Making risk modeling accessible with DiAGRAM

Additional development of an online digital preservation tool to meet Web Content Accessibility Guidelines 2.1

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**Abstract – this paper will examine the work undertaken on DiAGRAM (Digital Archiving Graphical Risk Assessment Model) to ensure it is fully compliant with the Web Content Accessibility Guidelines 2.1 (WCAG2.1) and the United Kingdom’s Public Sector Bodies Access Regulations (PSBAR). This work also supports The National Archives’ strategic goal of becoming the Inclusive Archive.**

**The initial development of DiAGRAM aimed to bring the power and insight of Bayesian Networks to the community of digital archivists. The prototype tool successfully demonstrated this, however, the relatively short project timeframe and adoption of a rapid prototyping approach (with R/Shiny) imposed constraints on accessibility. We offer some lessons learned from the project in how we could have approached this more effectively.**

**With The National Archives’ own successful use of the prototype in support of an investment business case for improving our digital archive’s resilience the tool’s utility was sufficiently clear for a further phase of work. The contract was awarded to data analytics firm Jumping Rivers, who had also previously undertaken initial usability and accessibility improvements. A full external accessibility review was undertaken by TetraLogical.**

**The first part of this new project phase determined that the most appropriate way to proceed was to re-architect the DiAGRAM tool to separate the web front-end from the underlying model and connect the two via a new set of API endpoints. Opportunity was also taken to review the “Advanced customisation” modeling options to improve usability.**

**Redevelopment is now substantially complete although the formal retest to confirm full compliance with PSBAR is to take place later this month, however ongoing dialog with TetraLogical throughout development means no major issues are anticipated.**

**Keywords – web accessibility, risk modeling,**

**Conference Topics – Community; Resilience.**

1. Introduction
	1. *Background and Prior Project Work*

DiAGRAM (Digital Archiving Graphical Risk Assessment Model) was an output of the project “Safeguarding the nation’s digital memory” [1]. It is an Integrated Decision Support System (IDSS) designed to give digital archivists guided access to the underlying Bayesian Network (BN) representing the various risk factors (and the interactions between them) relevant to the preservation of digital materials. In order to undertake simple modeling, archivists answer a series of questions to fit DiAGRAM to the current situation of their archive by setting the input nodes of the BN. These reflect factors such as the balance between different types of digital material currently held by the archive and the broad classes of storage media used. DiAGRAM then returns scores for Renderability and Intellectual Control which reflect the probabilities that “The object is a sufficiently useful representation of the original file” and that you “Hav[e] full knowledge of the material content, provenance and conditions of use” respectively [2].

Further discussion of the initial development of the model, and in particular of the structured elicitation process used to obtain rigorous probabilistic data where conventional quantitative data was not readily available can be found in the project team’s article in *Archives and Records* [3], and in a forthcoming chapter in the *Proceedings of the European Conference for Mathematics in Industry* [4].

Following the initial model development the project team presented a series of webinars to introduce DiAGRAM to the wider digital preservation community and to seek feedback on the tool. Formal user testing was also undertaken to assess usability. As the project had switched to engaging with stakeholders remotely due to the pandemic, we had unspent grant money which the National Lottery Heritage Fund approved to be repurposed on a further round of tool development to address the issues surfaced in the feedback and usability testing.

* 1. *Initial Usability Improvements (2020)*

Data analytics firm, Jumping Rivers [5], were appointed to make usability improvements to the tool initially developed by the project. In addition to the usability issues that had been identified, we wanted to ensure that DiAGRAM was compliant with the UK’s Public Sector Bodies (Websites and Mobile Applications) (No. 2) Accessibility Regulations 2018 [6] (PSBAR). This was the UK’s implementation of Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies [7]. Essentially, this generally requires websites to comply with the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines version 2.1 at the AA level [8] (WCAG 2.1).

At this point the remaining project budget gave us only 6 weeks’ development time. It was clear that this would not be sufficient to resolve all issues so it was decided to concentrate on the initial simple model building and scenario generation and to resolve as many general accessibility issues as possible.

Two sets of usability issues were addressed at this stage, to improve the ease of understanding and inputting percentages and to provide additional context to aid interpretation of the tool’s output.

The initial simple modeling process generally required archivists to enter percentage values for the input nodes. This is relatively straightforward for areas such as the breakdown of the types of digital objects in the archive or the types of storage media being used: but for technical skills, information management and system security users clearly found it much harder to give percentages in a consistent and meaningful way.

