UK Parliament POST

POSTNOTE

Number 669 May 2022

The impact of digital technology on arts and culture in the UK

This POSTnote describes the uses of emerging technology in arts and culture. It reviews recent evidence on the impact of digital technology on arts and culture stakeholders in the UK, including on audiences, artists and performers and organisations. It also identifies key barriers to the wider use of technology, such as skills gaps and accessibility.

Overview

- Supporting digital innovation in the creative industries is a UK Government priority.
- Organisations and artists increasingly used technology to engage audiences online during COVID-19 closures. However, this did not fully mitigate the impact on the sector.
- Emerging technologies are likely to affect the future of the sector. These include immersive technologies, non-fungible tokens, and artificial intelligence.
- Pre-pandemic inequalities affect how artists and organisations use digital technology.
- Policy priorities identified by experts include more funding for digital innovation, tackling sector diversity and restructuring creative education. Experts also noted that digital arts and culture could contribute to the Government's Levelling Up agenda.

Background

The UK is a global leader in the creative industries[1,2] (CI), which were growing at four times the rate of the UK economy prior to COVID-19.[3] Arts and culture are part of the CI (Box 1) and play an important role in UK society.[4] In 2019, the cultural sector contributed £34.6bn to the economy[5] and accounted for 676,000 jobs.[6] Arts and culture can positively affect people's lives[7,8] by improving health and wellbeing,[9–11] increasing educational attainment[12–14] and encouraging community engagement.[15]

Supporting the use of digital technologies in the CI has been identified as a priority for the UK Government and the devolved nations (Box 2).[16,17] In the 2018 Creative Industries Sector Deal, the Government pledged £33m to a programme on innovation in immersive technologies (such as virtual reality) to support the CI, and £39m for industry-academia partnerships. The Department for Digital, Culture, Media and Sport (DCMS) has since funded resources to boost the sector's digital capability, such as the Digital Culture Network.[18–20] DCMS has emphasised the importance of digital culture for the sector's recovery after COVID-19 in the 2021 'Boundless Creativity' report co-authored with the Arts and Humanities Research Council.[21] Projects which use emerging technologies are also part of Unboxed UK, a £120m Government-funded series of creative projects that opened to UK audiences in 2022.[22]

Definitions of arts and culture can vary (Box 1) and distinctions between sectors are not clear-cut as many artists work across the CI.[21] This POSTnote discusses the arts and culture sub-sectors from the DCMS definition of the Cultural Sector.[23] These include visual arts; performing arts; film and TV; music, live music and festivals; and libraries, museums and heritage sites.

Impact of COVID-19

The Office for National Statistics found that arts, entertainment and recreation (a sub-section of the DCMS-defined Cultural Sector) was the sector second worst affected during the pandemic.[24] Organisations used digital technology to avoid closing and to engage audiences remotely, but this did not entirely mitigate the negative impacts of COVID-19.[25] In the first 12 weeks of lockdown, 15,000 theatre plays were cancelled, losing £303m in revenue.[26] Live music and festivals were also severely affected.[27,28] The UK Government introduced the £1.57bn Culture Recovery Fund to support the sector in July

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2020, which was later increased by £30m. Separate financial support packages were available in the devolved nations.[29–33]

Despite this support, the sector experienced a slow recovery,[34] with 315,100 jobs still furloughed in arts, entertainment and recreation in January 2021.[35] A third of audiences were reluctant to return to in-person performances in Autumn 2021.[36] Research shows that COVID-19 amplified pre-existing problems faced by creative professionals such as gendered inequalities,[37] mental health issues[38,39] and job insecurity.[25,36,40] Freelancers were particularly affected,[36,41,42] with 38,000 leaving all creative occupations in 2020.[43]

Box 1: Arts and culture definitions
There are different definitions of arts and culture in UK policy and research. Under the Standard Industrial Classification (SIC), the Office for National Statistics includes arts and culture in the group 'arts, entertainment and recreation'.[44] This group contains two sub-sectors: arts and entertainment (such as plays or concerts)[45] and museums, galleries, and historical buildings.[46]
DCMS defines the Cultural Sector as "those industries with a cultural object at the centre of the industry", overlapping with different SIC groups.[23] It also uses the term "creative industries",[47] which is divided into nine sub-sectors.[48] These sub-sectors include computer games and IT, which are not considered part of arts and culture.

