results drawn from this data in a way which highlights potential issues with the EUSS.
- Link these results and findings to existing literature within a similar remit to the project, this being digital discrimination and the effects of the increased digitalisation of government services, also known as the 'Digital by Default' policy.
- Provide conclusionary recommendations which link all previously mentioned facets of the research project in the view of improving services and provide a more equitable experience and process for EU citizens.

Considering all the objectives above, the aim of this project is to add towards the research literature used by Citizens Advice Liverpool and the Citizens Advice national network in their advocacy for all citizens and in the improvement of government services for all citizens through a more nuanced understanding of some issues faced by service users.

EUSS and Brexit

The focus of this project is the Home Office's EUSS project, and so it is important to establish why the scheme was setup and what it entails. The EU Settlement Scheme or EUSS is the name of a programme set up by the Home Office in 2019 to register under lawful residence the many EU citizens resident in the UK (Home Office, 2022). It undertakes this task in order to properly organise the residency statuses of EU citizens who wished to continue living in the UK post-Brexit. The scheme is conducted digitally, with applicants required to submit their biometric data to the project, this being scans of their passports

and passport style photos of themselves, and an application form through an online portal. However, after complaints of issues with this system which were raised by applicants and organisation supporting applicants, such as Citizens Advice Liverpool, the Home Office has now implemented a paper application process for applicants finding issue with the digital system (Home Office, 2022). Paper applications however are difficult to come by, as the EUSS is a digital by default system, paper applications and where/how to access them are made obscure to push applicants towards applying digitally. The Home Office had originally planned to charge applicants for their applications when the project was created, a £65 application fee for applicants over the age of 16, and a £32.50 fee for those under 16. However, after much public criticism this fee was removed by the Prime Minister at the time, Theresa May (The Guardian, 2019).

Citizens resident in the UK prior to the 31st of December 2020 for a continuous period of 5 years are to receive the status of 'Settled', also known as Indefinite Leave to Remain, once their application had been successfully processed, their rights afforded as they were under the UK's EU membership would remain unchanged, such as the right to work, right to rent, and access to the NHS and other state provision (Gov.uk, 2019). Citizens who had not lived in the UK for more than 5 years on or before the 31st of December 2020 would receive the status of 'Pre-Settled', their rights such as those listed previously would not change, and they are granted a further 5 years continuous residence upon application, however would need to return to the EUSS process to apply for settled status once they hit the requirement of 5 years continuous residence in the UK to remain indefinitely in the UK (Gov.uk, 2019) (Home Office, 2022).

A deadline for EUSS applications was set by the government to be the 30th of June 2021, upon which any EU citizen continuing to live and work in the UK after this deadline would technically become 'unlawfully resident' in the UK regardless of their previous status in the UK under the EU (Gov.uk, 2021). While the EUSS does allow for those who missed this June 2021 deadline to still apply for status with 'reasonable grounds' for a late application, the rights afforded to them would have ceased. A late applicant to the EUSS before August 2021 would still have been afforded use of the NHS, however, would technically not have the legal right to drive, which is linked to one's immigration status, the legal right to rent, the

right to work, and difficulty with travel in and out of the UK until they have been granted status under the EUSS (Gov.uk, 2021). Following pressure from the European Commission, the Home Office eventually rectified this and extended the protection of civil rights to late applicants in August 2021, despite previously informing employers, civil servants, rental property owners, and the public, that those who did not apply after this 'hard deadline' in June 2021 would essentially become *persona non grata,* residing unlawfully within the UK (McKinney, 2021) (Gov.uk, 2021)

Facial Recognition and Discrimination

Facial recognition software is currently deployed by the Home Office for use by the EUSS, therefore it is important to know what this entails and the potential discriminatory implications of its use. Systems like those used by the EUSS are not confined to the EUSS. For instance, the use of facial recognition software powered by AI algorithms is becoming a more prominent feature of institutions and their processes globally. Common sense may dictate that these software algorithms are making our lives overall easier, the efficiency of an automated system is far greater than that of a manually operated one, and we are beginning to see systems such as these in the everyday. From my own personal experience, when I return to the UK for university term, I have used an automated passport control gate when entering the UK Border at Manchester Airport, which within my own empirical experience, has shortened the time it takes between me exiting the aircraft to being able to collect my bag and return to Liverpool. However, for those of BAME heritage in the UK and globally, these systems are accentuating themselves as being increasingly problematic in their deployment.

A United Nations Human Rights Council Report into racial discrimination and emerging digital technologies has found many of these AI systems to be increasing levels of inequity, digital discrimination, and exclusion where they are deployed (United Nations, 2020). Many of these large-scale AI algorithms are developed in technological industries in the west which predominantly tend to be white, affluent, and male (Ibid). Biases and inequalities existing in the industry which produces the software are then reproduced in the internal logic and code of the systems created (Ibid). Most strikingly, many of these problematic

software systems are deployed globally, and have been proven to unfairly action against people with BAME heritage from housing and employment selection systems in the US to one system deployed in Argentina which is employed to automatically calculate and recommend judicial sentences for low level misdemeanour crimes based on a range of different 'categories' which include a person's protected characteristics such as age, gender, and race (Ibid).

