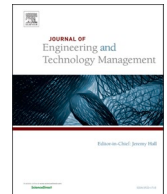




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Addressing Grand Challenges through transdisciplinary research collaborations between universities and the arts and cultural sector

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ABSTRACT

Transdisciplinary research collaborations between academics and actors from the arts and cultural sector can generate knowledge and practical interventions that contribute to addressing a wide range of Grand Challenges. However, we know relatively little about the processes through which these contributions occur. To address this research gap, we develop a conceptual framework linking different modes of involvement of arts and cultural sector actors to different scales of societal change. Drawing on 90 impact case studies from the UK Research Excellence Framework (REF) 2021, we identify three primary roles played by arts and cultural collaborators: users of research, providers of knowledge and resources, and co-creators of research. The findings show that different modes of involvement are associated with distinct pathways of societal change. When arts and cultural actors act as resource providers, benefits tend to accrue to organisations and communities directly connected to the collaboration. Co-creative engagement is associated with broader societal change extending beyond the original project and its immediate partners. The study offers key policy recommendations for governments, universities, and their arts and cultural sector collaborators to incentivise transdisciplinary collaborations to address Grand Challenges.

1. Introduction

Grand Challenges are complex societal problems with significant societal implications (George et al., 2016). Examples of Grand Challenges include inequality of wealth and of opportunity, social isolation, left-behind places, endemic and lifestyle diseases, and

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climate emergency; many such challenges are relevant to the attainment of the UN sustainable development goals.¹ Because these challenges transcend disciplinary, organisational, and sectoral boundaries, they require coordinated action among diverse actors, including universities, businesses, governments, charities, and civil society organisations. Consequently, increasing attention has been given to transdisciplinary research, which integrates academic and non-academic knowledge to better understand complex societal problems and develop solutions that advance the common good (Polk, 2014).

Among the diverse actors involved in transdisciplinary research, the arts and cultural sector is a particularly important partner. Grand Challenges are not solely technical or economic problems; they involve questions of meaning, values, behaviour, participation, and collective action. Addressing such challenges, therefore, requires forms of public engagement and societal transformation that extend beyond technological innovation alone. Arts and cultural organisations, including museums, galleries, theatres, artists, and community arts initiatives, are uniquely positioned to facilitate these processes through storytelling, creative practice, performance, and participatory engagement. They can shape public understanding, stimulate reflection, mobilise communities, and foster behavioural and cultural change in ways that differ from conventional industry-oriented collaborations.

Transdisciplinary research collaborations between academics and actors from the arts and cultural sector can generate knowledge and practical interventions that contribute to addressing a wide range of Grand Challenges, for example preventing ill health, promoting wellbeing, improving the management and treatment of medical conditions (Dow et al., 2023), increasing awareness of climate change, and strengthening community relations (Ferilli et al., 2017; Payne, n.d.). These collaborations frequently generate what Benghozi and Salvador (2016) describe as “hidden innovations”: socially embedded and practice-based forms of innovation that emerge outside formal R&D structures. These include new forms of public engagement, participatory governance, community-based experimentation, immersive communication practices, and creative approaches to sustainability and wellbeing challenges. The arts and cultural sector can provide a distinctive mode of transdisciplinary engagement capable of generating socially embedded forms of innovation and societal change. Reflecting the growing importance of transdisciplinary research, funding agencies and charities increasingly support projects that combine arts-based approaches with scientific and societal objectives.

Despite this potential, collaborations involving the arts and cultural sector remain under-theorised within both the Grand Challenges and transdisciplinary research literatures. Existing research on transdisciplinary collaborations and knowledge transfer has focused predominantly on university–industry relationships, particularly within Science, Technology, Engineering, and Mathematics (STEM) intensive sectors where innovation is typically associated with technological development, patents, and commercial Research & Development (R&D) outcomes (Tagliazucchi et al., 2021; Du et al., 2024). By contrast, arts and cultural collaborations have received less attention because their contributions are often cultural, social, participatory, and community-based, making them less visible within conventional innovation frameworks (Zukauskaite, 2012).

In particular, we know relatively little about collaborations involving the arts and cultural sector, including how their composition, the roles played by different actors, and the forms of interaction they adopt, influence their ability to address Grand Challenges. Existing studies rarely examine how arts and cultural actors contribute to the co-production of socially robust knowledge, how their roles differ from those of other non-academic collaborators, or how their involvement shapes the scale and breadth of societal change generated through research collaborations. As a result, current understanding of transdisciplinary collaboration remains heavily biased towards technological and industry-oriented models of innovation, overlooking cultural and participatory forms of societal transformation that may be essential for addressing complex societal challenges (Ferraro et al., 2015; Hamann et al., 2025).

This study addresses these gaps by posing the following research question: *How does the involvement of actors from the arts and cultural sector in transdisciplinary research collaborations contribute to achieving societal change in order to address Grand Challenges?*

To address this question, we develop a conceptual framework linking different modes of involvement of arts and cultural actors to different pathways and scales of societal change. We then examine these relationships using evidence from the UK Research Excellence Framework (REF) 2022 Impact Case Studies database. These case studies provide a uniquely valuable empirical resource because they systematically document how university research generates societal, cultural, economic, environmental, and policy impacts beyond academia across a wide range of disciplines and institutional contexts.² Drawing on a sample of 90 cases involving arts and cultural sector collaborations addressing Grand Challenges, we investigate how different forms of participation shape the generation and diffusion of societal benefits.

This study contributes to the literature in three ways. First, it extends research on Grand Challenges and transdisciplinary collaborations beyond dominant STEM- and industry-oriented perspectives by theorising the distinctive role of arts and cultural actors in generating societal change. Second, it develops an integrated framework linking different modes of involvement of arts and cultural collaborators to different pathways and scales of societal impact. Third, it demonstrates that deeper forms of co-creative engagement with arts and cultural actors are associated with broader and more transformative societal change. In doing so, the study repositions the arts and cultural sector not as a peripheral dissemination partner but as a central actor in the co-production of socially embedded

¹ The most widely acknowledged and adopted Grand Challenges are the Sustainable Development Goals (SDGs) set by the United Nations (UN) in September 2015 as part of a sustainable development agenda. A set of 17 goals aim to end poverty, protect the planet, and ensure prosperity for all, targeted to be achieved by 2030. These goals have been incorporated into government interventions and funding programmes, for example the UK's Global Challenges Research Fund, which supports cutting-edge research to address challenges faced by developing countries by focusing on six global strategic challenges: 1) cities and sustainable infrastructure, 2) education, 3) food systems, 4) global health, 5) resilience to environmental shocks and change, and 6) security, protracted conflict, refugee crises and forced displacement. <https://www.ukri.org/what-we-do/our-main-funds-and-areas-of-support/browse-our-areas-of-investment-and-support/global-challenges-research-fund/> (last accessed February 2026).

² See <https://www.ukri.org/who-we-are/research-england/research-excellence/research-excellence-framework/> (last accessed February 2026)

innovation and responses to Grand Challenges.

The remainder of the paper is organised as follows. [Section 2](#) develops the theoretical framework and hypotheses. [Section 3](#) describes the data and methodology. [Section 4](#) presents the empirical findings, while [Sections 5 and 6](#) discuss the results and outline their theoretical and practical implications.

2. Theoretical framework

2.1. Transdisciplinary research as a means to address Grand Challenges

Addressing Grand Challenges requires tackling complex, ill-defined issues (often referred to as “wicked problems”) that involve value judgments, lack simple solutions, and demand significant resources ([Brown et al., 2010](#); [Donaldson et al., 2010](#)). Responding to such problems necessitates collaborative approaches that unite academic researchers and societal actors ([Fam et al., 2020](#); [van Breda et al., 2016](#); [Witjes and Vermeulen, 2021](#); [Carew and Wickson, 2010](#)). Such *transdisciplinary research* collaborations aim to generate innovative concepts, methods, and knowledge ([Pohl, 2008](#)) and to produce real world impacts that make some progress towards addressing Grand Challenges. Transdisciplinary research involves crossing boundaries between academic disciplines and between academia and society in the design and implementation of research ([Petts et al., 2008](#); [Wesselink et al., 2011](#); [Jolibert & Wesselink, 2012](#); [Lang et al., 2012](#)). Similar approaches have been characterised as post-normal science ([Funtowicz & Ravetz, 1993](#)), Mode 2 science ([Gibbons et al., 1994](#); [Nowotny et al., 2003](#)), issue-driven interdisciplinarity ([Robinson, 2008](#)), interactive social research ([Talwar et al., 2011](#)), and participatory science ([Blackstock & Carter, 2007](#); [Spangenberg, 2011](#); [Wiek et al., 2012](#)). These frameworks share a commitment to bridging the gap between science and practice by integrating diverse knowledge, values, and expertise across academic and non-academic actors throughout the research process.

Transdisciplinary research is crucial in order to address Grand Challenges. On one hand, the complexity of Grand Challenges necessitates diverse perspectives and knowledge bases, which can only be provided by very different actors within and outside academia ([Bammer, 2013](#); [Bergmann, 2012](#); [Lang et al., 2012](#)). On the other hand, collaboration between academics and practitioners helps to ensure that research is both rigorous and practically applicable ([Spangenberg, 2011](#)). Despite its promise, the role of transdisciplinary research in effectively addressing Grand Challenges remains underexplored ([Thompson et al., 2017](#); [Belcher & Palenberg, 2018](#)). Furthermore, even when socially robust outcomes are produced, challenges remain in translating them into tangible societal change ([Lang et al., 2012](#); [Scholz, 2020](#)).

2.2. Modes of involvement of non-academic actors in transdisciplinary research

To characterise these different forms of involvement, it is useful to draw on models of knowledge utilisation that describe the relationship between research and practice ([Hoffmann et al., 2019](#)). [Landry et al. \(2001\)](#) identify four models of knowledge utilisation: science push, demand pull, dissemination, and interaction. These models differ in the extent to which non-academic actors influence the research process and the degree to which knowledge is transferred or co-produced.

