



CReAting a Dynamic archive of responsible Ecosystems in the context of creative AI (CRADLE)

AHRC/UKRI BRAID (Bridging Responsible Artificial Intelligence Divides) Programme 2024

Output: WORKSHOP Report 1: JESS+ A Digiscore¹

Jess+ Workshop	14 th February 2024
Organizers	Lydia Farina, Helena Webb
Funders	Bridging Responsible Artificial Intelligence Divides (BRAID) – an Arts and Humanities Research Council (AHRC) project.
Authors	Oliver Miles, Helena Webb, Lydia Farina, Gabriella Giannachi, Steve Benford, John Moore, Spencer Jordan, Bernd Stahl, Elvira Perez-Vallejos, Craig Vear

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Overview

The following report documents proceedings from the first workshop set up to address the Bridging Responsible Artificial Intelligence Divides (BRAID)/Arts and Humanities Research Council (AHRC) funded project 'CREating a Dynamic archive of responsibLe Ecosystems in the context of Creative AI (CRADLE) theme. The event was co-organised and convened on Wednesday 14th February 2024 at the University of Nottingham (UoN) by project lead Dr Lydia Farina, School of philosophy, and project Deputy lead, Dr Helena Webb, School of computer science. It was attended by 12 additional team members representing interdisciplinary expertise from Computer Science and Human Computer Interaction (HCI) to English and Creative Writing, Philosophy, Psychology, Music, and Archiving.

The report contains three main elements: section 1 – an overview of CRADLE as aligned to the broader objectives of the United Kingdom Research and Innovation (UKRI) 'Bridging Responsible Artificial Intelligence Divides' (BRAID) project including its key deliverables, dates, and associated practicalities; section 2 – an overview of dynamic archives as aligned to substantive objectives for this workshop with a specific focus on the Jess+ case study; and section 3 – the foundations and guiding principles of a dynamic archive inspired by Jess+, following focussed group discussion. A final 'next steps' section outlines enduring themes from the workshop and priorities to be carried forward.

Objectives

Objectives for this first workshop were initially to introduce team members to each other and ensure familiarization with key terms of the CRADLE project and its alignment with BRAID. This is documented in section 1. Six objectives were then articulated for translating the presentation of this workshop's case study by the Jess+ team, to considerations for responsible artificial intelligence (RAI), both in a general sense and specifically in terms of the Jess+ ecosystem. This is documented in section 2. Finally, we moved towards a critical discussion of what structuring a dynamic archive might look like, considering its key characteristics and requirements for a prototype inclusive of Jess+ data artefacts. This is documented in section 3.

Participants

	Initials	Role	Discipline
Lydia Farina	LF	Project lead, UoN	Philosophy
Helena Webb	HW	Deputy Project lead, UoN	Computer Science
Craig Vear	CV	Co-Investigator, UoN and Jess + Researcher	/ Computer Science / Music
Solomiya Moroz	SM	Jess + Researcher	/ Computer Science / Music
Adrian Hazard	AH	Jess + Researcher	/ Computer Science / Music
Steve Benford	SB	Co-Investigator, UoN	Computer Science
Gabriella Giannachi	GG	Co-Investigator, Exeter	English / Documentation
John Moore	JM	Co-Investigator, The National Archives	Archiving / Emerging tech.
Oliver Miles	OM	Research Assistant, UoN	Computer Science
Bernd Stahl	BS	Co-Investigator, UoN	Computer Science
Michel Valstar	MV	Industry Partner	CEO Blueskeye AI
Pat Brundel	PB	Research Fellow, UoN	Computer Science
Elvira Perez	EP	Co-Investigator, UoN	Medicine/ Psychology
Spencer Jordan	SJ	Co-Investigator, UoN	English / Creative Writing

CRADLE Project team:

Lydia Farina PL, Helena Webb DPL, Steve Benford CI, Gabriella Giannachi CI, Spencer Jordan CI, Oliver Miles RA, John Moore CI, Elvira Perez Vallejos CI, Bernd Stahl CI, Craig Vear CI, Michel Valstar Partner