More relevant to the UK, the previously mentioned automatic passport control gates and similar systems deployed by the Home Office have presented themselves as problematic. This is prominent in the Home Office's digital passport photo checker, which is a system deployed by the Home Office for use by the Passport Office, the division which issues British passports to British citizens, and the software used to ensure the validity of one's photograph for use in their passport when renewing it. It has been admitted by the Home Office that; "[Upon research] …people with very light or very dark skin found it difficult to provide an acceptable passport photograph." (New Scientist, 2019) meaning that those with darker skin complexions would have found issues with the system from the beginning as it could not read their photographs. The Home Office also admit that they were aware of these discrepancies in the performance of the system, however the 'overall performance' of this software was judged "…sufficient to deploy." (New Scientist, 2019). The implications of the deployment of this system are immense, and the Home Office's admission represent their knowledgeable exclusion of people from accessing an essential digital public service based upon a person's race.

'Digital by Default'
When considering the inoperability of a digital system used by the government, it is important to also view this in the wider context of the government's digital by default policy. The government's digital by default is a policy implemented by the Government Digital Services in 2011. It refers to a project by this unit of the Cabinet Office which aims to move the majority of government services into the digital sphere, allowing citizens to access services which they previously would have had to physically access through, for example, a brick-and-mortar government office (Cabinet Office, 2012). Digital by default aims to improve departmental cooperation and capacity within the civil service, remove

unnecessary legislative barriers to access to government services by citizens, and ensure services are consistent, convenient, and more efficient for service users (Cabinet Office, 2012). One of the departments which abides by these set objectives is the Home Office, and hence when the department rolled out the EUSS, it was bound by digital by default. The EUSS is a service which is by default offered and processed only online, with some provisions to allow for physical access if need be. The project will therefore be one piece of literature which will show some of the shortcomings of the government's digital by default policy.

Methodology

This section will focus upon the methodology used in this research project report. In this section, the collection and original use of the data will be explained, along with an explanation of the methods used to analyse the data.

Where exactly is the data from?

The data used consists entirely of internal data which has been provided to the researching student from Citizens Advice Liverpool.

Who collected this data?

The data was collected by caseworkers in employment by Citizens Advice Liverpool, and was collected over a period of 19 months, from March 2019 to September 2020.

What was collected?

This data consists of anonymised case-notes recorded by caseworkers in their assistance of clients of the Citizens Advice Liverpool EUSS team. The data provided by Citizens Advice Liverpool was a sample of 170 clients, the total of clients who had received EUSS advice between the period June 2019 to September 2020.

How was data collected?

Much of the data from March 2019 up until the UK National Coronavirus Lockdown was imposed in March of 2020 is collected from in person consultation and assistance sessions at Citizens Advice's Liverpool office. Data collected post March 2020 was collected via virtual means or through telephone consultations.

Why was this data collected?

This data was collected by Citizens Advice Liverpool for the purpose of internal recording of case-notes, in addition to national Citizens Advice policies on case recording. This research project has been given authorisation by Citizens Advice Liverpool to include this data in its research.

From whom was data recorded from?

This data was recorded from clients of Citizens Advice Liverpool engaging in their EUSS application service, the sample of which includes 170 persons.

How was data analysed?

Analysis Software

All analysis and computation of results was conducted by the researching student within IBM SPSS. This was on the advice of different methodological literatures which recommended IBM SPSS as a superior software in its ability for showing statistical relevance and its ease in the production of tables and graphs for the presentation of data, over for example, Microsoft Excel (Balnaves and Caputi, 2001).

Sampling

Within this sample of 170 clients provided by Citizens Advice Liverpool, 52 were filtered as clients who had issues with their applications. These 52 clients selected were clients who Citizens Advice Liverpool had reported as having had issues when being assisted through the EUSS process.

Variables

It must be clarified that all data received by the researching student was fully anonymised before being reviewed, all identifying characteristics of clients were redacted, their names, numerical ages, and addresses. All data was then coded and inputted into SPSS. Below is a table of variables and their codes which were selected for use in the data set:

Nominal Variables	**Binary Variables** **(Client Issues)**	**Discrete Variables**
EU00 – Client Nationality	SI01 – 'Picture too dark'	C00 – Client ID
ET00 – Client Ethnicity	SI02 – 'Face Scan'	
SS00 – Client Status	SI03 – 'Chip Scan'	

AC00 – Client Age (Adult/Child)	SI04 – 'Passport Image Scan'	

Originally coded into SPSS were the nominal variables 'Client Nationality', 'Client Ethnicity', 'Client Status', 'Client Age' intended to represent the respective characteristics of each client and how this relates to the data. Along with this, the discrete variable of Client ID is included to represent some level of identification for purposes of data analysis of anonymised clients.