R&D funding

Public funding for research and development (R&D) into digital technology in the CI mostly comes from UK Research & Innovation (UKRI). Three large UKRI-funded projects were recently introduced to develop digital capability and innovation:

- **The Creative Industries Clusters Programme:** This is a £120m investment between 2018-2023 to support innovation and growth in the CI across the UK.[49] It funds nine regional clusters bringing together businesses and researchers in fields like digital storytelling.[50]
- **The Audience of the Future Challenge:** This is a £39.3m investment into innovation in immersive technologies, launched in 2017.[51] Outputs included the Royal Shakespeare Company's 'Dream' digital performance in 2021.[52]
- **Towards a National Collection:** This is an investment of £18.9m to create a national digital collection of UK galleries, libraries, archives and museums between 2020-2025.[53]

DCMS research has however identified barriers to R&D in the CI. These include limited access to finance, the high cost of development and the dominance of established businesses in the market.[54] R&D activities in the CI are ineligible for R&D tax reliefs, which may be a further barrier.[55] Smaller grants for using technology come from Innovate UK (part of UKRI),[56,57] trusts or foundations like Nesta,[58] or charities and organisations that support the sector, such as the British Council[59] or The Space.[60] Arts and culture organisations however generally rely on their regular funding to implement digital technologies.[61] Sources of regular funding include commercial revenue, donations, grants, local authority funding, and central government funding.[62] The latter is usually administered by public bodies like the arts councils[63] and the National Lottery Heritage Fund.[64] However, these do not provide specific funding for digital arts and culture. International grants may also be available, such as the Bloomberg Connects Program.[65,66]

Box 2: Devolved Government policies
Arts and culture policy is a devolved area. The devolved nations have each committed to support the arts and culture sector, including the use of technology in the sector:

- **Scotland**: In 2020, the Scottish Government committed to developing the sector's digital skills, addressing risks arising from technology and ensuring the accessibility of digital culture.[67] It included innovation in the CI in its 2019 policy agenda[68] and launched the £1m Creative Digital Initiative in 2021 to support digital innovation in creative and cultural businesses.[69]
- **Wales:** In 2016, the Welsh Government recognised the potential of digital technology to make the sector more accessible and committed to increasing virtual participation at major arts and culture events.[70] It also commissioned two rounds of funding for organisations to experiment with digital technology.[71]
- **Northern Ireland:** The Northern Ireland Executive established the Culture, Arts and Heritage Recovery Taskforce in 2021.[72] It called for the creation of a long-term digital strategy for the sector and a digital innovation programme to improve audience engagement.[73]

Uses of emerging technologies

Over the past two decades, arts and culture organisations have adopted technologies to deepen engagement with and attract new audiences, conduct research, enhance their outputs and improve operational efficiency.[74–76] A range of conventional digital technologies are used for these purposes across the sector.[77,78] Given this breadth, this section focuses on emerging technologies which may affect the future of arts and culture.

Content creation and enhancement

Organisations and artists use technologies to enhance analogue content, like using audio-visual media in theatre,[79,80] and to create new digital content.[75] Some emerging technologies used to create and enhance content are listed below.

Immersive technologies (XR)
XR create immersive, computer-generated environments with which a user can interact.[81] Formats of XR include:

- **Virtual Reality (VR):** a fully simulated 3D environment with which a user can interact, viewed using a headset.
- **Augmented Reality (AR):** a technology that layers computer-generated images on our visual realm using a smartphone app or special 'glasses'.
- **Haptics:** a technology which uses sensors to recreate the sense of touch by applying forces or motions to the user.[82]

XR are used in home entertainment, exhibitions and performing arts to create new content or to deliver and drive engagement with existing content.[83] For example, the National Gallery's 'Virtual Veronese' is a VR and AR prototype, which claims to help visitors view an artwork in its original 1561 setting.[84,85] Another application, which may change film and TV production, is virtual production because it can bring actors on-screen from different geographical locations.[86] XR can also be used to access the Metaverse, which has no agreed-upon definition, but can be described as an immersive virtual world.[87–90] In the

Metaverse, inter-linked users can participate in arts and culture events, such as concerts.[91]

Early experience suggests that XR can be used for effective storytelling and can create valued user experiences at home[92] or in arts and culture organisations.[85,93–95] While AR is used increasingly at home and in organisations,[94,96] VR is limited to those who own a headset,[81] with Ofcom reporting that 6% of UK households owned a headset in 2020.[97] For organisations, challenges of using XR include usability and uptake by visitors, staff onboarding, the cost of devices and difficulty measuring the impact of the technology.[94,98,99] Early evidence warns of potential health effects of VR for users, such as nausea.[100,101]

Artificial intelligence (AI)

There is no universal definition of AI, but it is described in the National AI Strategy as "machines that perform tasks normally performed by human intelligence, especially when the machines learn from data how to do those tasks" (POSTnote 633). AI is at an early stage of adoption in arts and culture[102] where it can be used for various purposes, such as classifying artworks[103] and improving access to digital archives.[104] It has also been used to generate music[105–107] and artwork,[108] which led to a debate on the copyright of these outputs.[109] There is emerging interest in using AI to generate images and videos of people's faces and to synthesise speech ('deepfakes').[110] Experts have raised ethical concerns about deepfake use in filmmaking[111] and museums.[112]

Photogrammetry

Photogrammetry is a technique used to create a 3D model of an object from multiple photographs taken at specific positions around that object.[113] Photogrammetry[114] or 3D scanning and printing[115,116] are used extensively to digitise artefacts[117–119] and historical sites.[120–122]

Marketing and sales

Since the 1990s, the internet has been used to promote and sell creative content.[123] Sales in the global online art market doubled between 2013-2019, followed by a boost during COVID-19.[124] Social media has allowed creatives to interact with the customer directly,[75] while arts and culture organisations use it to improve visitor outreach and increase sales.[125] Emerging technologies, like blockchain and its applications, led to new ways of producing, selling and collecting art or music.