To guide users through these steps a series of structured inputs was developed drawing on existing digital preservation maturity models with weights in percentage terms assigned to the answers. For example, for the technical skills question the DigCurV skills framework [9] was used to select a subset of skills and levels of ability through the input screens of DiAGRAM which are then mapped to a percentage and fed into the underlying BN.

Another general usability issue was that users were not prevented from attempting to submit values for a node which totaled more or less than 100%, although the DiAGRAM prototype did then return an error telling users that this was a requirement. However, there was no assistance to users in calculating the percentages to ensure a total of 100% was reached. To resolve this input fields were linked and constrained so that changing the value in one linked field would lead to other linked fields being automatically adjusted to maintain an overall value of 100%. This was straightforward for pairs of values but is harder to implement where there are three choices.

The other issue left unresolved at the end of the development period was giving users sufficient context to understand the scores generated for Renderability and Intellectual Control, although discussion of how to do this had taken place. Fortunately the project team were able to complete this in-house, introducing two built-in reference models. These represent a simple commercial backup service and a well-established digital preservation program at a generic national archives. While commercial backup gives some likelihood of being able to render a file later (at least in the short term), it has a very low Intellectual Control score as such services do not typically go into extracting technical metadata about files or determining descriptive metadata and conditions of use. The national archives model is more balanced (and scores much higher on both fronts), though it also demonstrates that there is likely to be remaining risk even in such an institution. As the answers to the input questions are also provided for these reference models they can also be treated as a template for creating other models.

These changes were also evaluated against WCAG 2.1 using automated testing to improve accessibility. However, it was soon realized that the use of R/Shiny Dashboard meant that it would not be possible to make DiAGRAM fully compliant within the time available. This was because the framework and underlying libraries generate much of the HTML and JavaScript sent to the browser and there were sometimes limited opportunities to intervene and rewrite this in an accessible way. In particular the plots used to show model scores were being generated using Plotly [10], which integrates easily within R/Shiny, but the interactive display element is not fully accessible and cannot easily be customized to resolve the issues. The R/Shiny Dashboard also generates a single page app which appears to have a tabbed navigational structure but does not have true URLs for each tab which is not compliant.

At the end of the development period DiAGRAM had much improved usability (as measured by feedback from further webinars) but still had a significant number of accessibility issues. This led to the decision to continue badging DiAGRAM as a prototype rather than looking to formally make it a live service. It was felt that this mitigated the risks to The National Archives of having a non-compliant tool in the short term, but we knew we would have to make a further attempt to resolve the accessibility issues and bring DiAGRAM into compliance with PSBAR once budget could be found.

* 1. *Modeling With DiAGRAM*

In parallel with the development work, the project team had been applying DiAGRAM to model the risks to The National Archives’ (TNA) own digital holdings in order to support the organization’s business case for investment in the digital archive. This was expected to set TNA’s high level budget for the next three years.

The initial model was created using the simple modeling process. However, this was felt to not fully reflect the nuances of our situation, so we adjusted the model using the Advanced customisation options.

For this more advanced modeling archivists can directly edit the conditional probabilities associated with each node of the BN. The built-in probabilities typically reflect median values, particularly for the data obtained via the expert elicitation process. In some cases archives may reasonably decide that the situation in their archive is better than the median and so substitute alternative probabilities (such as the 95th percentile value from the expert elicitation). In our case, due to factors such as the reliability of our tape storage system, we opted to use the relevant 95th percentile value for a number of nodes.

We then wished to model various scenarios to show the potential impacts of differing levels of funding, contrasted against the default position of no increase in investment. Flat cash means receiving exactly the same funding, with no allowance for inflation, so is in real terms a budget reduction. This was modeled as giving a compounded decay in areas such as Obsolescence and Technical Skills of 5% per annum.

From the project team’s own use of Advanced customisation it appeared that it was broadly usable, albeit with a few bugs and issues to be understood for data entry. Of course the project team also had a higher familiarity with the statistical modeling concepts and the underlying model than would be the case for a typical archivist.

* 1. *Further Developments (2021)*

The team were able to use DiAGRAM to provide quantitative evidence to support the business case for investment in TNA’s digital archive. The success of this application of modeling with DiAGRAM demonstrated that further development was warranted to enable the tool to be used more widely.