Nominal Variables

Nominal Variables were split between 4 characteristics, a client's nationality, ethnicity, status within the UK (described above as 'Client Status') and age. Once this had been established, a system of coding for each of these variables was created, which the secondary data provided was then translated into. Each client had every variable coded into SPSS via the predetermined code allowing for ease of analysis by the software and by the researching student. Data was coded numerically, for example, with client ethnicity, the ethnicities were coded as follows:

Ethnicity	**Code**
Roma	ET01
Asian (All)	ET02
White (All)	ET03
African	ET04
Central European	ET05

(All codes can be found within Appendix A)

Binary Variables

The data received from Citizens Advice, much of it consisted of a compilation of case-notes recorded from clients, amongst which included a brief description of the issues that had arisen per client. These descriptions were analysed and from them arose 4 distinctive issues which each of the selected 52 clients had experienced. These 4 variables were created

corresponding to a client's experience, which was coded with a value of 1 or 0 in SPSS, 1 corresponding to a 'Yes' and 0 a 'No' implying that for each of the 4 issues identified, each client would be coded with a response of if they had experienced each issue through a simple 'Yes' or 'No'.

The 4 variables created include:

- Picture too dark – SI01
    - Refers to the error message which would be shown on the scanning app, informing the user that the image being shown is 'too dark' to be scanned and can arise when either scanning one's documents or face. The decision to include this as a stand alone variable rather than within either variables 'Face' or 'Image' is due to its explicitly in the cause of the error to the system.
- Face (Facial Scan Failure) – SI02
    - Refers to the recording of a client's failure to provide a facial scan to the app within the data. For reference, this differs from 'Picture too dark' as a photo can fail a facial scan for being too blurry, too much light exposure, among other failure conditions.
- Chip (Chip Scan Failure) - SI03
    - Refers to the failure of the app to read a document's biometric chip. A biometric chip is a Radio Frequency Identification (RFID) chip which stores a scan of the document holders face, along with other unique identifying information such as one's full name, date of birth, etc (Passport Office, 2022).
- Image (Passport Image Scan Failure) – SI04
    - Refers to the failure of the app to read an image of a provided document. Similarly, to the 'Face' variable, this can be due to a myriad of issues, such as too much light exposure, or from a high level of reflective glare from the face of a documents ID page.

Discrete Variable

There arose a need to include an anonymised client ID for the purposes of identification of each client within the context of analysis within SPSS. For this, each client was issued with an identifying number corresponding to their position within the sample.

The issuing of a client ID was done at random, with each ID not corresponding to any pre-existing mode of categorisation. IDs were issued numerically descending the SPSS sheet, ranging from the numbers 1 to 52.

Crosstabulation

Upon completion of the coding of data, crosstabulation of data began. Two levels of crosstabulation were undertaken, a wide-ranging general crosstab of client ethnicities and a multi-response variable set of the 4 binary variables, which produced a single crosstabulation table within SPSS. Along with this, 4 descriptive statistic crosstabs were conducted between client ethnicity and each binary variable along with a Chi-Square test for each crosstabulation, resulting in the production of 4 crosstabulation tables and their corresponding Chi-Square tests within SPSS. Both sets of crosstabulation actions created accurate tables, with each case processing summary within SPSS reporting 0 missing cases for each.

Graphs

Easily interpretable visualisation of data is key in opening up the content of a research report to a wider audience of readers (Hall and Hall, 1996). It is for this reason that from the crosstabs generated, sets of either pie or bar charts or both have been created in SPSS and included within this report. This has been taken in order to better visually illustrate both the strength of the relationships between data and the direction of their correlation in supplement to the inclusion of other measures of these, such as tests of correlation.

Tests for Association

In order to provide accurate tests of association within this piece of research, each crosstabulation is also produced with a chi-square test, to determine its p-value. Cramer's V and Phi tests are also conducted to allow for further evidence of tests for association.

Results for both p-value and Cramer's V/Phi for crosstabs will be addressed in the 'Findings' section of this report. These tests are run on data in order to determine if there exists a relationship between the variables being studied and allows for a more valid interpretation of this relationship (University of Southampton, 2022) (Bryman, 2016).

Bivariate Analysis

This research report uses Pearson's r in order to examine and present the relationship between variables. This use of Pearson's r alongside a chi-square test allows for the measuring of the strength of the relationship between variables and the direction and strength of correlation between variables (Bryman, 2016). Pearson's r will be presented alongside the tests for association in the 'Findings' section of this essay, presenting the strength and direction of correlation between variables.

Findings of Research

Within this section of the report are included different crosstabulations produced by the research data set. The first part of this section will focus on the relationship between the nominal variable of client ethnicity (ET00) and all the previously described binary variables (SI00), offering a 'general' crosstabulation of these in the form of a multiple response crosstab, and individual crosstabs between the different variables, to observe their relationships. Later in the section, crosstabs will be presented in which ET00 has been swapped for the nominal variable of client ethnicity (EU00) to compare results between the two groupings to distinguish if any other variables, such as nationality, also affected a client's service experience, offering a more varied analysis of the dataset.