The *science-push model* assumes a linear process in which researchers define problems, generate knowledge, and transfer findings to users, who are largely passive recipients ([Landry et al., 2001](#)). The *dissemination model* similarly assumes that knowledge originates within academia but emphasises the adaptation and communication of research findings to make them more accessible and useful to external audiences ([Johnson & Brown, 1986](#); [Grimshaw et al., 2012](#)). In both models, non-academic actors play a relatively limited role and are involved primarily as users of research outputs.

The *demand-pull model* gives external actors a more active role by allowing them to identify problems, articulate needs, or provide resources that shape research priorities ([Landry et al., 2001](#)). However, responsibility for designing and conducting the research remains largely with academic researchers. The *interaction model* represents the most collaborative form of engagement. It assumes that knowledge is generated through sustained interaction between researchers and users throughout the research process, from problem definition to implementation ([Greenhalgh & Wieringa, 2011](#); [Heinsch et al., 2016](#); [Webb et al., 2013](#)). In this model, knowledge is not simply transferred but co-created through the integration of diverse forms of expertise and experience.

Applied to transdisciplinary research collaborations involving actors from arts and cultural sector, these models suggest three broad modes of involvement: as research users, resource providers, and co-creators. Research users engage primarily with the application of research outputs; resource providers contribute resources, opportunities, networks, or strategic direction that support the research process; and co-creators participate throughout the research lifecycle, shaping both knowledge production and implementation. These different modes of involvement reflect different levels of influence over research agendas, methods, and outcomes.

This distinction can be further understood through [Max-Neef's \(2005\)](#) concepts of weak and strong transdisciplinarity. *Weak transdisciplinarity* is characterised by limited involvement of non-academic actors, who participate mainly as users or resource providers. *Strong transdisciplinarity*, by contrast, involves the integration of diverse forms of knowledge and perspectives through collaborative problem framing, knowledge production, and implementation. We therefore argue that collaborations involving arts and cultural actors as co-creators are more likely to exhibit strong transdisciplinarity and generate more original, socially embedded, and potentially transformative outcomes than collaborations in which they act primarily as users or resource providers. In the following section, we explore how these different modes of involvement shape the generation of societal change.

2.3. The link between modes of involvement of non-academic collaborators and societal change

A key advantage of transdisciplinary research collaborations is their orientation towards socially robust and actionable outcomes. However, assessing their effectiveness remains challenging. Demonstrating research impacts is difficult because societal and academic effects often emerge over long periods and are shaped by multiple interacting factors, making attribution and causality problematic (Walter et al., 2007; Bornmann, 2013; Joly et al., 2015; Greenhalgh et al., 2016; Rau et al., 2018; Hansson & Polk, 2018).

Within academia and policymaking, the term *research impact* is commonly used to describe changes arising from the production and dissemination of research, including cultural, economic, social, technological, political, and legal effects (Bornmann, 2013; Penfield et al., 2014). For example, according to the definition provided by the UK's REF, impact refers to demonstrable effects of research beyond academia, including effects on society, culture, public policy, health, the environment, and the economy (REF, 2022). However, the concept is often used ambiguously. On the one hand, impact is often treated as a broad umbrella concept encompassing multiple forms, scales, and temporalities of change. On the other hand, the term impact is used to refer both to the beneficial outcomes generated by research and to the broader processes through which those outcomes occur (Spaapen & van Drooge, 2011; Penfield et al., 2014; Greenhalgh et al., 2016).

Because of this ambiguity, in this study we use the term 'impact' only to refer to the overall set of changes arising from a research collaboration. To discuss the specific effects of a collaboration on specific actors and within a certain time frame, we talk about 'benefits', that is, the specific positive outcomes experienced by particular individuals, groups, organisations, or communities as a result of a research collaboration. These may include enhanced knowledge, capabilities, services, networks, visibility, or resources, as well as long-term social, cultural, environmental, and economic benefits, producing change both within projects and societal change across wider socio-economic systems (Bornmann, 2013).

Several frameworks have been developed to conceptualise the benefits from research collaborations. Fritz et al. (2019) distinguish benefits according to their scope, identifying benefits for the research and participatory process, for practitioners directly involved, and for wider practice. Wiek et al. (2014) differentiate benefits by timing, distinguishing between first-order (intermediate) and second-order (longer-term) benefits.

More integrative frameworks combine scope and timing. Belcher et al. (2020) propose three interconnected spheres: the sphere of control, encompassing activities and outputs directly shaped by a project; the sphere of influence, where project outcomes affect actors beyond the immediate collaboration; and the sphere of interest, where broader societal changes may emerge. Similarly, Schafer et al. (2021) distinguish between first-order benefits occurring within the project context, second-order benefits extending beyond the project but remaining closely connected to it, and third-order benefits that diffuse across the wider field of action.

Importantly, these benefits are interconnected rather than discrete. Interactions among project participants can generate networks, reputation, learning, and trust (first-order effects), which facilitate the transfer and adoption of research outcomes in other contexts (second-order effects) (Schafer et al., 2021). Learning can support changes in practices and decision-making, while trust can underpin regulatory and behavioural change. Through these mechanisms, benefits generated within a project may diffuse beyond the immediate collaboration and contribute to broader societal transformation (second- and third-order effects). We use the term 'societal change' to indicate the wider and enduring transformations that occur as the result of changes in policies, practices, behaviours, institutions, or social and cultural conditions

In this framework, benefits are understood as important mechanisms through which research impact is generated, while societal change represents the broader consequences that may emerge when benefits diffuse beyond the immediate collaboration; impact is the overall set of changes arising from a research collaboration. By distinguishing between the concepts of impact, benefits and societal change we can unpack the different pathways through which research collaborations contribute to wider societal transformations.

Table 1 integrates the main conceptual frameworks developed to characterise the beneficial societal changes brought about by research collaborations into a single typology.

Table 1
Typology of benefits from research collaborations.

Type of benefits	First order benefits: within the collaboration	Second order benefits: connected to the collaboration	Third order benefits: societal change
Scope and timing of benefits Schafer et al. (2021), Wiek et al. (2014), Belcher et al. (2020)	Sphere of control: benefits occur directly within and mostly during the project	Sphere of influence: benefits are directly connected with the project – they occur beyond the research project but within the close timing or spatial context of the research project	Sphere of interest: benefits occur beyond the timing or spatial context of the project, leading to broader societal changes
Beneficiaries Fritz et al. (2019), Belcher et al. (2020)	Arena of collaboration: the actors directly involved in the research and participatory process	Arena of practitioners: societal groups directly connected with the project	Wider practice: Societal actors and groups beyond the project
Processes that favour each type of benefit Schafer et al. (2021)	Learning Trust building	Learning Trust building Network formation Increased reputation	Learning Trust building Network formation Increased reputation

2.4. From transdisciplinary collaboration to societal change: The role of non-academic actors

While Table 1 identifies different scales of benefits from research collaborations, it does not explain how such benefits are generated or why some collaborations produce broader, longer-term benefits than others. Existing research suggests that societal change rarely results directly from research outputs. Instead, it emerges through processes of learning, trust-building, network formation, and reputation development that enable research findings to be adopted, adapted, and diffused beyond the original project context (Greenhalgh et al., 2016; Schafer et al., 2021).

These mechanisms are inherently relational and depend on how actors participate in the research process. The depth and reciprocity of engagement influence whether benefits remain confined to project participants (first-order benefits), extend to actors directly connected to the collaboration (second-order benefits), or diffuse more broadly across communities, sectors, and policy domains (third-order benefits). Understanding societal change therefore requires attention not only to research outcomes but also to the roles played by non-academic collaborators in generating, mobilising, and applying knowledge.

We therefore, argue that the involvement of non-academic actors provides the crucial link between transdisciplinary research processes and societal change, for several reasons. On the one hand, different modes of involvement are likely to foster different levels of learning, trust, network development, and knowledge mobilisation, shaping whether benefits remain localised or contribute to broader societal transformation. On the other hand, an important distinction across different modes of involvement concerns who influences different stages of knowledge production and utilisation. Transdisciplinary collaborations vary not only in the extent of non-academic participation, but also in when and where non-academic actors exercise influence. In some collaborations, academics retain primary responsibility for defining research questions, designing methodologies, and conducting research, while non-academic actors become involved, as research users, mainly in applying research outcomes. In other collaborations, non-academic actors contribute some resources but the process of research design and implementations remains in the hands of academics. In yet other collaborations, non-academic actors actively shape both the production and implementation of knowledge. Distinguishing between the drivers of research ideation, design, and performance, and the drivers of research results implementation therefore captures how authority, responsibility, and agency are distributed within collaborations and helps explain differences in societal outcomes.

In order to build the conceptual framework driving our empirical analysis, we focus on the involvement of non-academic actors from the arts and cultural sector in research collaborations aiming to address Grand Challenges, linking their mode of involvement with the types of benefits produced. As mentioned in the previous section, building on four models of knowledge utilisation (science push, demand pull, dissemination, and interaction; Landry et al., 2001), we identify three different modes of involvement of non-academic actors in research collaborations: (i) as users of research (typical of research collaborations that adopt a science push or dissemination approach); (ii) as providers of resources for research (typical of research collaborations that adopt a demand pull approach); (iii) as co-creators of research (typical of research collaborations that adopt an interaction approach).

Non-academic actors as research users. We argue that transdisciplinary research collaborations are most likely to generate first-order benefits for actors directly involved in the research when non-academic participants act primarily as users of research. In this mode, knowledge flows largely from academics to external actors, who apply research findings for their own purposes and benefit (Rossi & Rosli, 2015; Roux et al., 2006). Research ideation, design, and implementation remain predominantly academic-led, with non-academic actors involved mainly to ensure that outputs are relevant and tailored to intended users (Pohl, 2008). Academics therefore retain control over knowledge production while adapting research findings to the perceived needs of external audiences.