Following discussions with usability experts in the Digital Services Department at TNA, we began by commissioning a formal accessibility review of DiAGRAM. This was carried out by accessibility and inclusion specialists, TetraLogical [11]. As expected, a high number of issues (of varying severity) were reported following the audit, although it should be noted that a high proportion of these were effectively duplicates since some of the same components are used on multiple pages within DiAGRAM. Fixing the underlying component once would fix all occasions on which it was used.

With audit results available we again appointed Jumping Rivers to carry out the work, with ongoing assistance from the TetraLogical helpdesk.

The initial development task was defined as reviewing the current architecture and potential alternatives to determine the most appropriate approach to resolving the accessibility issues. In addition we had to take into account the wider UK Government Digital Service (GDS) service standard [12] and determine the extent to which the different options would allow us to align with that.

While it was determined that the accessibility issues probably could be resolved within the existing R/Shiny Dashboard framework, the wider considerations of the service standard, in particular reducing the use of JavaScript in favor of HTML where possible in line with the GDS principle of progressive enhancement (that is, a service should work as far as possible with HTML only, without the use of CSS, JavaScript or other technologies except to provide a more refined user experience if they are available) [13], led to the decision to move to a new architecture.

The front end would be rewritten in native HTML as far as possible, some JavaScript is retained, particularly since the data structures required for input into the underlying model are too large to be handled via cookies. We also wanted to retain the original back-end feature that no data is stored on the server beyond the life of the user’s session. This had proved popular in the original feedback as the data required for model building and the risk scores obtained are somewhat sensitive, and this means that neither The National Archives nor other partner has any access to the data used by an institution to model the risks to their digital archive. Users can however download their own model data for subsequent reuse if desired.

Much of the backend code (particularly that forming the BN itself) could remain essentially unchanged, but a new Application Programming Interface (API) would be required to enable communication between the front end and the back end code.

The API was generated using the R package plumber [14]. In line with further GDS guidance on the development of APIs [15] these have been documented with Swagger [16], although there is no intention currently to make the API publicly available as an alternative means of interacting with DiAGRAM.

Given the decision to redevelop the front end it also seemed appropriate to investigate options for some improvements to the Advanced customisation modeling since this had not been done in the prior round of development. This was aided by the availability of one of TNA’s Collaborative Doctoral Programme students on a professional placement supported by the Arts and Humanities Research Council’s Additional Student Development Fund. As her PhD is in the area of Human Computer Interaction this provided the project with someone who could undertake user research while providing appropriate professional experience.

Initial user research for this phase was undertaken in mid-December 2021 with four users. This,in conjunction with the project team’s own experience in using Advanced customisation modeling, was sufficient to determine the main issues and to propose improvements to the user journey and flow. Following the improvements, a further round of testing was undertaken, again with four participants (two of whom took part in the initial testing and two new participants) to validate the success of the changes.

This further development phase will conclude with a formal re-test of compliance with accessibility regulations carried out by TetraLogical.

1. User Testing
	1. *Approach For Initial Usability Improvements*

Given the time constraint, with Jumping rivers working on the project for a short period, and the limited capacity of the team, the goal was to identify the main areas of concern, prioritize them and implement simple and effective changes that would solve a maximum number of users’ problems.

Before Jumping Rivers joined the project, the team performed a basic accessibility audit by manually testing the tool [17, 18]. These easy checks enabled us to detect a few accessibility problems. However we knew that this accessibility check was not sufficient and we needed to run detailed checks with automated tools and conduct testing with assistive technologies.

During a preliminary workshop, an inventory of the previous users’ insights was drawn up. Usability issues were categorised and prioritised considering their impact, the number of users affected and their plausible repetitiveness. Interpreting the severity of these issues, the DiAGRAM team was able to list a dozen priorities to focus on during the following sprints. The main areas of improvement were: content, navigation and accessibility. It was decided to divide the efforts in several working sessions, allowing the team to brainstorm and implement straightforward, yet effective changes to the different points of focus.

Two rounds of moderated remote user testing sessions [19] took place after recruiting research participants using a survey shared within The Digital Preservation Coalition (DPC) Network. Participants were recruited to reflect representative users of DiAGRAM: primarily archivists and record managers, people with a broad range of work experiences and skills; from new joiners to subject matter experts. Making DiAGRAM accessible and inclusive for many users as we could was key. We conducted the sessions with participants that had different levels of digital confidence. We tried to recruit participants with accessibility needs but it was difficult as our users are specialist target audiences. We realized that we needed help from agencies, charities and disability networks for the next iterations on the tool.