Agenda

09:00-09.30	Arrivals, coffee, introductions
09.30-10:00	Summary of key project dates, objectives, deliverables, impacts, and potential future bids, Identification of key characteristics of artworks used as case studies including seeking suggestions for the 5 additional artworks (LF)
10:00-12:00	Summary of key objectives of workshop 1 (LF) Identification of key characteristics of dynamic archive vis-à-vis a conventional museum documentation: focus on the terms: creativity, authenticity, responsibility (LF and GG) Identification of key characteristics of Jess+ (CV, SM, AH) Identification of key characteristics of a possible Jess+ archive in relation to the following questions (split-off groups and then group discussion) (CV, SM, AH, LF)
12:00-12.30	Lunch
12:30-14:00	Prototype design of dynamic archive for Jess+ (group discussion and summary: bringing together findings from the first part of the workshop)

Section 1: an overview of CRADLE

Dr Farina began by outlining ‘CREating a Dynamic archive of responsible Ecosystems in the context of creative AI’ (CRADLE) as the current work package running from 01/02/24 to 31/07/24. The objective of CRADLE was established as a first step toward operationalizing a broader theme of ‘Responsible AI in creative AI projects/ applications’, as set out by UKRI.

Proposed works

In terms of the purpose of CRADLE, we discussed its desired outputs as aligned to key dates and tangible deliverables, which are listed below.

<i>Workshop 1</i>	<i>14/02/24, University of Nottingham</i>
<i>Workshop 2</i>	<i>25/03/24, University of Nottingham</i>
<i>Workshop 3</i>	<i>June/July, The National Archives, London</i>
<i>Networking BRAID event</i>	<i>June/July, Cobot Maker Space, University of Nottingham</i>

Workshop 1 will focus on Jess+; workshop 2 on Cat Royale; and workshop 3 on Jess+, Cat Royale, a project involving our industry partner Blueskye AI and 4 additional projects. This will culminate in a structural piece or a framework for a ‘dynamic archive’, with a view to drafting a journal article.

Alignment with BRAID: Envisioning future work

We then discussed the future aims of CRADLE as aligned with the wider BRAID project. Dr Farina introduced this work as contributing to 10, six-month scoping projects that will define what responsible AI is across multiple sectors. This was done with the view to emphasising that initial CRADLE work packages could unlock further funding for a second phase of the BRAID programme, extending contributions to 2027 and 2028. Consequently, we position this workshop as an integral first step towards establishing a dynamic archive of responsible AI ecosystems for a demonstrator project, with a view to further networking, professional AI skills development, and collaboration with industry and other partners.

Much of our discussion focused on identifying and defining key concepts, technical challenges, and ethical dilemmas, first regarding dynamic archives in general, and then, more specifically, in regard to an AI ecosystem inspired by our Jess+ case study. As an

interdisciplinary team, this work already began to draw on the internal expertise of industry stakeholders (MV), academics, and public sector institutions (JM), with organizational challenges ranging from the practical and commercial, to the ethical and theoretical. Broad examples include the labeling and indexing of data, the inclusion and exclusion of stakeholders, and the definition of key terminology.

In terms of other BRAID projects which could benefit from insights gained in this project, we identify 2 of the 10 funded BRAID projects dealing with aligned contexts. These are:

1. *Joanna Tidy, University of Sheffield: Museum Visitor Experience and the Responsible Use of AI to Communicate Colonial Collections | Sheffield Hallam University; University of Cambridge; University of York; The Royal Armouries*
2. *Szilvia Rusvev, Bournemouth University: Shared Post-Human Imagination: Human-AI Collaboration in Media Creation | University of Michigan; University of Southern California; Zhejiang University; Beijing Film Academy; Policy Connect; Joint Audio Media Education Support (JAMES)*

The two case studies we analyse in depth on in this project, *Jess +* and *Cat Royale*, were selected on the basis that they that they are located within a creative industry context, they demonstrate a focus on responsible AI; they attempt to identify stakeholders; they address equality, diversity, and inclusion (EDI) considerations, they examine the relationship between creativity/authenticity, and between creativity/responsibility. Over the whole series of scheduled CRADLE workshops, we aspire to include 7 case studies in total building on these themes. Four case studies are currently being addressed:

<i>Jess+</i>	<i>'Intelligent DigiScore as a creative platform for inclusive music-making for disabled and non-disabled musicians'²</i>
<i>Cat Royale</i>	<i>'...explor[ing] the impact of AI on humans and animals'³</i>
<i>Blueskye AI</i>	<i>'...human behaviour analysis using face and voice sensing artificial intelligence'⁴</i>
<i>Dancing with robots</i>	<i>'...bringing expert human bodies into harmony with robots'⁵</i>

Further candidate projects include the Horizon/TAS Hub funded 'Tarics' (Trustworthy Accessible Robots for Inclusive Cultural experiences)⁶, the AHRC funded 'GLOW3'

² https://digiscore.github.io/pages/Impact_case_study_Jess_Plus/

³ <https://www.blasttheory.co.uk/projects/cat-royale/>

⁴ <https://www.blueskeye.com/>

⁵ <https://tas.ac.uk/research-projects-2023-24/embodied-trust-in-tas-robots-dance-different-bodies/>

⁶ <https://tas.ac.uk/research-projects-2022-23/tarics/>

(‘...showcase[ing] women, non-binary and trans artists’) ⁷, with a further vacancy for a suitable candidate project.

An overview of archiving

We began by hearing from Gabriella (GG) and John (JM), our academic (Exeter) and industry (TNA (The National Archives)) experts, respectively, on the documentation of mixed media art and archiving. Gabriella began by setting out that archiving is distinct from documentation, highlighting that while documentation is the practice usually carried out by artists or museums to create a legacy of a work, so as to preserve the work, archiving, within the museum context, is the practice of cataloguing and preserving a wider range of materials pertaining to a work that may not be in the collection. Within the museum context, documentation is often iterative and aimed at discerning the characteristics of a work that cannot change, i.e. the identity of the artwork, as well what could or even must change over time. Museums separate the art in their collection, which they acquired, and which they document, from the documentation in their archive which often consists of ephemera and published materials that were donated in relation to a work. The process of documenting work typically starts with the artists identifying the key terms/parameters for their work which are usually based on what is required to activate the work in the future. GG further emphasised the tension between working at the intersection of past, present, and future, indicating that documentation is both past-facing (defining the characteristics of a work), and future-facing, describing the conditions for its activation. In this sense archives and collections are both sites for preservation and creation. A particular **challenge** is presented in the documentation and preservation of performances and complex and hybrid media artworks given that they are so much more than the physical remains of a particular instantiation of it.

From the perspective of The National Archives, JM added the conflicting **challenges** of *authenticity* and *privacy*, which is typically seen when there are limits to the release of certain sensitive data. Further, The National Archives handle *big volumes* of digital content; one attempt to categorise this volume is to distinguish between content which was created digital from content which became digital (digitalised). Examples include government websites and social media, versus digitised paper records. Increasingly, The National Archives use AI applications to deal with the scale of all sources, as well as for tasks such as optical character recognition of documents. Currently, they are also building on use of semantic search using large language models (LLMs), combined with clustering and federated learning. Standards regarding these areas are still emerging, for example the International Image Interoperability Framework (IIIF), cultural heritage standards, etc.

Risks associated with opening such capabilities to the public must be considered and managed, as sensitive content can be included in the process. Major issues centre around *provenance data and authenticity*, over reliance on big tech storage such as Amazon Web Services (AWS), ‘take down’ requests and establishing organizational rights to content and retaining content irrespective of knowledge of its current or perceived future value.

⁷ <https://www.kcl.ac.uk/news/glow3-to-showcase-women-non-binary-and-trans-artists>

Thinking more speculatively around how to make the archive accessible to all stakeholders one method would be to allow others to annotate data to create more content. However, this raises further questions of how this ecosystem deals with issues of *trust*, *transparency*, *privacy* and on what grounds. So, as archiving remains a practical necessity, we still need to answer questions relating to how we determine whether something is valuable and needs to be documented as such or will become valuable in the future.