The effectiveness of this approach depends on how accurately these needs are identified and translated into usable outputs. However, knowledge transfer occurs with relatively limited engagement from non-academic actors, as research activities remain largely controlled by academics (McCabe et al., 2016). As a result, interactions tend to be characterised by low levels of mutuality, with external actors primarily engaging as recipients and adopters of knowledge rather than active contributors to its production (Ankrah et al., 2013). Consequently, the benefits generated are likely to remain concentrated among those directly participating in the collaboration. This means that benefits are seen by the individual participants as the key positive outcome from the research collaboration. From the discussion, it can be hypothesised that:

H1: The likelihood that a research collaboration will benefit the non-academic actors directly involved in the collaboration increases when those non-academic actors are involved as users of the research

Non-academic actors as research resources providers. We argue that transdisciplinary research collaborations are more likely to generate second-order benefits for actors beyond the project but within the direct reach of project partners, when non-academic actors act as resource providers. In this mode, external actors contribute resources, expertise, networks, and ideas that help shape research agendas towards socially relevant challenges. This reflects a more dynamic exchange process in which societal needs and anticipated applications influence academic research (De Wit-de Vries et al., 2019), with external actors actively participating in problem identification, project design, and data collection (McCabe et al., 2016). Effective collaboration depends on the development of shared practices, mutual engagement, and aligned goals (Gertner et al., 2011). Through sustained interaction and norms of reciprocity, collaborators build relational trust that supports ongoing knowledge exchange (Neergaard & Ulhøi, 2006), encouraging joint commitments of time, effort, and resources (Ulhøi et al., 2012). Partners may also act as intermediaries, helping to disseminate research outcomes to wider audiences and stakeholder groups (Audretsch & Belitski, 2022). Although academics retain primary responsibility for conducting the research, the resulting knowledge is typically directed towards addressing broader societal needs rather than the interests of specific users alone. Therefore, this allows us to formulate the following hypothesis:

H2: The likelihood that a research collaboration will benefit external societal groups directly connected with the collaboration increases when non-academic actors are involved as research resource providers

Non-academic actors as co-creators of research. We argue that transdisciplinary research collaborations are most likely to generate

third-order benefits for actors beyond those directly connected to the project—when non-academic actors participate as co-creators. In this mode, knowledge is jointly produced throughout the research process, from problem formulation to implementation, because addressing complex challenges requires the integration of diverse knowledge bases and perspectives. Co-creation involves deep interactions between academics and actors from business, government, and civil society around shared goals and objectives (Osborne & Strokosch, 2013; McCabe et al., 2016). The interaction of different organisational cultures becomes a core element of knowledge production.

As Markovic and Bagherzadeh (2018) note, collaborators contribute complementary resources and capabilities to jointly create new knowledge. This process combines the joint exploration of problems and opportunities (Bruneel et al., 2016; Laursen & Salter, 2004) with the joint exploitation of resulting knowledge and innovations (Caloghirou et al., 2001). The outcomes are often more innovative and interdisciplinary, increasing their capacity to engage actors beyond the original partnership. Consequently, the benefits generated may extend beyond project participants to regional and national economies, broader societal groups, and wider fields of practice (Bozeman, 2000; Reypens et al., 2016). Hence, it can be postulated that:

H3: The likelihood that a research collaboration will benefit broader societal groups beyond the collaboration increases when non-academic actors are involved as co-creators of the research

Table 2 summarises the conceptual framework linking modes of involvement, knowledge utilisation, and societal change. In the science-push model, academics dominate knowledge production and non-academic actors act primarily as users of research. In the demand-pull model, non-academic actors influence research agendas by providing resources and articulating needs, although academics remain responsible for implementation. The interaction model represents the highest level of integration, with academics and non-academic actors jointly defining problems, co-producing knowledge, and sharing responsibility for implementation. These arrangements are associated with different scales of benefits, ranging from effects within the sphere of control, to broader effects in the sphere of influence, and ultimately to longer-term societal changes within the sphere of interest.

To examine how different modes of involvement of arts and cultural collaborators shape societal change, the next section outlines the study's empirical strategy. It describes the selection of REF 2021 impact case studies, the analytical framework, and the coding approach used to investigate the relationship between collaborative roles and the scale of societal change.

3. Methodology

3.1. The REF impact case studies database

This study draws on the REF 2021 impact case studies database to examine how transdisciplinary research collaborations involving arts and cultural actors contribute to societal change addressing Grand Challenges. The REF is the UK's national research assessment exercise, conducted approximately every seven years to evaluate research outputs, research environments, and the wider impacts of research across publicly funded universities and disciplines (REF, 2022). Universities submit evidence through 34 Units of Assessment (UoAs), organised into four panels covering A- Medicine, Health and Life Sciences; B- Physical Sciences, Engineering and Mathematics; C- Social Sciences; and D-Arts and Humanities. Each submission includes selected research outputs, an environment statement, and a set of impact case studies reviewed by expert panels (see Appendix 1).

The REF impact case studies provide a particularly valuable empirical resource because they systematically document how university research generates impacts beyond academia across social, cultural, economic, environmental, and policy domains (REF, 2021). Since the introduction of impact assessment in 2014, they have become an important source of information about the societal contributions of academic research. Their breadth and comparability make them especially suitable for investigating how collaborations involving arts and cultural organisations contribute to societal transformation and responses to Grand Challenges. The analysis draws on 90 case studies selected from the REF 2021 database through a two-stage process involving automated screening followed by manual review. The full database contains 6361 different impact cases³ and provides detailed information on research impacts, underpinning research, institutional affiliations, collaborating partners, funding sources, geographical reach, and supporting evidence. This richness enables a systematic examination of how different forms of collaboration involving arts and cultural actors contribute to societal change.

3.2. Identification of impact case studies relating to Grand Challenges and involving collaborations with actors from the arts and cultural sector

To extract from the 2021 REF impact case studies database (<https://results2021.ref.ac.uk/impact>) a number of relevant cases to analyse, we developed a structured set of keywords designed to capture the two dimensions we were interested in: the objective to address Grand Challenges, and the involvement of the arts and cultural sector. We therefore adopted a two-tier keyword strategy. First, we used keywords aligned with several Grand Challenges which were deemed particularly relevant for this study. Second, we included a complementary set of keywords representing the principal arts and cultural sectors. Together, these two layers ensured that the cases retrieved were both thematically relevant and representative of the diversity of arts and cultural production and organisation.

To identify key words related to several Grand Challenges, we started by scoping relevant literature (such as government and

³ The total number of impact cases submitted to the REF 2021 was 6781, but some of these were deemed as confidential or sensitive in nature, and therefore they are not included in the database.

Table 2

Modes of involvement, knowledge utilisation, and societal change.

Role of non-academic actors in the transdisciplinary research collaboration	Users of research	Providers of resources for research	Co-creators of research
Model of knowledge utilisation	Science push, dissemination	Demand pull	Interaction
Drivers of research ideation, design and performance	Academics	Academics	Both academics and non-academic actors
Drivers of research results implementation	Non-academic actors	Academics	Both academics and non-academic actors
Type of impact	Sphere of control: benefits occur directly within and mostly during the research collaboration	Sphere of influence: benefits are directly connected with the research collaboration – they occur beyond the research collaboration but within the close timing or spatial context of the research collaboration	Sphere of interest: benefits occur beyond the timing or spatial context of the research collaboration, leading to broader societal changes
Beneficiaries	Arena of collaboration: the non-academic actors directly involved in the research and participatory process	Arena of practitioners: societal groups directly connected with the research collaboration	Wider practice: Societal actors and groups beyond the research collaboration

organisations reports, academic journals and websites). We focused on Grand Challenges themes that have been evidenced in key policy documents (HM Government, 2017; Mazzucato & Rainer, 2020; Davies, 2020; Gutierrez Posada et al., 2018; Arts Council England, n.d.; UKRI, 2021; Centre for Cultural Value, 2024) discussing knowledge exchange activities between universities and the arts and cultural sector across the UK: placemaking and levelling up,⁴ health and wellbeing,⁵ technologies for social good,⁶ and environment and climate emergency⁷ (Rossi et al., 2023). These were also key themes identified by the National Centre for Academic and Cultural Exchange (NCACE), established in 2020 by Research England to support and better understand and evidence collaborations between research and the arts and culture sector; NCACE was led by one of the co-authors of this work, and the other two co-authors were affiliated with it.

To structure the four Grand Challenges themes, a targeted keyword-selection process was undertaken. Two members of the research team independently identified between five and seven core keywords for each theme from the various sources outlined above. These keywords were chosen to represent the conceptual, policy, and applied dimensions of each Grand Challenge, ensuring that they captured both the strategic intent and the practical scope of the themes. Selection was guided by three main criteria: (i) alignment with core dimensions of the Grand Challenge (keywords had to directly reflect the fundamental goals and priorities of each theme, ensuring that the terms represented not only topical areas but also the underlying social, economic, and environmental issues the Grand Challenges are designed to address); (ii) coverage of multiple analytical levels (the keywords were chosen to span different scales and perspectives, from local and community-based concerns (e.g. *community engagement*, *community health*, *sustainable communities*) to broader structural and systemic issues (e.g. *levelling-up*, *global health*, *climate change*), in order to ensure that each theme was conceptually broad but analytically coherent); (iii) relevance to research, policy, and innovation contexts (terms were selected to reflect language commonly used across academic research, policy frameworks, and innovation agendas; this allowed the keywords to act as effective anchors for mapping existing activities, funding, and expertise onto the four Grand Challenges themes).

For each theme, the final set of keywords was agreed through discussion among the researchers, who refined their initial selections to remove duplication and ensure balance across social, economic, technological, and environmental dimensions. The resulting keywords function as *boundary objects*: they are sufficiently precise to support classification and analysis, while remaining broad enough to accommodate the interdisciplinary nature of the Grand Challenges. The selected Grand Challenges thematic keywords were the following:

⁴ Place making and levelling up is given a definition by the Department of Digital, Culture, Media and Sport 'The role that art and culture might play in delivering a Government commitment to level up the country. The emphasis is on cultural placemaking and the recognition that arts organisations can make a significant contribution to levelling up'. (<https://committees.parliament.uk/work/1744/reimagining-where-we-live-cultural-placemaking-and-the-levelling-up-agenda/> last accessed February 2026)

⁵ According to the World Health Organisation (WHO), 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Mental health is a state of well-being in which an individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community (<https://www.who.int/data/gho/data/major-themes/health-and-well-being#:~:text=The%20WHO%20constitution%20states%3A%20%22Health,of%20mental%20disorders%20or%20disabilities,> last accessed February 2026)

⁶ The World Economic Forum has defined Technologies for social good as 'the space where technology is deployed to take on big social and environmental problems' (<https://www.weforum.org/agenda/2023/03/tech-for-good-what-does-it-mean-and-how-can-we-deliver-on-it/>, last accessed February 2026)

⁷ Climate emergency is defined as 'a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it. (Oxford Dictionary)

- *Theme 1 - Place making and levelling up*: Community engagement, Community wealth building, Levelling-up, Regional and urban creative economic development, Inequality, Inclusive and sustainable economic growth, Regeneration
- *Theme 2 - Health and wellbeing*: Health, Well-being, Global health, Healthy lives, Community health, Mental health
- *Theme 3 - Technology for social good*: Artificial intelligence, Data technology, Green technologies, Emergent technologies, Immersive experiences, Virtual reality
- *Theme 4 - Environment and climate emergency*: Zero emission, Environment, Climate change, Climate emergency, Sustainable communities, Ecology

Additional keywords were then selected in order to identify the main arts and cultural sectors. These keywords were selected to represent the major fields in which arts and cultural activity, employment, and policy intervention are concentrated. Rather than aiming for an exhaustive list of every arts and cultural practice, we focused on sectors that are widely recognised in arts and cultural policy, funding structures, and academic literature. These sectors were chosen because together they cover both institutional and community-based forms of arts and cultural production, as well as both tangible and intangible cultural outputs.