During testing, participants were asked to undertake a series of short and representative tasks with the tool while being observed by an interview and observer. Participants were asked to ‘think-aloud’ [20] as they completed the tasks, describing their actions as well as their thoughts and any reasoning behind their actions. Any actions requiring clarification or follow-up were probed by questions from both the interviewer and observer. The feedback gathered allowed the team to confirm whether or not the solutions put in place were efficient and uncovered new users’ needs.

Jumping Rivers made significant alterations on the risk assessment tool using the outputs of the workshop, the design work sessions and the usability sessions. The DiAGRAM team received positive feedback on the content and the design changes made on the tool.

Due to tight deadlines, the team were unable to deal with the complex accessibility issues identified. However, the work done on content, which is in many aspects part of Accessibility benefited all users including users with accessibility needs.

* 1. *Approach For Advanced Customisation Improvements*

When undertaking simple modeling, archivists answer a series of questions to fit DiAGRAM to their archives’ current situation. Conversely, Advanced customisation allows users to input probabilities directly and edit lower level conditional nodes which are not included in the basic modeling process. It is therefore aimed at larger or more specialized organizations which are more likely to differ from the median values which are incorporated in the default statistical data used in the BN.

During previous usability testing, the Advanced customisation feature in DiAGRAM was deprioritised and therefore not fully tested. As the original application in the R/Shiny framework remained live, it was possible to use this as a functioning prototype for testing.

As with previous usability testing, an iterative approach was taken, comprising two short rounds of testing. Adopting this approach made it possible to identify the majority of issues and allowed for iterative development of DiAGRAM as it was transferred to the new site [21]. We began with an evaluation of the Advanced customisation page, using an heuristic framework [22] which drew attention to potential problem areas where we would focus testing: namely, navigation and content.

Following this, we conducted two rounds of usability testing, each with three to four participants recruited from TNA’s pre-existing contacts. Participants included digital archivists; a digital analyst; a data lead; and a digital archives manager. The first round of testing sought to identify usability issues, focusing on 1) the user journey through the Advanced customisation page; and 2) page content, such as in the ‘Edit’ tables where changes to nodes are made.

Alterations were then made to the design of the page as it was implemented in the new site and a second round of usability testing was undertaken to validate the changes that had been made. Firstly, the elements were reordered so that the user journey flowed from the top to the bottom of the page. Secondly, an SVG image file was also added as an alternative means of navigation, though a drop-down box was retained to meet accessibility requirements. Several other minor recommendations to improve usability were also made.

Participants generally found the flow much improved by the reorientation of elements. All participants opted to use the SVG image to navigate the model. There was some indication that having the model to hand - in the form of the SVG image - helped with interpretation of some of the nodes, although participants continued to express some difficulty when interacting with lower level conditional nodes. This suggests that further consideration may be necessary to communicate the conditional nature of the model more effectively.

While qualitative data such as this holds high validity, testing with such small numbers naturally limits the generalisability of such findings. Therefore, to complement these findings a survey has been devised, incorporating System Usability Scale (SUS) [23, 24] to gather quantitative data on the usability of the website from a much larger number of users.

1. Accessibility

Our experience in this project points to the importance of considering accessibility from the beginning of development of a new tool or service. However, given the short timeframe of the original project there were also valid reasons for developing the initial prototype in R/Shiny Dashboard.

Previous risk management frameworks within digital preservation have been more qualitative in nature [3], and there does not appear to have been a previous attempt to develop an Integrated Decision Support System in the field. Coupled with the fact that few archivists have a background which had given them much prior exposure to Bayesian Statistics and related concepts meant that we initially needed to develop a prototype very quickly (using a BN from a different domain) in order to help introduce the concepts to the archivists involved in the project and show what might be possible.

However, as the initial project was NLHF funded (with their current guidance on web accessibility dating to August 2020, after the start of the project [25, 26], there was essentially no digital guidance available at the start of 2020 [27]), and since the IDSS does not really fall within the GDS definition of a transactional service [12] “Your service is transactional if it allows users to either:

* exchange information, money, permission, goods or services
* submit personal information that results in a change to a government record”,

we did not initially focus strongly on accessibility (a weakness of the original project team was arguably the lack of a specialist UI/UX researcher who might have prompted greater focus on this area from the beginning).