Client Ethnicity and Client Issues Multiple Response Crosstabulation

Client Ethnicity and Client Issues Crosstab

			ClientIssues[a]				
			Image	Chip	Face	Picture Too Dark	Total
Client Ethnicity	Roma	Count	2	3	3	1	5
		% within ClientIssues	16.7%	18.8%	25.0%	3.4%	
		% of Total	3.8%	5.8%	5.8%	1.9%	9.6%
	Asian (All)	Count	4	5	5	2	8
		% within ClientIssues	33.3%	31.3%	41.7%	6.9%	
		% of Total	7.7%	9.6%	9.6%	3.8%	15.4%
	White (All)	Count	2	6	2	1	7
		% within ClientIssues	16.7%	37.5%	16.7%	3.4%	
		% of Total	3.8%	11.5%	3.8%	1.9%	13.5%
	African	Count	4	0	1	25	30
		% within ClientIssues	33.3%	0.0%	8.3%	86.2%	
		% of Total	7.7%	0.0%	1.9%	48.1%	57.7%
	Central European	Count	0	2	1	0	2
		% within ClientIssues	0.0%	12.5%	8.3%	0.0%	
		% of Total	0.0%	3.8%	1.9%	0.0%	3.8%
Total		Count	12	16	12	29	52
		% of Total	23.1%	30.8%	23.1%	55.8%	100.0%

Crosstab 1
Percentages and totals are based on respondents.
a. Dichotomy group tabulated at value 1.

The crosstab above was produced in SPSS as a multiple response analysis between variable ET00 and a variable set including all of group SI00. SPSS reports this crosstab as reporting valid responses at 100% with 0 cases missing. From this crosstab, we can begin to view some of the results of the data analysis emerging already when looking at the relationship

between ethnicity and client issues. With regards to the variables we are looking at, that being client ethnicity and client issues, we can see that clients of African descent make up 82.6% of all reported error messages 'Photo Too Dark', with this number making up 48.1% of all issues recorded by Citizens Advice Liverpool.

<u>Client Ethnicity and Client Issues</u>

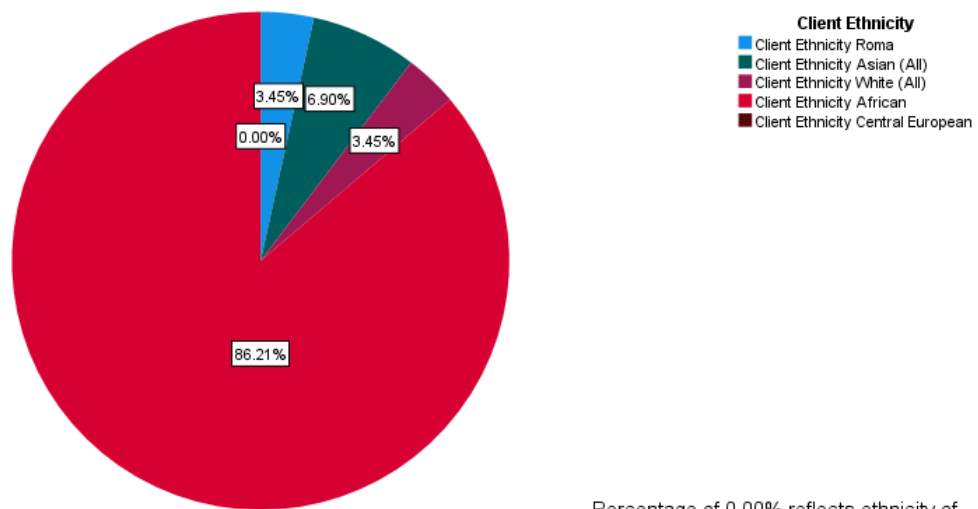**Client Ethnicity and 'Picture Too Dark' Crosstab**

			Picture Too Dark		Total
			No	Yes	
Client Ethnicity	Roma	Count	4	1	5
		% within Picture Too Dark	17.4%	3.4%	9.6%
	Asian (All)	Count	6	2	8
		% within Picture Too Dark	26.1%	6.9%	15.4%
	White (All)	Count	6	1	7
		% within Picture Too Dark	26.1%	3.4%	13.5%
	African	Count	5	25	30
		% within Picture Too Dark	21.7%	86.2%	57.7%
	Central European	Count	2	0	2
		% within Picture Too Dark	8.7%	0.0%	3.8%
Total		Count	23	29	52
		% within Picture Too Dark	100.0%	100.0%	100.0%