Specifically, we included keywords relating to 6 main arts and culture sectors⁸: Theatre (including performance art, opera, dance, plays), Music, Public Arts (including Community Arts), Museums (including Galleries), Visual Arts, Artists, Literature (including poetry and literary festival).

Including both sector-based and practitioner-based terms (such as *artists*) allowed us to capture not only organisational and venue-based activities (e.g., museums, theatres) but also freelance and independent cultural work, which is particularly significant in this sector. Overall, this keyword framework allowed us to extract a dataset that, while not fully exhaustive, provides a balanced and representative overview of the main governance challenges across the principal arts and culture domains.

By applying these keywords, we identified 903 impact case studies that both dealt with Grand Challenges and involved the arts and cultural sector. These cases were distributed across the four themes (440 in theme 1, 227 in theme 2, 98 in theme 3 and 165 in theme 4). For each case, we collected relevant information and listed it in the database. Additionally, we included information about: whether the case was retrieved under more than one keyword, which art and cultural sectors were involved, and which keyword(s) were associated with the case.

Across the REF impact case studies, the four Grand Challenge themes varied considerably in their prevalence and association with the arts and cultural sector. Health and Wellbeing keywords appeared in more than half of all cases, while Environment and Climate Emergency keywords occurred in more than 40%. However, only a small proportion of cases within these themes also contained arts and cultural sector keywords. The strongest association with the arts and cultural sector was found in Placemaking and Levelling Up, where more than 20% of cases contained arts and cultural sector keywords. By comparison, the corresponding proportion was approximately 5% for each of the other three Grand Challenge themes. This pattern suggests that arts and cultural sector involvement is particularly prominent in research addressing place-based societal challenges, while remaining less prevalent, although still evident, across Health and Wellbeing, Technology for Social Good, and Environment and Climate Emergency.

Fig. 1 shows how the seven arts and cultural sector keywords are distributed across the four themes (considering only the impact cases that contain both Grand Challenges thematic keywords and arts and cultural sector keywords). The distribution of arts and cultural sector keywords is broadly similar across themes 1, 2 and 4 (with the greatest shares belonging to literature, theatre and museums, the latter particularly important in the health and wellbeing theme), while theme 3 (technology for social good) sees a greater prevalence of music and theatre.

Although impact cases which include arts and cultural sector keywords are a small share of the overall number of cases in each theme, they are widely distributed across universities and across Units of Assessment. As explained in Section 3.1, impact case studies were submitted across 34 Units of Assessment, organised into four main panels: Main Panel A (Medicine, Health and Life Sciences), Main Panel B (Physical Sciences, Engineering and Mathematics), Main Panel C (Social Sciences), and Main Panel D (Arts and Humanities). 85% of Units of Assessment (82% of universities) submitted at least one case dealing with Placemaking and Levelling Up, 77% (67% of universities) submitted at least one case dealing with Health and Wellbeing, 62% (57% of universities) submitted at least one case dealing with Environment and Climate Emergency, and 50% (34% of universities) submitted at least one case dealing with Technology for Social Good. The majority of these Units of Assessment were in the arts and humanities and social sciences but some cases were also submitted to Physics, Computer Science, Geography and Environment, and Psychology, Psychiatry and Neuroscience.

Subsequently, the research team read the summaries of the REF impact cases and manually identified a subset of cases in each theme for further analysis. The purpose of the manual identification was to single out cases which involved transdisciplinary research collaborations with non-academic actors from the arts and cultural sectors.

In particular, the selection was based on the following criteria:

- the cases had to refer to a variety of art and culture sectors, type of institutions, geography of institutions and Units of Assessment;
- the cases had to describe research collaborations involving actors from the arts and cultural sectors.

Each member of the research team was assigned one third of the 903 relevant cases, which they reviewed in order to systematically screen and identify those that best illustrated transdisciplinary research collaborations involving arts and cultural sector actors, in line

⁸ These sectors map onto the disciplines supported by Arts Council England (see <https://www.artscouncil.org.uk/>, last accessed February 2026).

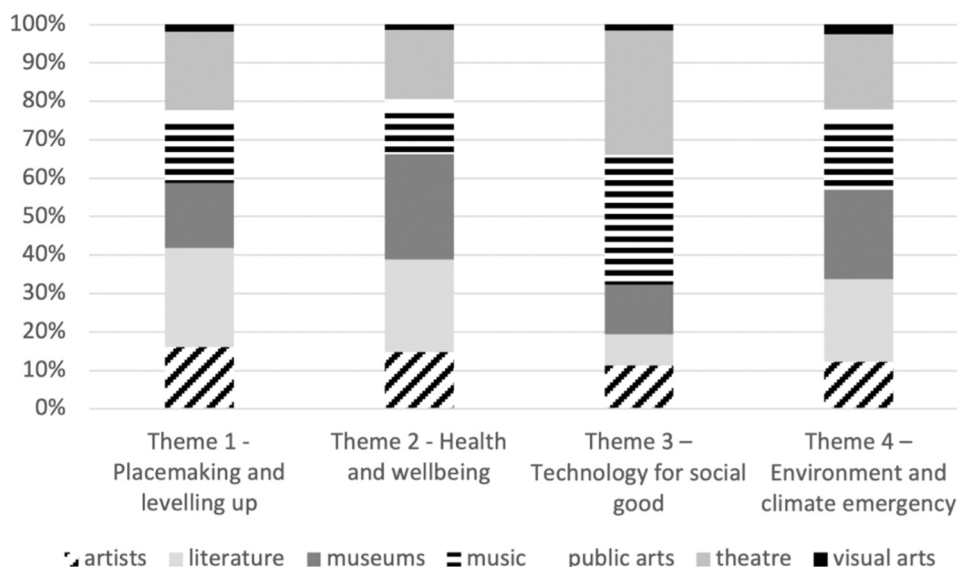


Fig. 1. Distribution of arts and culture keywords within each of the four themes.

with the selection criteria outlined above. Each researcher shortlisted 25 cases per theme. These were then discussed and collectively ranked according to their relevance and analytical richness. A final sample of 90 cases (corresponding to 10% of all cases in our database) was selected using maximum variation sampling to ensure diversity across art and cultural sectors, types of universities, geographical locations, Units of Assessment, and involvement from the arts and cultural sectors. Principles from quantitative content analysis support the use of a 10–15% subsample for exploratory, pattern-oriented research (Lombard et al. 2002).⁹

Fig. 2 shows how the 90 cases are distributed across themes. The selected cases represent about 10–15% of cases in each theme.

3.3. Analysing impact cases relating to Grand Challenges

The next phase involved in-depth analysis of each of the 90 cases. We downloaded the 5-page detailed cases from the REF Impact Case Studies database (<https://results2021.ref.ac.uk/impact>). Two members of the research team free coded the cases to identify the parts of the case descriptions which illustrated: (i) the art and cultural sector collaborators, (ii) the roles of art and cultural sector collaborators in the context of the research collaboration, (iii) the benefits achieved, (iv) the actors and social groups who benefited from the collaborations, and (v) the processes and networks through which benefits were generated.

The free codes developed this way were then aggregated into second-order codes and subsequently into first-order codes by the research team through a process of joint analysis and discussion of the codes in the course of several meetings. The first-order codes were then aligned with the main categories of the conceptual framework we presented in Table 2. In particular, we coded: (i) the roles of art and cultural sector collaborators in the transdisciplinary research collaboration (See Table 3); (ii) the benefits generated by the research collaboration (See Appendix 2); (iii) the beneficiaries of the research collaboration (See Appendix 3).

The first-order codes were also used to create a set of binary variables, which, for each of the 90 cases, take value 1 if the code is present and 0 if it is not. This way, we developed a dataset containing 90 observations and several variables derived from the interviews, as well as variables drawn from the REF 2021 Impact Case Studies database.

Empirically, we first developed a summary of the main differentiating characteristics of cases addressing each of the four Grand Challenges we focus on. In order to identify the specificities of each theme, we performed a combination of descriptive analysis of the dataset of the 90 case studies, and qualitative analysis of the cases' content. Subsequently, using the dataset of 90 case studies we ran a set of regressions on the various types of societal changes we identified – first, second and third order benefits – on the various kinds of roles of arts and cultural sector collaborators in transdisciplinary research collaborations – research providers, research users, research co-creators – as well as several control variables.

⁹ In large documents, such as policy documents, reports, or government databases, full-population coding is rarely efficient because analytical returns diminish relative to time and cost; instead, we rely on samples sufficient to detect stable themes, topic distributions, and structural regularities rather than precise population parameters (Pavelko & Grabe, 2017). Content-analysis methodology commonly treats 10–20% samples of large, bounded but heterogeneous database as adequate for this purpose (Krippendorff, 2019). REF impact case studies fit this profile: they are structurally standardised yet highly diverse by discipline, impact type, and institution, making a 10–15% sample a defensible balance between analytical depth and breadth. Validity depends on design rather than sheer size: a 10–15% subsample, stratified on theoretically relevant dimensions and checked against key variables, is sufficient to yield stable themes and structural patterns without implying precise population-level estimates (Krippendorff, 2019).