Section 2: Dynamic archives & Jess+

After familiarization with CRADLE and the broader BRAID project, we moved to a consideration of dynamic archives and the role of the Jess+ 'Digiscore' project. Objectives here were as follows:

- To get information on Jess+ from the project team
- To identify main stakeholders in this project
- To ask, 'is the ecosystem inspired by this project compatible with RAI priorities and policies?'
- To ask, 'what insights can we extract on the relation between creativity and responsibility?'
- To ask, 'does the project provide any insights on the relation between creativity and authenticity?'
- To ask, 'were there any particular worries/issues during the project relating to responsibility?'

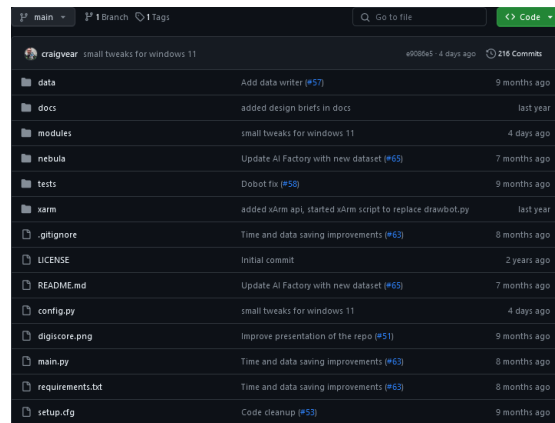
Introducing Jess+

The Jess+ project brought together musicians, sensory probes, and an AI-enabled robotic arm, as a novel means of '...build[ing] an embodied-AI system that facilitates co-creation for an improvising ensemble of disabled and non-disabled musicians...'⁸. The project was part of the wider European Research Council (ERC) 'digiscore' project, investigating how AI and robotics can transform musicianship and aid people with disabilities. It received further funding from Nottingham University (Faculty of Arts) and TAS hub. It aims to encourage a responsible approach to performance, composition, and interaction, by means of joint authorship or co-creation. It also aims to bring about the breaking down of barriers between composer and performer, and it employs a user-centred, inclusive, and flattened hierarchy approach to physical mobility. Jess+ affords knowledge of the participants' perceptions of being 'in the loop' in terms of creation of the digital score, and constitutes a shared space for creativity. From a technical point of view, it may also be considered as an example of collaborative reinforcement learning (CRL).

⁸ Jess+ (2023) https://digiscore.github.io/pages/Impact_case_study_Jess_Plus/



Artefacts of Performance⁹



Artefacts of Experience¹⁰

As an ecosystem, Jess+ might be described as an attempt to foster an emerging set of principles aiming to:

- Ground a hierarchy of trust
- Build a sense of togetherness
- Build a forefront of creativity and blended inclusivity
- Invite discussion on the creative agency of the robotic arm

Thinking about what an ecosystem of Jess+ might look like, project lead Craig Vear together with Solomiya Moroz and Adrian Hazard (researchers in Jess+) reflected that data elicited both gives insight into the practice led experience itself, as well as into the experiential output of the participants. Crucially therefore, the artefacts of Jess+ as a performance (the instruments, sensory probes, robotic arm) should NOT be considered the points of focus for CRADLE. Rather, emphasis should be placed on the phenomenological experience, which is captured in a variety of archived sources (e.g., a GitHub repository). We reflected that this becomes nuanced when considering the role of certain components of the original Jess+ performance, for example the use of a preexisting Jazz dataset. This invoked the “no decision about me, without me” principle.

Archiving Jess+

In terms of Jess+ data available which could be included in an archive, the three datasets available were given as the GitHub repository, DigiScore, and TAS enhancement.

⁹ Nottingham Research @ UoN Research (December 2023), X, <https://twitter.com/UoNresearch/status/1735192899309179115> [Accessed 26/02/24]

¹⁰ Jess_plus, DigiScore, GitHub (2023) https://github.com/DigiScore/jess_plus [Accessed 26/02/24]

The GitHub repository contains 215 ‘commits’ – digital footprints tracking each decision made through the project lifecycle, inherently linked to participant experience. They also serve as a rationale for the way the Digiscore was created.