This early work could also be considered as being in line with the Discovery and Alpha phases of an Agile project given the exploratory nature of the initial working together of archivists and statisticians and the uncertainty over what an IDSS might look like in this context.

With the opportunity to repurpose part of the project budget that had not been spent on in-person events as originally planned came the realization that accessibility needed to be improved, helped by the welcome addition of a user researcher to the project team.

We knew that given the very limited time period it was unlikely that we would be able to resolve all accessibility issues during this phase of development. Members of staff at The National Archives with some experience of accessibility undertook an informal review ahead of development starting which gave us a number of high priority work areas. Jumping Rivers also introduced the use of Koa11y, an automated assessment tool [28, 29]. However, it is well known that automated assessment and testing can only catch a fraction of the potential issues, particularly since aspects of accessibility such as a logical flow for users of assistive technologies (such as screenreaders) do not lend themselves to automated assessment [30].

Despite these constraints progress was made, and the wider usability improvements should also have contributed to accessibility, such as not requiring mental arithmetic from users to ensure that sets of values totaled 100%. Custom HTML and JavaScript was created to work around some issues arising from the R/Shiny Dashboard ecosystem, keyboard only navigation and data entry worked across much of the tool, but we knew significant obstacles to true accessibility remained, not least the single page app paradigm imposed by R/Shiny Dashboard which made it hard to navigate across the whole site in an accessible way.

There does also seem to be a lack of appreciation of the importance of accessibility within the open source data visualization community. DiAGRAM originally used the plotly widget to provide visualization of the scoring of the two output nodes, Renderability and Intellectual Control. Again this was the natural choice from within the R/Shiny Dashboard ecosystem and for a user interacting with an online visualization via mouse offers an easy way to download an image of a chart, zoom in and out, select areas of the chart, and display further information about a data point, or compare data points. However, none of these actions have accessible alternatives by using the keyboard or other forms of interaction, nor is alt text or equivalent provided for to allow access to the data by non-visual means. An issue was raised in plotly’s GitHub repository on 24 May 2016 asking for keyboard shortcuts to be added for accessibility (referencing the requirements of the US Section 508 rules, essentially the US Federal Government equivalent of PSBAR [31]), since then multiple others have supported the request, and other similar issues have been created but it does not appear to have been given much priority by maintainers, although the “needs sponsor” tag was added on 10 September 2020 [32]. Here of course we see another issue frequently raised in relation to open source coming into play, the lack of (financial) support for maintainers from those using an open source product, one problem here perhaps being the difficulty of fitting existing government procurement models to such sponsorship. Similar problems arguably exist within the ecosystem of open source digital preservation tools.

As we prepared to embark on a further phase of development we sought further advice from colleagues in the Digital Services Department at The National Archives who are more familiar with the challenges of accessible design, and undertook some introductory training [33]. As a result it was decided to commission a formal review of DiAGRAM from a specialized firm. After obtaining quotes from several, TetraLogical were appointed. In discussion with the project team they prepared a detailed test plan, ensuring coverage of all key features across the site (due to overlapping functionality and reuse of components it was not necessary to test every page). Following the completion of development they will also retest and sign off the work as compliant (assuming the work has been successful) and prepare an appropriate accessibility statement in compliance with the legislation.

We opted for what TetraLogical describe as a Lightning Report. For each area of the site under test the full set of WCAG 2.1 Success Criteria are listed and each criterion is marked as Fail, Pass, Not Applicable, and Not Tested. Fails are then graded on criticality as Low, Medium, High, or Critical. In total 16 areas of the site were assessed with 187 fails, 322 successes and 291 not applicable (there were no instances of criteria not being tested). Of the fails, 4 were deemed critical, 6 high, 52 medium and 125 low.

The critical issues related to the slider used on the Physical Disaster screen (within Create a model) not being keyboard operable, similarly it was not possible to select a model on which to base a scenario via the keyboard, nor to change the selection of models on View results or Download Results (these three all used the same underlying table component, the test also revealed what was actually a bug, using the mouse it was possible to double-click on some cells, such as Intellectual Control and then manually edit the value, such editing should not have been possible at all).

For each identified issue there was also a brief suggestion of how it might be possible to resolve it. TetraLogical also offer a more in depth service where they will raise detailed tickets in your system of choice (eg Jira, GitHub etc) with more comprehensive information on resolving the issues identified. However, they state that this is more appropriate when upskilling your own developers in developing accessible websites, rather than when contracting development to others (and is more expensive). They also provide a paid helpdesk service to provide advice during development. As part of their reappointment for the second round of redevelopment Jumping Rivers opted-in to this helpdesk service to strengthen their ability to deliver an accessible service.