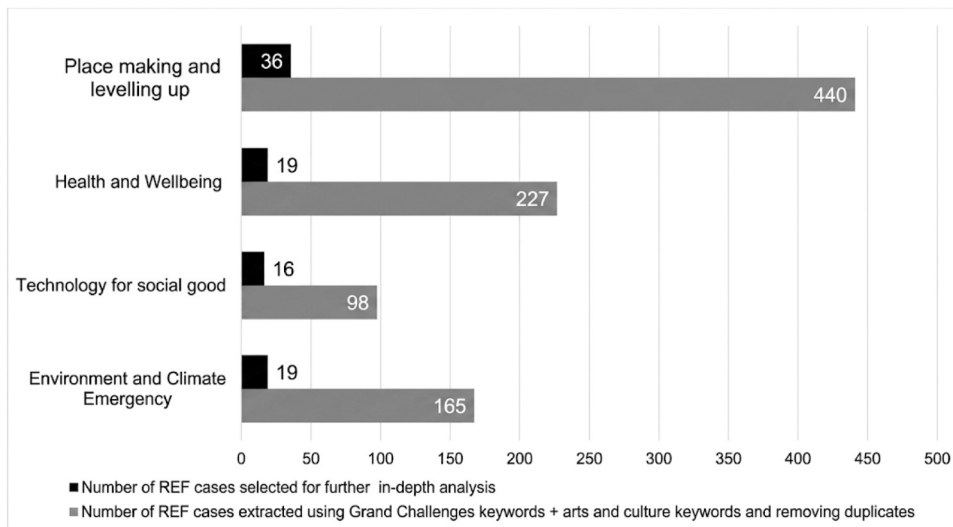


Fig. 2. Number of REF impact cases extracted using thematic Grand Challenges keywords and art and cultural sectors keyword.

As alternative dependent variables in these regressions, we used three variables coded from the impact case studies, using the codes listed in Table 4.

- *Benefits_within_project* is a binary variable equal to one if at least one of the codes relating to first-order benefits (research that generated benefits that occurred directly within and mostly during the project) was present in the impact case study.
- *Benefits_connected_to_project* is a binary variable equal to one if at least one of the codes relating to second-order benefits (research that generated benefits beyond the research project but within the close timing or spatial context of the research project) was present in the impact case study.
- *Benefits_beyond_project*, is binary variable taking values 1 if least one of the codes relating to “research that generated further benefits for specific organisations, which in turn generated further impact on others” or one codes relating to “research that generated further collaborations, which in turn generated further benefits for the organisations and for others” were present in the impact case study.

The independent variables are three binary variables that capture the role of the arts and cultural sector collaborators in the research process, using the codes listed in Table 3:

- *Partner_provider* is a binary variable equal to one if at least one of the codes relating to providing knowledge, resources or dissemination platforms for research is present
- *Partner_user* is a binary variable equal to one if at least one of the codes relating to using research for themselves or to develop further activities is present
- *Partner_co_creator* is a binary variable equal to one if at least one of the codes relating to co-designing research is present

As control variables, we include:

- The number of formal partners of the collaboration, and the Herfindahl-Hirschmann concentration index computed on the shares of types of partners present in the collaboration (considering partner organisations of five different kinds: universities, arts and cultural sector collaborators, businesses, charities or government agencies). The higher the concentration index the more homogeneous was the collaboration’s composition. We also included the shares of formal partners that are businesses, charities, government bodies. The nature of the partners can affect the type of impact that the collaboration generates;
- The number of external funders of the research collaboration, as a greater number of funders can increase the expectations for the collaboration to have broader societal impacts;
- The number of research outputs of the collaboration and the share of outputs that are artifacts (such as performances, compositions, art installations) rather than publications. Artifacts may be more likely to have broader societal benefits compared to academic publications. We also include the Herfindahl-Hirschmann concentration index computed on the shares of types of references (articles, books, artifacts), to capture the diversity of the knowledge base on which the project relies (combination of theoretical and more applied work);
- The Grand Challenges theme that the research deals with;
- The type of art and cultural sector involved in the research.

Table 3
Coding: Roles of arts and cultural sector collaborators.

Second-order codes	First-order codes	Aggregate categories corresponding to conceptual framework
Partner organisation provided data - facilities - infrastructure for research Partner organisation provided funding for research-initiative-project Partner organisation gave award to research Partner organisations provided evidence for further academic studies Partner organisation hosted intervention-initiative-training by researcher Partner organisation hosted or broadcasted work - exhibition - performance based on research Partner organisation invited researcher to participate in event Partner organisation demonstrated technology developed by researcher	Supporting research Showcasing-hosting (to disseminate or share research internally or with external audience)	Non-academic arts and cultural sector collaborators as research resource providers: providing knowledge, resources or dissemination platforms for research
Partner organisation collaborated with researcher to implement technology Partner organisation commissioned work by researcher Partner organisation used research to augment own practice Partner organisation used research to bid for funding - award Partner organisation used technology developed by researcher	Using research	Non-academic arts and cultural sector collaborators as research users: using research for themselves or to develop further activities
Partner organisation delivered programme-intervention-training based on research Partner organisation developed product based on research Partner organisation performed work by researcher Partner organisation released product (record, book) based on research	Developing independently (based on research)	
Partner organisation co-developed initiative-project-performance with researcher Partner organisation collaborated with researcher in producing work-performance Partner organisation collaborated with researcher to develop product Partner organisation collaborated with researcher to produce evidence-report-consultation response-guidance	Co-creating	Non-academic arts and cultural sector collaborators as research co-creators: co-creating research

The following table presents the main descriptive statistics of the variables used in the regressions.

4. Findings

We analyse the involvement of arts and cultural sector collaborators across the four Grand Challenge themes. Most cases were submitted to Units of Assessment (UoAs) in the Arts and Humanities, particularly Art and Design: History, Practice and Theory; Music, Drama, Dance, Performing Arts, Film and Screen Studies; and English Language and Literature. There are, however, also cases submitted to Geography and Environmental Studies, Education, Physics, Anthropology and Development Studies, Computer Science and Informatics, Archaeology, Psychology, Psychiatry and Neuroscience. While the prevalence of Arts and Humanities is unsurprising given the study's focus, this disciplinary distribution also highlights the transdisciplinary nature of these collaborations. Although knowledge of arts and humanities provides the primary foundation, many projects draw on expertise from other disciplines, reflecting the diverse knowledge requirements of different Grand Challenges.

The variation across themes illustrates how arts and cultural collaborations extend beyond traditional disciplinary boundaries. For example, Health and Wellbeing projects frequently combine arts-based approaches with expertise from health and medicine; Technology for Social Good projects often involve STEM disciplines, particularly Computer Science; Environment and Climate Emergency projects draw on Earth Systems and Environmental Sciences, Politics, and International Studies, reflecting the environmental and governance dimensions of climate challenges. Meanwhile, Placemaking and Levelling Up projects are more likely to engage with Built Environment and Planning, Area Studies, and Business and Management Studies. This pattern reinforces the argument that addressing Grand Challenges requires the integration of artistic, scientific, social, technical, and policy knowledge through transdisciplinary collaboration.

Table 4

Descriptive statistics for variables used in the regressions.

	Variables	Obs	Mean	Std. dev.	Min	Max
Dependent variables	Benefits_within_project	90	0.38	0.49	0	1
	Benefits_connected_to_project	90	0.36	0.48	0	1
	Benefits_beyond_project	90	0.46	0.50	0	1
Independent variables	Partner_provider	90	0.74	0.44	0	1
	Partner_user	90	0.77	0.43	0	1
	Partner_cocreator	90	0.42	0.50	0	1
Controls: type, number, diversity of partners	Partner_universities	90	0.60	1.64	0	11
	Partner_arts_cultural_sector	90	0.40	1.12	0	7
	Partner_business	90	0.36	0.93	0	5
	Partner_charity	90	0.29	0.77	0	4
	Partner_government	90	0.36	1.55	0	14
	N_formal_partners	90	2.07	4.27	0	25
	Concentration_index_partners	90	0.49	0.80	0	5
Controls: funders	N_external_funders	90	1.70	1.62	0	8
Controls: research outputs	N_research_outputs	90	5.72	1.40	1	11
	Share_arts_objetscs	90	0.23	0.33	0	1
Controls: Grand Challenges themes	Theme_1	90	0.40	0.49	0	1
	Theme_2	90	0.21	0.41	0	1
	Theme_3	90	0.18	0.38	0	1
Controls: arts and cultural sectors	Artists	90	0.22	0.42	0	1
	Literature	90	0.16	0.36	0	1
	Museums	90	0.19	0.39	0	1
	Music	90	0.12	0.33	0	1
	Public_arts	90	0.06	0.23	0	1
	Theatre	90	0.18	0.38	0	1
	Visual_arts	90	0.06	0.23	0	1

Within the Placemaking and Levelling Up theme, artists are more frequently involved as collaborators than in other themes, reflecting the importance of creative practices in place-based regeneration, community engagement, and local identity formation. Arts and cultural organisations typically act as resource providers, offering venues, exhibitions, and performances that facilitate the dissemination and discussion of research with local stakeholders, while also serving as users of research to inform their own activities. These collaborations primarily generate benefits for specific communities and social groups through policy influence, advocacy, place branding, and the preservation and sharing of cultural assets (second-order benefits). They also often stimulate further partnerships and initiatives that extend the reach and impact of the original project (third-order benefits). Illustrative quotations of these roles and impacts are presented in Table 5.

Cases within the Health and Wellbeing theme show particularly high levels of collaboration with theatre and music organisations, reflecting the established role of performance- and music-based interventions in health promotion, mental health support, rehabilitation, dementia care, and community wellbeing. These organisations bring expertise in participation, storytelling, emotional engagement, and experiential learning, making them valuable partners in research aimed at improving health behaviours, wellbeing outcomes, and patient experiences. They commonly act as both resource providers, hosting performances and dissemination activities, and users of research, applying findings within their own programmes and developing new initiatives. Many collaborations generate benefits beyond the immediate partnership through subsequent projects, wider organisational adoption, and further dissemination, demonstrating their capacity to create broader societal impacts. Illustrative quotations are presented in Table 6.