Crosstab 2

Before analysis of this can begin, one must first explain the tests for association for this crosstab to establish validity of the results. From crosstab 2 it can be reported that the chi-square p-value of this crosstabulation is at <.001, which means the possibility of accepting a null hypothesis when it should be rejected is 1 in 1,000. We can therefore be confident in the relationship which we may observe from the data. From this point, SPSS calculates the Phi and Cramer's V values of crosstab 2 at <u>0.665</u> within an approximate significance of <.001 respectively, meaning that we can be confident in the strength of relationship between the two variables. The Pearson's r value of this crosstabulation is reported at <u>.451</u> with an approximate significance of <.001, which when considering a p-value of <.001, we can claim a statistically significant positive relationship between the two. From this computation, we can therefore observe that the hypothesis that variable **'Client Ethnicity' has as an effect on whether one will receive an error code of 'Photo Too Dark' exists within a probability of 1 in 1,000 and is statistically significant.** Crosstab 2 above focuses on the relationship between the variables 'Photo Too Dark' and 'Client Ethnicity'. In this crosstab, we can

observe strikingly that clients of African heritage make up 86.2% of cases of error message 'Photo Too Dark' within the sample of 52. This is also especially significant when considering that out of a total of 69 reported issues of the sample of 52, the error of 'Photo Too Dark' for clients of African heritage makes up 36.23% of the entirety of reported issues. If we are to consider the original sample of the total of EUSS clients of 170, within which 53 clients are listed as being of African heritage, 25 out of 53 clients were presented with error code 'Photo Too Dark', 47.16% out of a total of 53 African heritage clients have been affected by this issue. In further analysis, if we consider the total of 'Photo Too Dark' errors out of the original sample of 170 total clients, we can show that 17.05% of all clients received this error, with clients of African heritage making up 14.72% of this. We can also see the scale of crosstab 2 in the chart below:

Crosstab 2 Pie Graph
Client Ethnicity and 'Picture Too Dark'
'Yes' Entries

Client Ethnicity
- Client Ethnicity Roma
- Client Ethnicity Asian (All)
- Client Ethnicity White (All)
- Client Ethnicity African
- Client Ethnicity Central European

Percentage of 0.00% reflects ethnicity of 'Central European' within data

Graph 1

Other Reported Technical Issues

Along with the previous results reported, this report will also explain and overview the total of issues which were reported by clients of Citizens Advice. The frequency of all these issues is displayed on the next page in the form of a pie graph:

Client Issues Frequency Pie Chart
'Yes' Responses

Varname
- $ClientIssues Image
- $ClientIssues Picture Too Dark
- $ClientIssues Face
- $ClientIssues Chip
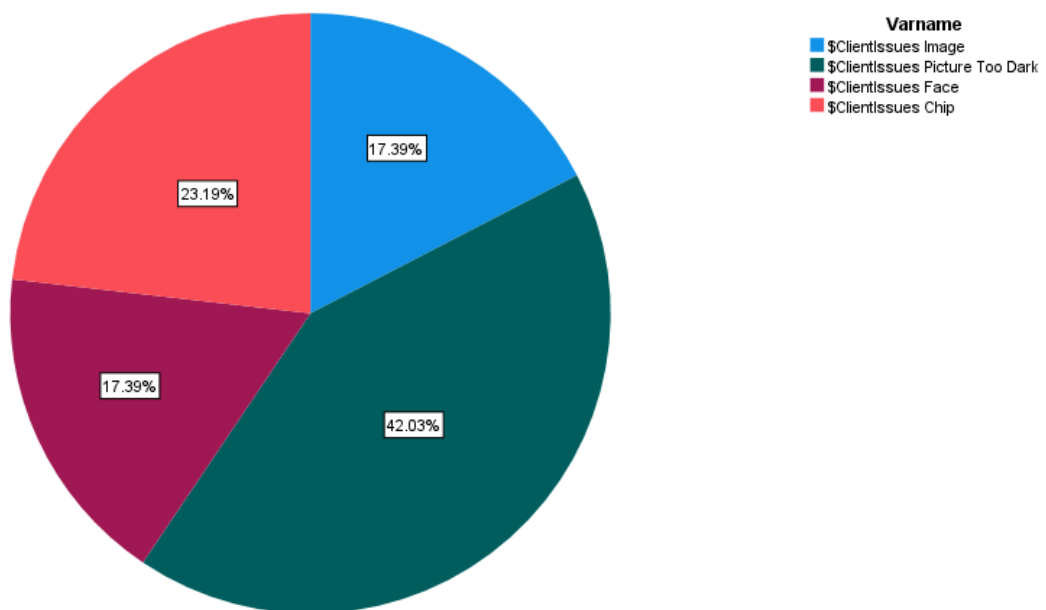
Graph 2

If one were to exclude SI02 and SI04 as variables in that they are ones which may have some bearing of influence from the individual clients (e.g., a client may not be able to take a steady photograph of themselves or their passport/documents) and observe the variables which are wholly affected by the proficiency of the document scanning app, SI01 and SI03, we can infer that **65.22% of all client issues, regardless of a client's ethnicity, were due to technical failure on the part of the app, when considered within the entire sample of 170, 26.47% of clients were unable to access the software due to factors out of their control.** Assuming that these two variables, SI01 and SI03 are wholly technical failures, the fact that 65.22% of all issues with the app are due to the app being unable to function, we should begin to question the use of such an app, which has shown to be problematic.