Blockchain and non-fungible tokens (NFTs)

Blockchain is a class of distributed ledger technology that allows identical copies of a record to be stored on different computers on a network and updated by multiple users (POSTbrief 28). It is the technology that underpins cryptocurrencies and NFTs. Blockchain can be used to verify artwork provenance,[64] enable shared art ownership,[126] or check the authenticity of digital records.[127] In industries like music, blockchain could be used as a decentralised copyright database,[128,129] which some musicians claim could give them more control over their work.[130,131] Significant challenges remain, including the environmental impact of its high energy use and cybersecurity risks.[126,129,132,133]

NFTs are certificates of ownership for digital assets, such as artwork, that are registered and traded in a blockchain.[134] While the assets can still be replicated digitally, NFTs trace ownership via the tamperproof blockchain record.[135] Artists can create and sell NFTs on platforms like OpenSea,[136] which enabled some unknown artists in the traditional art world to be recognised for their NFTs.[137] Musicians and arts and culture organisations have also sold NFTs.[138–140] Supporters argue that NFTs allow more artists to sell their work on a decentralised global market,[141] but this is disputed by some who argue that NFTs simply create new intermediaries.[142] Other sources of debate include a lack of regulation,[143] with recent cases of fake NFTs being sold.[144–146]

Distribution and remote access

Advances in 5G and broadband technology (POSTbrief 32)[147,148] enable people to access arts and culture remotely, for example through virtual tours.[149] Content streaming is the main way that people in the UK accessed digital cultural content in 2021.[150] Live streaming is also used to broadcast performances in cinemas or via on-demand platforms.[151,152] Streaming has had a marked impact on the music and screen industries.

Screen industries

Streaming in film and TV operates via on-demand platforms, including subscription services like Netflix. In 2021, three in five UK households paid for a subscription service, after an increase in 2020 due to COVID-19.[153] The uptake of streaming reduced advertising revenues[154] and subscriptions for commercial TV.[155] Streaming also affected the revenue of and engagement with public service broadcasting (PSB).[156,157] The Commons DCMS Select Committee undertook an inquiry on PSB in 2020 that called for an updated funding model and further regulation of on-demand platforms.[158] In April 2022, The Broadcasting White Paper outlined the Government's plans to regulate streaming, including through a new Video-on-demand Code by Ofcom.[159]

Music industry

Evidence suggests that streaming revived the music sector after declining revenues since the early 2000s[160] and widened access to music.[161] Industry stakeholders have however criticised the revenue models of streaming platforms, claiming they lack transparency, offer low royalties to independent musicians and favour major labels.[162] In 2019, the Commons DCMS Select Committee undertook an inquiry on the economic impact of music streaming, which called for a "complete reset".[163] The Government responded that more evidence of the negative impact was needed, and created stakeholder groups and commissioned research as a result.[164]

Audience engagement

Research suggests that technology can deepen engagement when tailored to audience needs. Using technology strategically can improve in-person museum visits rather than replace them, for example through smartphone apps or pre-exhibition videos.[165–168] Digital platforms can also enable more democratic engagement by allowing audiences to express themselves more freely[169] and to engage in more participatory ways, such as in crowdsourcing projects where many people interpret artefacts digitally.[170,171] Social media can be used to deepen relationships with local and international audiences if used strategically.[172,173]

The impacts of technology on stakeholders

The consensus among most experts is that digital arts and culture activity will grow in importance and that organisations

may provide hybrid programmes in future.[21,38,174–176] Numerous stakeholders have argued that the sector is at a crucial point where it can learn from the increased digital activity during the lockdowns.[177] This section reviews research conducted throughout the COVID-19 pandemic, focusing on stakeholders and the barriers they faced when using digital technologies.