Cases within the Technology for Social Good theme are particularly likely to involve visual arts organisations, reflecting the

Table 5

Supporting quotations for roles and benefits in Theme 1 impact case studies.

Descriptive statement	Supporting quotations
In cases relating to the Placemaking and Levelling Up theme, arts and cultural sector actors play the role of resource providers for the research collaboration	<i>"The National Library of Wales provided facilities for workshops involving more than 400 children from 12 primary and secondary schools, who produced original cartographic artworks based on the research, reflecting diverse visions of Wales past and present".</i>
Cases relating to the Placemaking and Levelling Up theme benefit specific social groups directly connected to the collaboration	<i>"The film, as a research output, was taken up as a campaign tool by Lawyers for Palestinian Human Rights (LPHR) and Medical Aid for Palestinians (MAP). It helped build platforms with like-minded NGOs and successfully raised awareness of key issues among audiences ranging from law students and lawyers to parliamentarians"</i>
Cases relating to the Placemaking and Levelling Up theme benefit specific social groups indirectly connected to the collaboration, through further collaborations, which in turn generate further impacts beyond the project	<i>"Stirling's research fosters collaboration between various stakeholders, such as Fife Council, Fife Cultural Trust, Fife Pilgrim Way, the Abbey Church, the Carnegie Dunfermline Trust and Birthplace Museum, Dunfermline Carnegie Library & Gallery (DCLG), Abbot House Trust, Dunfermline & West Fife Local Tourism Association, Visit Scotland and HES, to position the lost Abbey choir and tombs as a cornerstone' of regional plans for regeneration around Dunfermline's heritage quarter"</i>

Table 6
Supporting quotations for roles and benefits in Theme 2 impact case studies.

Descriptive statement	Supporting quotations
In cases relating to the Health and Wellbeing theme, arts and cultural sector actors play the role of users of the results of the research collaboration	<i>"The poetry archive (research output) was curated and made publicly available via the newly established Manchester Poetry Library as a collection of creative responses to the Coronavirus pandemic, supporting wider public engagement with poetry and the lived realities of health and wellbeing during lockdown."</i>
In cases relating to the Health and Wellbeing theme, arts and cultural sector actors play the role of resource providers for the research collaboration	<i>"Live Music Now (LMN) provided access to a network of care homes and used our research to support a large-scale national initiative aimed at mitigating the impact of Covid-19 and lockdown. The Choir in Every Care Home initiative involved 35 national care and music organisations working collaboratively".</i>
Cases relating to the Health and Wellbeing theme benefit specific social groups indirectly connected to the collaboration, through further collaborations, which in turn generate further impacts beyond the project	<i>"Building on the success of the research, Dance for Parkinson, in collaboration with the English National Ballet, has informed the training of dance artists in the UK and internationally. This included training provision that led to the development of 20 new initiatives across the UK. The research also enabled the expansion of partnerships internationally. Through the international collaborations, dance artists and organisations have established programmes for people with Parkinson's, and secured funding to sustain their work."</i>

growing convergence between digital technologies and creative practices such as digital design, immersive media, virtual reality, and data visualisation. These organisations often provide experimental environments in which emerging technologies can be developed, tested, and communicated to wider audiences. Projects in this theme are also more likely to attract external funding from international sources, local governments, businesses, and research councils. Arts and cultural partners typically act as resource providers, hosting exhibitions, showcasing prototypes, and facilitating public engagement, while also serving as users of research by applying research outputs within their own activities. The resulting benefits tend to be concentrated among specific organisations through increased income, expanded client bases, innovation adoption, and improved service delivery. Illustrative quotations are presented in [Table 7](#).

Finally, cases within the Environment and Climate Emergency theme are particularly likely to involve literature and museum partners, reflecting their role in engaging with issues of heritage, place, memory, and public education. Through exhibitions, collections, storytelling, and public engagement activities, these organisations help communicate complex environmental issues through accessible cultural narratives. Compared with other themes, partners are more frequently involved as co-creators, highlighting the importance of integrating scientific, cultural, and community knowledge in addressing environmental challenges. These projects also attract the highest levels of external funding and the largest number of funders per case, particularly from charities, businesses, research councils, and universities. Their impacts are less concentrated on specific organisations and more likely to benefit wider public audiences through increased awareness, engagement, and understanding of climate and environmental issues, reflecting the collective nature of these challenges. Quotations from the case studies are reported in [Table 8](#).

The results from this analysis are summarised in [Table 9](#).

The qualitative evidence seems to be aligned with some of our hypotheses. In particular, evidence from the Placemaking and Levelling Up theme appears to highlight the connection between arts and cultural sector actors playing the role of research resource providers, and the research primarily benefitting organisations directly connected with the collaboration; and evidence from the Environment and Climate Emergency theme appears to highlight the connection between arts and cultural sector actors playing the role of research co-creators, and the research primarily benefitting social groups beyond the collaboration. The role of research users instead is less clearly associated with a specific type of societal change.

In order to provide a broader perspective on whether the mode of involvement of arts and cultural sector collaborators in the transdisciplinary research collaboration process has an effect on the societal change that the research collaboration produces, we

Table 7
Supporting quotations for roles and benefits in Theme 3 impact case studies.

Descriptive statement	Supporting quotations
In cases relating to the Technology for Social Good, arts and cultural sector actors play the role of users of the results of the research collaboration	<i>"Porthcurno Telegraph Museum (PTM) has benefited substantially from our research in two key ways. We developed a historical HoloLens-based escape room experience, The Augmented Telegrapher, designed for group use in the museum's on-site tunnels (built during the Second World War). Players collaborate to solve puzzles using haptic devices. This installation enabled the museum to enter the escape room market."</i>
In cases relating to the Technology for Social Good theme, arts and cultural sector actors play the role of resource providers for the research collaboration	<i>"The National Gallery credits KIMA, multi-sensory installations, as a means to foster social connectedness" during the Covid-19 pandemic. New, remote audiences were able to engage in "shared experiences of cultural heritage, with over 2000 unique views on YouTube and a combined social media reach of over 100,000 people. Audiences were able to remain socially connected [...] in a shared cultural experience, at a time when museums were not accessible to the public"</i>
Cases relating to the Technology for Social Good theme benefit specific organisations directly connected to the collaboration	<i>"Our research has enabled the Cornwall Museum Partnership (CMP) to make its offer more relevant to contemporary expectations. We have supported CMP in helping its 60 client museums to use immersive technologies to protect their collections for future generations, while also enhancing CMP's capacity to advise and support its members, thereby contributing to job retention and creation in the region."</i>

Table 8

Supporting quotations for roles and benefits in Theme 4 impact case studies.

Descriptive statement	Supporting quotations
Cases relating to the Environment and Climate Emergency theme tend to benefit specific social groups indirectly connected to the collaboration, through further collaborations, which in turn generate further impacts beyond the project	<i>"Artist and academic scientists have co-created major immersive artworks, through lighting and sound effects driven by machine learning algorithms analysing real-time honeybee colony activity. The gigantic 17 m metal 'Hive' has brought honeybee conservation issues to prominence. The 'Hive' is now a popular attraction at Royal Botanic Gardens Kew, experienced by 2.9 million people to explore the urgent issues in relation to pollinators, their relationships with plants and their vital role in helping us feed a rapidly growing population".</i>

Table 9

Main features of research collaborations across four themes.

Theme:	Collaborations more likely to feature arts and cultural sector collaborators of the following type:	Arts and cultural sector collaborators more likely to play the role of:	Collaborations more likely to benefit the following:
Place making and levelling up	Artists	Resource providers	Social groups directly connected to the collaborators Social groups beyond the collaboration
Health and Wellbeing	Theatre and music	Resource providers and/or research users	Social groups beyond the collaboration
Technology for social good	Visual arts	Resource providers and/or research users	Specific organisations
Environment and Climate Emergency	Literature and museums	Research co-creators	Social groups beyond the collaboration

perform a quantitative analysis. Overall, 42% of cases reported the involvement of arts and cultural sector collaborators as co-creators, 77% as research users and 74% as resource providers (this can also be seen from the descriptive statistics reported in [Table 4](#)). 52% of cases reported benefits accruing to general societal sectors (e.g. viewers, audiences, residents of certain regions), whereas 54%

Table 10

Regression model.

	(1)	(2)	(3)
	d		
VARIABLES	Benefits within project	Benefits connected to project	Benefits beyond project
Partner_provider	-0.815* (0.419)	0.966* (0.577)	0.018 (0.392)
Partner_user	0.012 (0.431)	-0.133 (0.540)	0.175 (0.400)
Partner_cocreator	-0.095 (0.383)	0.531 (0.484)	1.126*** (0.358)
N_Formal_partners	0.027 (0.039)	0.077 (0.050)	-0.008 (0.041)
Concentration_partners	0.636 (0.404)	0.011 (0.601)	-0.168 (0.366)
Share_business	-0.008 (0.815)	-0.683 (0.929)	-0.071 (0.636)
Share_charity	-0.280 (0.882)	7.237* (4.217)	0.320 (0.807)
Share_government	-0.464 (0.826)	-0.222 (1.334)	0.742 (0.753)
N_external_funders	0.007 (0.109)	0.306** (0.135)	-0.152 (0.104)
N_research_outputs	0.083 (0.130)	-0.217 (0.170)	-0.054 (0.119)
Share_arts_objects	-0.360 (0.565)	0.287 (0.749)	-0.174 (0.487)
Themes	significant	significant	not significant
Arts and cultural sectors	significant	significant	significant
Constant	-1.040 (1.024)	-1.026 (1.395)	0.263 (0.988)
athrho	0.047 (0.456)	0.334 (0.311)	0.209 (0.352)
Observations	90	90	90

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

reported benefits accruing to specific community or social groups, 34% reported benefits to specific businesses and 50% reported benefits to specific non-commercial organisations (such as NGOs, hospitals, schools, other public sector bodies). 38% of cases reported benefits accruing to the organisations directly involved in the collaboration, and 36% reported benefits accruing to actors outside the collaboration but directly connected to it. In 46% of cases the benefits were accrued to actors beyond the collaboration and not directly connected to it, thanks to the intermediation of other organisations, or through further collaborations (see Table 4).