These facts also lend license to questions of the government's digital by default strategy and their deployment of digital systems in place of physical ones. Within the sample of clients

which had been assisted by Citizens Advice Liverpool, a significant portion of these clients had issues which have delayed their applications in the imposing of barriers at the effect of the Home Office's decision deploy a digital system. Considering a majority of these issues were due to this system, and not the fault of clients, we must seriously question the presence of a system which imposes these barriers to access of an essential government service. While in the macro-context of the entirety of applicants to EUSS the statistics gained from this arguably small-scale research, these numbers may seem somewhat insignificant due to the sample size. However, if we were to assume that such an issue does exist not just in the empirical, and remember that there is evidence of the Home Office also deploying similar digital systems for use by the Passport Office in the renewal of British passports for British citizens, the problematic issues identified by this report potentially may be extended to larger government processes which are not just at the detriment of EU citizens, but of British citizens too.

Conclusions and Recommendations

This section will conclude the report with a series of conclusion to be drawn from the data analysed and a set of recommendations to rectify and/or improve on the issues which have been raised.

Conclusions

From this report we can conclude:

- There is a statistically significant correlative link between one's ethnicity and their application to the Home Office's EUSS, most negatively affecting persons of BAME and especially African heritage.
  - This issue manifests itself in delays in service and the ability for one to use the EUSS document and facial recognition scanning software (This hypothesis is reliable within a chance of 1 in 1,000 of a null hypothesis being accepted when it should be rejected.)17.05% of all clients in receipt of Citizens Advice Liverpool's EUSS assistance were unable to apply to the EUSS through digital means because of the EUSS software being unable to adequately identify them.
- The majority of reported issues by clients of Citizens Advice Liverpool with the EUSS were out of the control of clients and due to pitfalls with the software deployed by the Home Office.
  - This means that out of the 52-client sample who were listed as having issues, 65.22% of these were issues were ones which were stemming from factors out of the control of clients and with which they were unreasonably expected to overcome by the deployment of this software by the Home Office.

From these findings above, we can draw the initial hypothesis of Citizens Advice Liverpool to be correct, that there exist barriers to service for people of certain ethnic backgrounds due to the implementation of facial recognition software by the Home Office. This report will assist in Citizens Advice Liverpool's calls for this Home Office system to be revisited for its inappropriate deployment and pitfalls in equitable service.

Recommendations

The recommendations from this report are:

- An independent review of the Home Office's deployment of facial recognition and document identification software for the EUSS in order to establish why this software was used when there was already evidence to show deployment of such a system may be problematic.
  - If the Home Office is bound to the government's digital by default policy, this policy should ensure that access to use this software is available to all in a fair way. One's ethnicity should not act as a barrier to entry in their access of a digital government service.

- An immediate cessation of the use of this certain software deployed by the Home Office for the EUSS and the implementation of software which is able to identify peoples from a broader range of ethnic backgrounds.
  - This would therefore allow those of BAME heritage access to use of a government service through the use of other already existing software which can recognise and identify a more diverse sample of people (Buolamwini and Gebru, 2018).

- Pragmatic implementation of a system of physical application for EUSS applicants alongside the existing digital one.
  - There still exists a possibility that software employed by the Home Office may restrict the ability for those without digital facilities, or through the simple failure of certain processes within the software, access to the EUSS and other processes such as passport renewal. The implementation of a system to receive physical applications as an equal alternative to a digital system would remove much of the possibility of an applicant being unable to access the services provided, they would have the ability to apply according to their available means. An approach of digital by default at inception ignores the real possibility that not all individuals may be able to access or use such digital systems.

Appendices

Appendix A – SPSS Codes

Nominal Variables	Binary Variables (Client Issues)	Discrete Variables
EU00 – Client Nationality	SI01 – 'Picture too dark'	C00 – Client ID
ET00 – Client Ethnicity	SI02 – 'Face Scan'	
SS00 – Client Status	SI03 – 'Chip Scan'	
AC00 – Client Age (Adult/Child)	SI04 – 'Passport Image Scan'	

Ethnicity	Code
Roma	ET01
Asian (All)	ET02
White (All)	ET03
African	ET04
Central European	ET05

Nationality	Code
Romanian	EU01
Swedish	EU02
Hungarian	EU03
Italian	EU04
Spanish	EU05
Portuguese	EU06
Slovakian	EU07
Nigerian	EU08
Bangladeshi	EU09
Polish	EU10

Client Issue	Code
Photo Too Dark	SI01
Face Scan Failure	SI02
Chip Scan Failure	SI03
Passport Image Failure	SI04