Audiences and visitors

Audiences for film and TV grew during the pandemic as live events were restricted by lockdowns and people turned to streaming.[178–180] For other sectors, although digital technology had the potential to increase the number and diversity of audiences,[181] evidence from the pandemic showed it mostly engaged the same people as those who participate in person.[36,61,182,183] However, the increased digital offer drove up engagement among younger and more ethnically diverse arts-interested audiences.[36] This inverted the age profile whereby older people were formerly more likely to engage with arts and culture. It also increased access for existing disabled audience members.[184,185] The Centre for Cultural Value found that half of disabled audiences were more likely to engage with cultural content online, rising to three-quarters for disabled audiences aged 16-24.[36] However, digital accessibility tools (such as audio description) and devices (such as the National Theatre's smart caption glasses[186]) are only emerging in arts and culture.[61,187]

Another significant barrier to more diverse audiences engaging with arts and culture online arises from the UK's digital divide (POSTnote 643),[188] with research showing that certain groups lack access to digital infrastructure and skills.[76] Evidence shows these disparities widened during COVID-19 (POST rapid response 'COVID-19 and the digital divide') which affected who could access the enhanced arts and culture digital offer.[25,189–191]

Audiences reported that engaging with arts and culture online improved their wellbeing in lockdown,[183,192–196] showing how technology may be used to widen access to the benefits of arts and culture. However, evidence on the health impacts of digital arts and culture on audiences is inconclusive. A national study of over 2,000 participants during six weeks of lockdown found no significant effects on subjective wellbeing for using new media such as TV or films.[197] In contrast, a national survey of 500 UK adults found that around 60% of participants reported negative physical and mental health impacts from using screens over six hours a day during the pandemic, with young people, women and high earners worst affected.[198] However, health and wellbeing impacts may be specific to the pandemic and further research is required to understand the health impacts of accessing arts and culture online.

Artists, performers, and content creators

There is limited evidence on how performers and artists are affected by digital technology, with research mostly focusing on audiences or organisations. Digital technology may affect artists' copyright payments; for example, the Intellectual Property Office found that 15% of consumers used an illegal source to access music online in 2021.[150] Another impact on practitioners comes from the skills and capabilities needed to use digital technology, which may require substantial upskilling (POSTnote 659).[199,200] Although some creatives used technology to improve their digital skills during the lockdowns,[201] emerging evidence indicates that some practitioners encountered barriers to improving their skills and continuing to work online.[202] For example, those from lower socio-economic backgrounds and those with caring responsibilities reported a cost and time barrier to developing their digital skills and working online.[37,203] These findings reflect the wider lack of diversity in the cultural workforce,[204–206] which was exacerbated during the pandemic.[36]

Cultural organisations and institutions

Research, reinforced during the pandemic, shows that the use and impact of digital technologies on cultural organisations depends on the organisation's size.[78,21] During COVID-19, large organisations built on their expertise and reserves, but smaller organisations needed to change business models and rapidly develop their skills in order to use digital technology.[38,207] Although some were able to innovate in low-cost ways (for example Creation Theatre's Zoom performances[183]), most small organisations did not profit financially from digital activity.[21]

Location can also influence organisations' ability to use digital technologies, with those in areas with many other creative businesses faring better than those outside such clusters.[208] Although regional imbalances in the sector appeared to improve before COVID-19,[209] analysis of the Cultural Recovery Fund showed that funding was concentrated in affluent areas with more flagship arts and culture institutions.[210] This meant that organisations in deprived areas without a history of public funding may have struggled to secure support during the pandemic, which had a knock-on effect on their digital activity.

Disparities in digital skills and capabilities also affect the ability of organisations to use digital technologies. Evidence suggests that there are shortcomings in skills development in the CI in areas such as apprenticeships and training for the existing workforce.[211] Research during lockdowns found that skills gaps appeared across arts and culture, especially in museums, galleries, and theatres.[36,212] This did not only include technical skills, but also 'digital leadership', which refers to understanding how to use technology to meet audience needs and improve business models.[38,213] Without digital leadership, organisations may struggle to create high-quality digital engagement.[214,215]

Future trends and policy priorities

Stakeholders have identified wider issues and future trends that may be priorities for policy interventions:

- **Funding:** Researchers and industry stakeholders have called for more funding to improve the sector's digital capability, especially cross-sector R&D collaborations and support for smaller organisations. Some have also called for using public over private funding.[36,216,217]
- **Levelling-up:** Stakeholders note that arts and culture can support the Government's Levelling Up agenda,[36,218,219] and that using technology can play a key role.[220]
- **Diversity and accessibility:** Experts have identified the lack of diversity in the sector as a key challenge for pandemic recovery.[21,221,222] They called for improvements in accessibility, for both audiences and practitioners.[202,222,223]
- **Creative education:** stakeholders have expressed concern about the separation of arts and culture from technology in formal education, which may restrict the growth of creative and digital ('createch') skills in the future workforce.[224–226]

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of policy issues that have a basis in science and technology. POST is grateful to Ana-Maria Cîrstea for researching this briefing, to the Economics and Social Research Council for funding her parliamentary fellowship, and to all contributors and reviewers. For further information on this subject, please contact the co-author, Natasha Mutebi.

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