Based on the framework presented in Table 2 and proposed hypotheses, Table 10 shows the results of a trivariate probit regression on the three joint dependent variables measuring benefits within the project, benefits connected to the project and benefits beyond the project (we use the trivariate probit regression to take into account the fact that more than one type of benefit can occur concurrently so there may be correlation among the regressions' errors. We also ran separate probit regressions as a robustness check, obtaining very similar results).

Arts and cultural sector collaborators as providers of knowledge, resources or dissemination platforms are positively associated with benefits that are directly connected with the research collaboration (sphere of influence: benefits occur beyond the research collaboration but within the close timing or spatial context of the research collaboration), and partners as co-creators of research are positively associated with benefits that occur beyond the timing or spatial context of the research collaboration, leading to broader societal changes (sphere of interest). This is in line with the expectations of our conceptual framework and particularly with hypotheses H2 and H3. However, when considering the variable *Benefits_within_project*, we find that partners as users have no association with benefits that occur directly within and mostly during the research collaboration, and that partners as providers of knowledge, resources or dissemination platforms have a significantly negative association with this variable. Our findings thus do not support H1.

In terms of controls, we find that there is a positive effect of the share of charity partners and of the number of funders on the likelihood to obtain benefits that are directly connected with the research collaboration. We also find that theme 1 (Placemaking and Levelling Up) is more likely to be associated with benefits to actors that are directly connected with the research collaboration, in line with the qualitative evidence presented earlier. We also find a positive association between this theme and benefits that occur directly within and mostly during the research collaboration. Theme 3 (Technology for Social Good), is associated with benefits that occur directly within and mostly during the research collaboration, which is also in line with the qualitative evidence presented earlier. In terms of arts and cultural sectors, Music has a negative association with benefits connected to the project and benefits beyond the project while Public Arts has a positive association with benefits within the project.

Hence, we partially support the arguments proposed by the theoretical framework, that different roles played by non-academic collaborators from the arts and cultural sector are associated with different types of societal change. When arts and cultural sector collaborators provide resources or act as disseminators of research outcomes, the research collaboration is more likely to generate benefits that are directly connected with the research collaboration – they occur beyond the research collaboration but within the close timing or spatial context of the research collaboration. The benefits of the research not only create value to the collaborators, but also spills over to societal groups directly connected with the research collaboration (arena of practitioners). When arts and cultural sector collaborators act as co-creators of research, the research outcomes show a ripple effect indirectly beyond the research collaboration to wider society (Rossi et al., 2025). Benefits occur beyond the timing or spatial context of the research collaboration, leading to broader societal changes (sphere of interest). The beneficiaries are societal actors and groups beyond the research collaboration (wider practice). Supportive quotations aligned with these associations are presented in Appendix 4.

5. Discussion

A central debate within the Grand Challenges and transdisciplinary research literatures concerns how collaborations between academic and non-academic actors generate societal change beyond the immediate boundaries of research projects (Ferraro et al., 2015; Polk, 2014; Lang et al., 2012). While existing studies generally assume that broader participation enhances societal impact, they provide limited insight into how different forms of stakeholder involvement shape the scale and diffusion of benefits. Our findings contribute to this debate by showing that the role played by arts and cultural sector collaborators matters as much as their presence. Different modes of involvement are associated with distinct pathways of societal change, ranging from benefits confined to project participants to broader transformations extending beyond the original collaboration.

More specifically, collaborations in which arts and cultural actors act primarily as resource providers tend to generate second-order benefits for communities and organisations directly connected to the project. By contrast, co-creative collaborations are more likely to generate third-order benefits that diffuse beyond the immediate project context. These findings suggest that the depth and nature of participation, rather than participation alone, are critical in explaining societal transformation. They support arguments that partnerships create value by combining complementary resources, knowledge, and capabilities unavailable to individual organisations (Selsky & Parker, 2005; Frølund et al., 2018; Faccin & Balestrin, 2018). Through such collaborations, partners gain access to learning opportunities, social capital, and wider networks (Austin, 2000; Selsky & Parker, 2005), generating innovations and societal benefits that extend beyond the participating organisations to connected communities and stakeholder groups (Selsky & Parker, 2010; Clarke and MacDonald, 2019). As a result, these partnerships can facilitate more innovative responses to complex societal challenges (van Tulder et al., 2016).

When arts and cultural sector collaborators act as co-creators, research collaborations are more likely to generate third-order effects that extend beyond the temporal and spatial boundaries of the project, contributing to broader societal change within the sphere of interest. In such cases, the benefits reach societal actors and communities beyond those directly involved in the collaboration.

Our findings align with and extend the work of Bouwen and Taillieu (2004), who argue that cross-sector collaboration involving co-design and joint decision-making builds social capital and supports broader societal goals (Al-Tabbana and Ankras, 2019).

Similarly, [Trencher et al. \(2014\)](#) emphasise that addressing societal challenges requires the integration of research, engagement, and action across multiple sectors, while [Gerke et al. \(2023\)](#) highlight the importance of alliances that combine academic, governmental, industrial, and civic knowledge through co-design and co-production. [De Silva and Wright \(2019\)](#) likewise show that academics, public entrepreneurs, and citizens acting as co-creators can generate innovations whose value extends well beyond immediate project partners.

Our study advances this literature by developing an integrated framework linking three collaborative roles—users, resource providers, and co-creators—to distinct pathways of knowledge utilisation and corresponding first-, second-, and third-order effects. In doing so, it bridges research on knowledge transfer, transdisciplinarity, and research impact, helping explain why some collaborations remain project-bound while others generate wider societal transformation.

Crucially, our analysis of 90 REF impact case studies moves the literature beyond normative claims about the value of co-creation by providing empirical evidence that co-creative engagement is associated with third-order effects extending beyond the project and its immediate partners. While previous studies have relied largely on qualitative case evidence, our mixed-method approach demonstrates that the deep involvement of arts and cultural sector actors is not merely beneficial but closely associated with broader societal transformation. The findings therefore not only corroborate existing arguments about the value of co-creation but also illuminate how research collaborations scale their impacts across organisations, networks, institutions, and communities when addressing Grand Challenges.

The findings also reveal important differences across Grand Challenge themes. Health and Wellbeing and Environment and Climate Emergency projects are less likely to generate benefits for participating organisations and more likely to produce benefits for wider societal groups beyond the original collaboration, suggesting a stronger orientation towards broader societal change. By contrast, Placemaking and Levelling Up and Technology for Social Good projects more frequently benefit organisations and actors directly connected to the collaboration, indicating impacts concentrated within the sphere of influence.

However, our findings do not support the assumption that collaborations involving users primarily generate benefits within the project itself. Research outcomes are often disseminated widely through publications and other channels, creating impacts that extend beyond project partners and are difficult to attribute to specific beneficiaries ([Mansfield, 1991](#); [Johann et al., 2024](#)). This pattern may partly reflect the nature of REF impact case studies, which are assessed primarily on the basis of “reach” and “significance” and therefore tend to emphasise broader societal impacts rather than benefits experienced by collaborators ([REF, 2022](#)). It may also reflect the capacity of arts and cultural collaborations to generate wider societal benefits in areas such as health, education, criminal justice, mental health, social inclusion, and regeneration ([Galloway, 2009](#)), supported by diverse pathways of research utilisation across disciplines ([Hughes et al., 2019](#)).

6. Conclusion

This study contributes to the literature on stakeholder participation, transdisciplinary research, and innovation for Grand Challenges by advancing understanding of how arts and culture research generates societal impact ([George et al., 2016](#); [Ferraro et al., 2015](#); [Mazzucato, 2018](#); [Lang et al., 2012](#); [Polk, 2014](#)). It develops an integrated framework linking the roles of users, resource providers, and co-creators to different models of knowledge utilisation and orders of societal change ([Landry et al., 2001](#); [Starkey & Madan, 2001](#); [Greenhalgh & Wieringa, 2011](#); [Wiek et al., 2014](#); [Belcher et al., 2020](#); [Schäfer et al., 2021](#)). By connecting science-push, demand-pull, and interaction-based processes to first-, second-, and third-order effects, the framework explains how research benefits diffuse from project-level outcomes to broader societal change.

The study also extends transdisciplinary research into the under-theorised domain of arts and culture. While previous research has focused largely on science, engineering, and sustainability, and often treats culture as a vehicle for communication or dissemination, we conceptualise arts and culture research as a form of transdisciplinary innovation capable of generating socially embedded and often hidden solutions to complex societal challenges ([Benghozi & Salvador, 2016](#); [Zukauskaitė, 2012](#); [Miles & Green, 2008](#); [Crossick & Kaszynska, 2016](#)).

Using evidence from 90 REF 2021 impact case studies, the study further demonstrates that the depth of stakeholder involvement matters. Co-creation is associated with broader societal change, while resource provision generates more limited spillovers and user-based engagement does not consistently produce project-level effects. Together, these findings show that how stakeholders participate is a key determinant of whether arts and culture research achieves transformative societal change ([Bouwen & Taillieu, 2004](#); [Trencher et al., 2014](#); [De Silva & Wright, 2019](#); [Gerke et al., 2023](#)).

6.1. Managerial and practical implications

The findings provide practical guidance for universities, arts and cultural organisations, funders, and managers of transdisciplinary collaborations. At the strategic level, the framework can help partners align the form of collaboration with the scale of societal change they seek to achieve. Rather than assuming that greater stakeholder participation will automatically generate greater impact, organisations should consider the roles played by non-academic actors, the stages of the research process at which they participate, and the intended beneficiaries. Where the objective is primarily to apply research within particular organisations or communities, engagement as research users or resource providers may be appropriate. Where broader societal change is sought, the findings indicate the value of deeper co-creative arrangements in which partners contribute to problem definition, research design, knowledge production, implementation, and dissemination.

At the operational level, managers can translate these principles into collaborative practices by defining partners' roles and

responsibilities at the outset, establishing shared decision-making processes, allocating resources for sustained participation, and creating opportunities for knowledge exchange and joint reflection. Arts and cultural organisations should therefore be engaged not merely as dissemination partners but, where appropriate, as contributors throughout the research process. This requires universities and funders to support capacity building in research methods, co-creation, impact evaluation, partnership development, and knowledge exchange, alongside appropriate resources for sustained collaboration.