Age	Code
Adult	AC01
Child	AC02

Status	Code
Pre-Settled	SS01
Settled	SS02

Appendix B – Crosstabs, Tables, and Graphs

Client Ethnicity and Client Issues Crosstab

			ClientIssues[a]				Total
			Image	Chip	Face	Picture Too Dark	
Client Ethnicity	Roma	Count	2	3	3	1	5
		% within ClientIssues	16.7%	18.8%	25.0%	3.4%	
		% of Total	3.8%	5.8%	5.8%	1.9%	9.6%
	Asian (All)	Count	4	5	5	2	8
		% within ClientIssues	33.3%	31.3%	41.7%	6.9%	
		% of Total	7.7%	9.6%	9.6%	3.8%	15.4%
	White (All)	Count	2	6	2	1	7
		% within ClientIssues	16.7%	37.5%	16.7%	3.4%	
		% of Total	3.8%	11.5%	3.8%	1.9%	13.5%
	African	Count	4	0	1	25	30
		% within ClientIssues	33.3%	0.0%	8.3%	86.2%	
		% of Total	7.7%	0.0%	1.9%	48.1%	57.7%
	Central European	Count	0	2	1	0	2
		% within ClientIssues	0.0%	12.5%	8.3%	0.0%	
		% of Total	0.0%	3.8%	1.9%	0.0%	3.8%
Total		Count	12	16	12	29	52
		% of Total	23.1%	30.8%	23.1%	55.8%	100.0%

Crosstab 1
Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

Client Ethnicity and 'Picture Too Dark' Crosstab

			Picture Too Dark		Total
			No	Yes	
Client Ethnicity	Roma	Count	4	1	5
		% within Picture Too Dark	17.4%	3.4%	9.6%
	Asian (All)	Count	6	2	8
		% within Picture Too Dark	26.1%	6.9%	15.4%
	White (All)	Count	6	1	7
		% within Picture Too Dark	26.1%	3.4%	13.5%
	African	Count	5	25	30
		% within Picture Too Dark	21.7%	86.2%	57.7%
	Central European	Count	2	0	2
		% within Picture Too Dark	8.7%	0.0%	3.8%
Total		Count	23	29	52
		% within Picture Too Dark	100.0%	100.0%	100.0%

Crosstab 2

Crosstab 2 Pie Graph
Client Ethnicity and 'Picture Too Dark'
'Yes' Entries

Client Ethnicity
- Client Ethnicity Roma
- Client Ethnicity Asian (All)
- Client Ethnicity White (All)
- Client Ethnicity African
- Client Ethnicity Central European

3.45% 6.90%

0.00% 3.45%
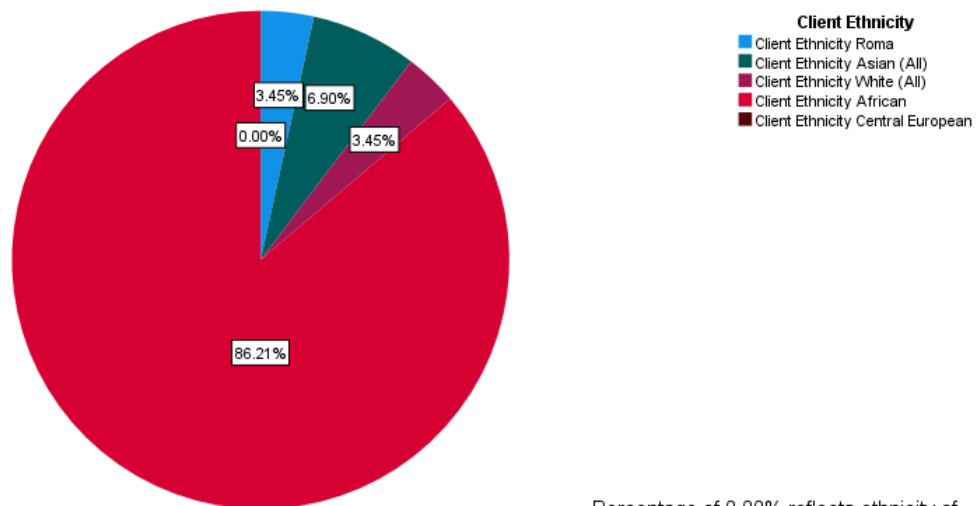
86.21%

Percentage of 0.00% reflects ethnicity of
'Central European' within data

Graph 1

Chi-Square Tests (Crosstab 2)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.309[a]	4	<.001
Likelihood Ratio	24.617	4	<.001
Linear-by-Linear Association	9.495	1	.002
N of Valid Cases	52		

a. 8 cells (80.0%) have expected count less than 5. The
minimum expected count is .88.

Symmetric Measures (Crosstab 2)

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Nominal by Nominal	Phi	.655			<.001
	Cramer's V	.655			<.001
Interval by Interval	Pearson's R	.431	.128	3.382	.001[c]
Ordinal by Ordinal	Spearman Correlation	.455	.139	3.617	<.001[c]
N of Valid Cases		52			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