The Digiscore element represents a novel record of the collaborative composition between participants including the AI robotic arm, available as two archives on the project MS Teams channel: these two sets of archived material include a proposal, a reflective journal, an intention statement, post-performance interviews, audience surveys, and subsequent questionnaires and interviews. The latter can be considered as reflecting the musicians’ perspective.

The TAS element involved a workshop with musicians, research team, external partners, followed by interview with the musicians culminating in a thematic analysis of experiences, musicianship, what ‘trust’ means to them in the context of musicianship. Interestingly, musicians reported this is not something they explicitly think about, instead trust arises from developing relationships through practice. Subsequent workshops with the same members were conducted to improve the music score and explore ideas for future work, and further, a group interview took place at the end of the process, furnishing project team reflections.

Implications for dynamic archives and trustworthy, responsible AI ecosystems

Jess+ affords a wealth of project documentation and data pertinent to developing a responsible dynamic archive prototype. The challenge remains how we might disentangle the repository to use as a research archive. What should the search terms be? What value can it add to the richness that already exists? These questions necessitate a *degree of openness* such that stakeholders from a wealth of disciplines can annotate.

It was also suggested that these repositories should be reviewed in case there is currently anything of interest to AI practitioners. An example was given of a participant (jazz musician contributing to the dataset used to train the AI) withdrawing from the project and restricting existing and continued use of their data as they did not want to be part of AI co-created music as a matter of general principle. An important issue highlighted here is that it is important to make people aware in advance of what they are participating in and that they should be allowed to withdraw their participation throughout the project.

Discussing practical considerations of archiving, we were encouraged to consider that archives should have unique identifiers, so the first step is to find a persistent identifier scheme (GG/JM). This may be informed by questions of ‘Who is the audience for the archive?’ and could necessitate a pilot AI application which tags the data/documentation to make it meaningful so that it can be used in future searches. This provides a solution to the problem of researchers taking a lot of time to do this manually and would be an interesting future research project. Moreover, we considered the question ‘What is the *dynamic* part of a dynamic archive?’. One of the senses of dynamic allows the emergence of novel meanings or novel

combinations arising from using AI to tag the data at the start and enable different searches at later points.

We noted that the original BRAID keynote did differentiate between notions of responsibility and accountability, particularly in terms being ‘reactive’ versus ‘future proof’, and that this remains an open discussion point. In terms of the ‘responsibility’ element, we identified factors such as environmental impact (with regards to AI) and EDI issues around creation of meta data and how tagging is done. It was also noted that EDI concepts differ around the world, and so we cannot, and arguably should not, impose a system that everyone must follow regardless of contextual factors. This led to the question, ‘How do we prove we are not biased in what we are doing?’ Responding to this, the Jess+ team reflected that they did not have a set of processes to evaluate the application of a ‘flat hierarchy’ principle in the original project and were aware that this application was not always successful. However, greater emphasis was instead placed on the sense of emerging shared values during performance. This reflects the current contribution standpoint regarding responsibility, in the sense that *responsibility* issues typically reflect the priorities of the active participants in each ecosystem.

In summary, there were 6 questions outlined in the workshop for dynamic archives based on the Jess+ project. The main contributions to these are outlined as follows:

1) the Jess+ project affords 3 distinct data sources useful for informing the creation of a responsible dynamic archive; the GitHub repository, Digiscore, and stakeholder reflections on contributing to the project. Crucially, these – rather than the human and technological components of the Jess+ ensemble – represent the artefacts we propose to operationalize. In terms of **2) identifying main stakeholders**, this remains a key consideration. Discussion focused on how stakeholders are accurately and ethically selected, perhaps by a standardised system that considers who the archive is/is not for, considering the uncontrolled/unforeseen consequences of the archive, and the problem of dealing with metadata, archiving meta data and determining the meaning of ‘dynamic’ from the standpoint of different stakeholders.