This second period of redevelopment began with Jumping Rivers reviewing the existing architecture of DiAGRAM in order to make recommendations on the most appropriate route forward allowing for all accessibility issues to be resolved.

While they believed that it would be possible to resolve all issues within the existing R/Shiny Dashboard architecture, this would have required a large amount of custom JavaScript which The National Archives viewed as potentially risky, and in conflict with GDS principles of progressive enhancement which provides that services should work even only HTML is available in the browser, but then additional styling and refinement of service can be added through the use of technologies such as CSS (Cascading Style Sheets) and JavaScript.

With this in mind, and taking into account the available time and budget, it was ultimately decided to take the opportunity for a more thorough reworking of DiAGRAM, moving to a relatively simple front end and retaining the main parts of the existing back-end (including, for example, the BN written in the R package gRain [34]) and introduce a new API layer using the R package plumber [14] to create the necessary endpoints to allow communication between the front- and back-ends.

As the data that comprises the model inputs exceeds the maximum permitted storage for cookies we have not been able to remove the need for JavaScript entirely, but the rebuild has moved us towards the principles of progressive enhancement with the quantity of JavaScript being greatly reduced across DiAGRAM, and avoiding using heavyweight frameworks. To eliminate JavaScript completely would probably have required us to move to having backend data storage of some sort, further complicating the rebuild. Also, feedback during the first round of development had been appreciative of the fact that there was no permanent storage of model data because this meant that other archives did not feel that TNA were “looking over their shoulder” and being able to see data on digital preservation risk levels that archives were not ready to share.

From November 2021 to March 2022 Jumping Rivers worked on the redevelopment. Work on the front- and back-ends was carried out in parallel, with the front-end using dummy data until the relevant API endpoints were available. Development was carried out in dialog with the TetraLogical helpdesk to ensure that accessibility targets were met. At the time of writing planning was underway for the formal retest of the redeveloped DiAGRAM [35] against the accessibility criteria at the end of March 2022. A tender process is also underway for the creation of the live environment for the redeveloped version of DiAGRAM along with ongoing application support [36].

1. Conclusion

It is important to acknowledge the overall success of the Safeguarding the Nation's Digital Memory project which led to the creation of DiAGRAM, as evidenced in the DPC’s evaluation report [37], the shortlisting of DiAGRAM for the Digital Preservation Awards 2020 [38], TNA’s own use of modeling in support of making the case of investment (as described in this paper), and early evidence of wider usage such as described in a case study in the DPC’s EDRMS preservation toolkit [39]. However, there are lessons for us all to learn in some areas of the project.

The development process could have been streamlined with an earlier focus on the issue of accessibility. This may not have changed the initial decision to prototype in R/Shiny Dashboard due to the ability this gave to easily connect to the back end model, while making initial rapid iteration of designs at the front end relatively straightforward. However, this would have given a clearer view of the trade-offs we were making, which would have allowed earlier planning of a route to achieving full accessibility of the tool.

Similarly a more explicit framing of what the initial funded project was aiming to deliver as effectively the Discovery and Alpha phases of an Agile project, producing a useful proof of concept, would have helped manage expectations around the amount of work that would still be required to create a true live product. What the project achieved was actually somewhat more (particularly after the initial round of work by Jumping Rivers) than the project team had really been anticipating.

As GLAM institutions around the world grapple with wider questions of diversity, equity and inclusion in relation to our collections and practice it is vital that we consider this in relation to the accessibility of our digital presence and tools as well: at The National Archives this is an integral part of our desire to become the Inclusive Archive. Many GLAM organizations around the world are public bodies so will be operating under equivalent regulations to PSBAR (particularly those organizations within EU countries) so the considerations outlined in this paper should be broadly applicable.

Reflecting on the conference themes: the original project was very much centered around making our shared digital heritage more resilient, which was a key project outcome we needed to demonstrate to the National Lottery Heritage Fund[39] and an improved funding position for The National Archives is an early success in that direction. We also sought to broaden the community of practice which could participate in digital preservation by providing a tool which would help members of the community make an evidence-based argument for particular interventions in their context. If the tool we provide is not fully accessible we will be failing in that aim by excluding some members of the community.

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