**Client Issues Frequency Pie Chart
'Yes' Responses**
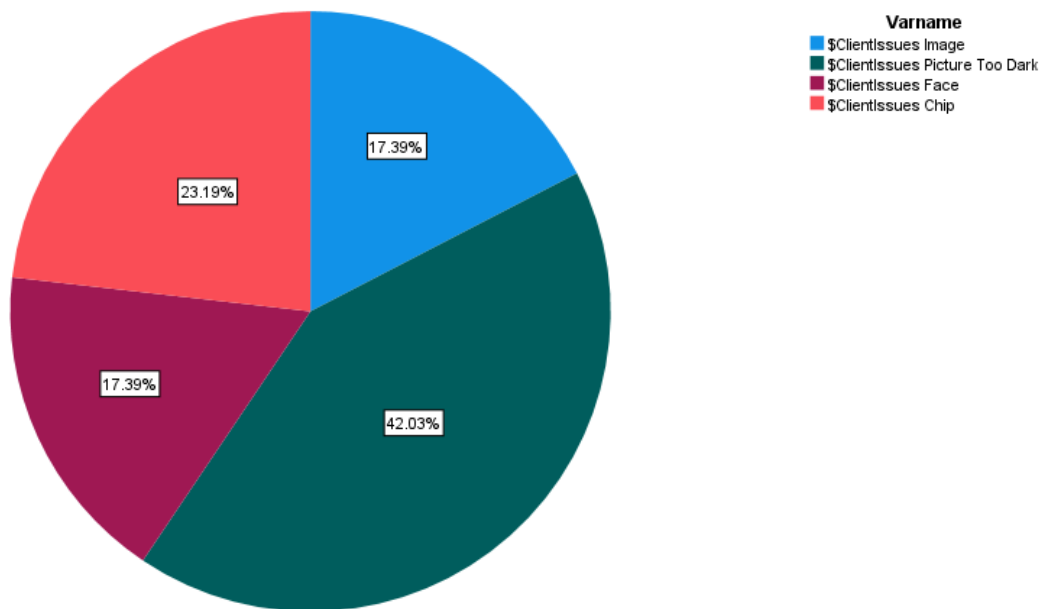
Graph 2

Client Issues Frequencies

		Responses		Percent of Cases
		N	Percent	
ClientIssues[a]	Image	12	17.4%	23.1%
	Picture Too Dark	29	42.0%	55.8%
	Face	12	17.4%	23.1%
	Chip	16	23.2%	30.8%
Total		69	100.0%	132.7%

Table 3

a. Dichotomy group tabulated at value 1.

Bibliography

Balnaves, M. and Caputi, P. (2001) *'Introduction to quantitative research methods : an investigative approach / Mark Balnaves and Peter Caput*i'. (SAGE Research Methods).
Bryman, A. (2016) *'Social research methods'*. 5th ed. Oxford University Press. Available at: https://search-ebscohost-com.liverpool.idm.oclc.org/login.aspx?direct=true&db=cat00003a&AN=lvp.b3993849&site=eds-live&scope=site

Buolamwini, J. and Gebru, T. (2018) *'Gender shades: Intersectional accuracy disparities in commercial gender classification.'* In Conference on fairness, accountability, and transparency (pp. 77-91).

Citizens Advice Liverpool (2022) '*About'* Available at: https://www.citizensadviceliverpool.org.uk/about

Gov.uk (2019) '*Immigration Rules Appendix EU'* Available at: https://www.gov.uk/guidance/immigration-rules/immigration-rules-appendix-eu

Gov.uk (2021) '*EU Settlement Scheme: Information for late applicants'* Available at: https://www.gov.uk/government/publications/eu-settlement-scheme-information-for-late-applicants/eu-settlement-scheme-information-for-late-applicants#:~:text=The%20Department%20of%20Health%20and,until%20that%20outcome%20is%20known.

Gov.uk (2021) '*Temporary protection for more applicants to the settlement scheme'* Available at: https://www.gov.uk/government/news/temporary-protection-for-more-applicants-to-the-settlement-scheme

Gov.uk (2022) '*EU Settlement Scheme Statistics January 2022'* Available at: https://www.gov.uk/government/statistics/eu-settlement-scheme-statistics-january-2022/eu-settlement-scheme-statistics-january-2022

Home Office (2021) '*Are there really 6m EU citizens living in the UK?'* Available at: https://blog.ons.gov.uk/2021/07/02/are-there-really-6m-eu-citizens-living-in-the-uk

McKinney, C J. (2021) '*Good News for EU Citizens Making Late Applications for Post Brexit Residence Rights'* Available at: https://freemovement.org.uk/good-news-for-eu-citizens-making-late-applications-for-post-brexit-residence-rights/

The Guardian (2019) '*May drops £65 fee for EU nationals seeking post-Brexit settled status'* Available at: https://www.theguardian.com/politics/2019/jan/21/may-drops-65-fee-for-eu-nationals-seeking-post-brexit-settled-status

United Nations (2020) '*Racial discrimination and emerging digital technologies : a human rights analysis : report of the Special Rapporteur on Contemporary Forms of Racism, Racial Discrimination, Xenophobia and Related Intolerance*' Available at: https://digitallibrary.un.org/record/3879751?ln=en

University of Southampton (2022) '*Chi Square*' Available at: https://www.southampton.ac.uk/passs/full_time_education/bivariate_analysis/chi_square.page#:~:text=A%20chi%2Dsquare%20test%20is,the%20variables%20you%20are%20studying.