The framework can also inform the evaluation of transdisciplinary collaborations. Rather than assessing success primarily through research outputs or immediate benefits, universities, funders, and project managers can examine whether benefits remain within the project, extend to connected organisations and communities, or diffuse more widely through changes in practices, behaviours, policies, networks, or institutions. Funding and assessment systems could support this approach by recognising partnership quality, co-created outputs, and different scales of societal impact, alongside conventional research outcomes (Whitmer et al., 2010; Trencher et al., 2014). More broadly, funding programmes can facilitate such collaborations through dedicated support for university–arts and cultural sector partnerships, co-design and shared leadership, and evaluation criteria that recognise arts-based approaches to participation, public engagement, and innovation. In this way, the framework provides a practical basis for designing, managing, and evaluating transdisciplinary collaborations according to the societal change they seek to achieve.

6.2. Limitations and future research

This study has several limitations that provide opportunities for future research. Although collaborations between universities and arts and cultural organisations are often viewed positively, critical scholarship highlights important challenges, including the exploitation and precarity of cultural workers (Banks, 2023; Belfiore, 2015; Gill, 2014). Studies of culture-led regeneration further show that initiatives intended to address societal challenges can produce exclusionary outcomes, such as rising rents, displacement, and the marginalisation of artists and creative practitioners (Comunian, 2019; Grodach et al., 2018; Kitsos et al., 2025; Tanghetti et al., 2022). Likewise, critical perspectives from cultural policy and urban geography caution that creativity-led collaborations may reproduce inequalities, commodify cultural labour, and obscure power asymmetries between institutions and creative workers (Courage, 2017; Mould, 2018). Research on participation and co-creation similarly emphasises the need to examine who benefits from collaboration and whose labour, knowledge, and risks remain invisible (Toonen, 2021). Future research should therefore investigate the labour conditions, power relations, and distributive outcomes of university–arts and cultural sector collaborations.

A second limitation concerns the dataset. The study draws on a relatively small sample of 90 REF impact case studies and focuses on a UK-specific research evaluation framework. Future research should examine larger samples and other national contexts to assess the generalisability of the findings. In addition, because REF assessments prioritise the reach and significance of impacts beyond academia, case studies are more likely to document broader societal impacts than immediate benefits experienced by collaborators. Consequently, first-order effects may be under-represented, making the contribution of collaborators acting primarily as research users less visible than in studies based on interviews, surveys, or project-level evaluations.

Future research should therefore complement REF-based analyses with qualitative and mixed-method approaches that capture collaborators' experiences, motivations, and perceived benefits. It should also explore the conditions that enable collaborations to generate broader societal change and examine forms of university–arts and cultural sector engagement beyond research projects. Finally, comparative studies across cultural sectors could provide deeper insights into how different capabilities, organisational logics, and strategic priorities shape contributions to addressing Grand Challenges.

CRedit authorship contribution statement

Federica Rossi: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Ning Baines:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Evelyn Wilson:** Writing – review & editing, Resources, Investigation, Conceptualization.

Appendix 1. The REF's Units of Assessment (UoAs)

Main panel	Units of Assessment
A - Medicine, Health and Life Sciences	Clinical Medicine, Public Health, Health Services and Primary Care, Allied Health Professions, Dentistry, Nursing and Pharmacy, Psychology, Psychiatry and Neuroscience, Biological Sciences, Agriculture, Food and Veterinary Sciences
B - Physical Sciences, Engineering and Mathematics	Earth Systems and Environmental Sciences, Chemistry, Physics, Mathematical Sciences, Computer Science and Informatics, and Engineering
C - Social Sciences	Architecture, Built Environment and Planning, Geography and Environmental Studies, Archaeology, Economics and Econometrics, Business and Management Studies, Law, Politics and International Studies, Social Work and Social Policy, Sociology, Anthropology and Development Studies, Education, and Sport and Exercise Sciences, Leisure and Tourism
D - Arts and Humanities	Area Studies, Modern Languages and Linguistics, English Language and Literature, History, Classics, Philosophy, Theology and Religious Studies, Art and Design: History, Practice and Theory, Music, Drama, Dance, Performing Arts, Film and Screen Studies, Communication, Cultural and Media Studies, Library and Information Management

Appendix 2. Coding: Benefits generated from the transdisciplinary research collaboration

Second-order codes	First-order codes	Aggregate categories corresponding to conceptual framework
Partner organisation increased income as result of research	Research collaboration generated benefits for specific organisation	First order effects (sphere of control): benefits occur directly within and mostly during the project
Partner organisation increased or expanded client base after research		
Partner organisation increased reputation - visibility following research		
Companies adopted product which was developed based on research		
Research enabled partner organisation to improve service delivery		
Research led to the development of educational resources	Research generated benefits for society	Second order effects (sphere of influence): benefits are directly connected with the project – they occur beyond the research project but within the close timing or spatial context of the research project
Research has been used to advocate for policy change		
Research has been used to support an advocacy campaign - charity initiative		
Research has contributed to visibility-branding of local community-area		
Research has enabled preservation or sharing of cultural artefacts for public benefit		
Programmes and initiatives emerging from the research have increased interest in and voice of partner organisation	Research generated further benefits for specific organisation, which in turn generated further benefits for others	Third order effects (sphere of interest): benefits occur beyond the timing or spatial context of the project, leading to broader societal changes
Research enabled partner organisation to obtain further funding, awards, demonstrate value		
Research has helped artists to obtain funding, commissions, improve their careers etc.		
Collaboration with partner organisation led to new or expanded initiatives - programmes - services - curricula		
Research has resulted in collaboration with commercial companies to deliver new products		
Collaboration with organisation to co-deliver initiative resulted in further creative outputs	Research generated further collaborations, which in turn generated further benefits for the organisations and for others	
Collaboration with partner organisation evolved from informing research to co-designing intervention		
Research has improved training of professionals which further benefited their clients		
Research has helped partner organisation to change policy		
Research has inspired individuals to become activists - advocates		
Research has inspired individuals to improve their careers		
Research inspired groups to start new programmes-initiatives		
Research outcome has inspired other organisations to adopt similar approach		
Research enabled partner organisation to develop international partnerships		
Research enabled further collaboration between institutions		
Researcher set up centre which led to further research, commissions		
Researcher set up competition - network - centre		
Research enabled the set up of an action group - advocacy organisation		
Research led to creation of spinout company		
Researchers built communities around theme		

Appendix 3. Coding: Beneficiaries of the research collaboration

Second-order codes	First-order codes	Aggregate categories corresponding to conceptual framework
Arts organisations (dance, music, theatre companies)	Specific organisations	Arena of collaboration: the arts and cultural sector actors directly involved in the transdisciplinary research collaboration
Charities		
Companies		
Festivals		
Hospitals, care homes		
Libraries		
Municipalities, local governments		
Museums		
Schools		
Venues		
Users (of product, technology, service)	Specific groups - business, professions, policy	Arena of practitioners: societal groups directly connected with the collaboration
Professionals (artists, health professionals, curators, teachers etc)		
Policymakers		
Local economy		
Academics		
Carers	Specific groups - society	
Patients		
Families		
Local or ethnic communities		
Students		
Children		
Young people		
Women		
Marginalised groups (e.g. prisoners, the homeless, refugees, migrants...)		
Audiences, visitors	General groups	Wider practice: Societal actors and groups beyond the collaboration
Viewers, listeners, readers		
Wider public		

Appendix 4. Supporting quotations

Theme	Non-academic actors involvement as research resource providers and benefits to external societal groups directly connected with the collaboration	Non-academic actors are involvement as co-creators of the research and benefits to broader societal groups beyond the collaboration
Theme 1: Placemaking and levelling up	<i>'The researchers promoted Chagossian heritage to politicians, policy makers, and the public via an international touring exhibition.'</i>	<i>'El had positive cultural and societal impact on local communities. In Ercolano, key stakeholders were involved through an extensive workshop programme. This resulted in closer relationships between surrounding communities and the archaeological site; changed opinions and behaviour regarding local Roman heritage; and attracted new visitors to the site.'</i>
Theme 2: Health and well- being	<i>'The Royal Society for Public Health produced a webinar with Houston as one of its expert speakers, reaching an audience in 25 countries'</i>	<i>'Co-creation and collaboration with local communities were at the heart of both projects. [...] Despite not having effective formal channels for communal disaster risk reduction actions, displaced people are keen to work in broader coalitions mediated by academics to manage risk in their places of resettlement (3.2, 3.3). Our interdisciplinary research demonstrated the potential to further strengthen existing capacity through arts-based approaches, which helped break down issues of distrust and stigma for Indigenous and marginalised communities.'</i>
Theme 3: Technology for social good	<i>"This interdisciplinary research project, Avant-Gardes and Speculative Technology (AGAST), explores the intersections of technology, literature, and culture. It has benefited two partner library networks serving 48 libraries across two countries (Oxford County Library and Bergen Public Library), as well as two museums (the Ashmolean Museum and Oxfordshire County Museums). The project has delivered 23 co-creation workshops for young people aged 11–24, many from BAME, disabled, LGBTQ+ , and socio-economically disadvantaged communities."</i>	<i>'These projects have developed ongoing collaborations with creative industry partners, experimented with new forms of guided tours, and explored potential applications of theatre, binaural audio and location-sensitive mobile devices in heritage contexts.'</i>
Theme 4: Environment and climate emergency	<i>'The LABS has also defined the design code for other developers applying for permission to build on land elsewhere in Darlington, acting as a blueprint for best practice in residential development'</i>	<i>'Performance research enables individuals and communities to navigate challenging political and historical themes, narratives and landscapes, in order to make personal or communal meaning and view their environments through new lenses. These include the Commoners Choir's singing and walking project, Magna Carta, about</i>

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(continued)

Theme	Non-academic actors involvement as research resource providers and benefits to external societal groups directly connected with the collaboration	Non-academic actors are involvement as co-creators of the research and benefits to broader societal groups beyond the collaboration
		<i>the rights of people to access land for leisure and recreation, which was 'transformative in terms of promoting a sense of connection with others and for promoting well-being'</i>

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