In terms of how the ecosystem inspired by this project is **3) compatible with RAI priorities and policies**, we focused again on what is meant exactly by the term ‘dynamic’, postulating new ‘layers’ that emerge iteratively with new uses and retrospections. In terms of insights we might extract on **4) the relation between creativity and responsibility**, following a discussion on working definitions for these concepts, it was suggested that creativity and responsibility can be postulated as correlative: We reflected that framing creativity as a responsibility issue furnishes practical examples such as responsibility to co-composers and depends on the context. It also needs to include responsibilities towards an audience. Intuitively, this seemed to speak more to the use of meta data.

Considering **5) the relation between creativity and authenticity**, we reflected that a practical example might be evidenced at least implicitly in the sense of the ‘flow’ participants experience during interactions. In terms of **6) outstanding issues** that appeared particularly challenging to resolve, the following four issues were cited:

- Co-creative archiving (archiving co-created material),

- establishing core RRI questions and considerations including using working definitions for the main relevant concepts of creativity, responsibility and authenticity,
- replacing meta-tagging with macro-tagging, and
- responding specifically to issues relating to disability without imposing restrictions on the creativity of artists with disabilities.

Section 3: structuring a dynamic archive: towards a prototype

In the final part of the workshop, we moved toward a more specific discussion of the implications for structuring a dynamic archive prototype based on the previously discussed features of Jess+. We first outlined the key characteristics of a dynamic archive as inclusive of features enabling a) continuous development, b) iterative development, and c) modification of components. Second, we speculated on what might constitute a dynamic archive including Jess+, by addressing the following questions:

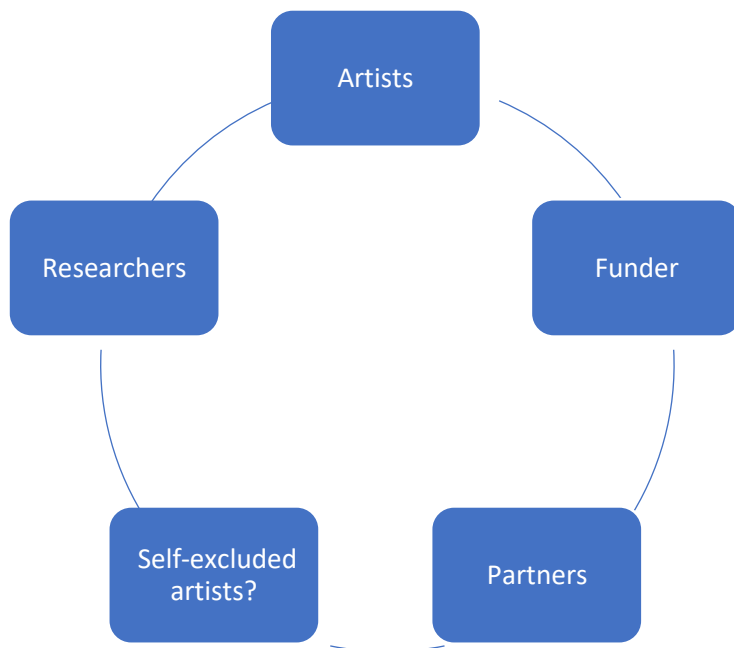
How are case studies to be categorised in the archive and what are the priorities and principles of arrangement?

How can we structure the archive so it prioritises our focus on creativity, authenticity, and responsibility?

What insights can we get from Jess+ as to how to structure the archive?

We reflected that Jess+ had a broad range of identified stakeholders, including funders, composers, performers, and further external partners; some emerging ‘accidentally’ through the project journey. This accidental emergence of stakeholders prompted us to ask ‘who might be missing’ from the project, and consequently, from a subsequent discussion of archiving. This raised the paradox of missing stakeholders who on the one hand self-exclude (e.g., through the lack of value alignment), but in doing so, do not have their interests represented in the burgeoning prototype. There was a clear sense that Jess+ helped users to become more creative and aid their own creativity by becoming a member of the ensemble.

Sketch of ecosystem stakeholders in Jess +:



Is all the data accessible/ Can it be made accessible?

When it comes to working out the design of a prototype ecosystem in the context of Creative AI, we asked ‘do we need a standard method?’. With respect to The National Archives, it was acknowledged for example that there is now an (industry) standard to identify stakeholders (JM), but equally, there was a sense that we should consider how lines should be drawn around a defined ecosystem.

A tension thus emerged in how an ecosystem might leave room for unpredictability while remaining a clearly delineated entity. Further work around what we mean by the terms ‘dynamic archive’ and ‘ecosystems’ is needed, with a focus on collating examples, if possible, from similar creative domains. This led to a consideration of stakeholders in terms of end-users: Who is it for? Who are the permitted users? How will the ecosystem suggested by Jess+ change when the project is included in CRADLE and then compared with other projects in Creative AI?

It was noted that creative AI projects are often multifaceted and are comprised by ‘many layers’. A crucial consideration emerged in discussion around the question ‘which layer(s) does the archive attempt to capture?’. Again, in terms of The National Archives, JM noted current practices around archiving the models for themselves (a kind of meta-archive), but nevertheless, there are and will be limitations on what can be recreated from these archives. This is because fundamentally, stakeholders of an archive change over time: We cannot predict what people will be interested in – we might think for example that their interest ‘is about music or tech’, but in years to come people might be interested to see the clothes people were wearing.

From our discussion it follows that when these data become accessible through archiving to multiple users, this allows for a constant modification of the ecosystem's stakeholders and thus the ecosystem itself. As this will have implications for responsibility considerations and priorities, additional research is needed to ensure that responsibility priorities match and are appropriate to the ecosystem's *updated stakeholders and boundaries*.

Next steps

Despite progress towards working definitions of dynamic archives and ecosystems in terms of creative AI, we cautioned a need to be practical about what can be achieved in this scoping project. We reflected that we should avoid focussing on abstract questions about what archives are in a meta sense, and instead focus on narrowing down a definition for instantiating a dynamic archive for the creative projects aligned to the CRADLE theme using bottom-up evidence available from the projects.

In a similar way we reflected on the difficulty of creating an archive which can accommodate abstract, subjective or contextually dependent concepts and diverging stakeholder values. An example we focussed on was the concept of 'authenticity'. *Authenticity* as relating to experience and to shared artefacts remains a very challenging area, especially considering whether something AI created can be seen as authentic.

In addition, authenticity may be impacted when an artefact is archived. For example, parallels were drawn between that of an oral traditional song and its potential loss of authenticity when written down. One of the main research questions of Jess+ relates to the possibility of co-creativity with AI. Evidence provided by the Jess+ artists supports the claim that co-creativity with AI is possible. Nevertheless, the challenge of how to archive co-creativity remains. Again, this brought us back to a consideration of stakeholders: If something has been co-created, should the co-creators also be involved in the setup of the archive? Moreover, what are the responsibility issues in setting up an archive from a project where this wasn't in the initial research plan? What about the end users as added potential stakeholders – how far do we need to attend to their expectations etc?

Moving toward a consideration of the technical features of a dynamic archive, we again reflected on the need for established techniques such as macro tagging. For each study in CRADLE, we might delineate 'the aims of the study' from 'how was RRI defined' for instance, as two classes of tags which speak to the ethical priorities of distinct groups of stakeholders.

As well as Jess+, we note that many of the creative AI projects we will analyse either explicitly or implicitly invoke considerations of equality, diversity, and inclusion (EDI). Disability aspects in this project include considerations of bodily choice and safety, as with other trustworthy autonomous systems (TAS) projects, such as the TAS Dance project. Conventionally, AI does not tend to deal well with these issues of 'positionality' – but positionality is coming into these discussions. These issues will be further explored and discussed when we analyse the *Cat Royale* and *Embodied Trust in Tas* case studies.

Towards the end of the workshop, we finalised next steps towards the creation of a structure of an archive and the in-depth analysis of *Cat Royale* which will take place in March 2024.