

# The Art of R&D

Why bringing R&D in the arts, humanities and social sciences within the scope of R&D tax relief would boost innovation in the UK's creative industries

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## About the Creative Industries Policy and Evidence Centre

The Creative Industries Policy and Evidence Centre (PEC) works to support the growth of the UK's Creative Industries through the production of independent and authoritative evidence and policy advice.

Led by Nesta and funded by the Arts and Humanities Research Council as part of the UK Government's Industrial Strategy, the Centre

comprises of a consortium of universities from across the UK (Birmingham; Cardiff; Edinburgh; Glasgow; Work Advance; LSE; Manchester; Newcastle; Sussex; Ulster). The PEC works with a diverse range of industry partners including the Creative Industries Federation. For more details visit [www.pec.ac.uk](http://www.pec.ac.uk) and [@CreativePEC](https://twitter.com/CreativePEC)

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1

# Introduction

In a previous Creative Industries Policy and Evidence Centre [policy briefing](#), we provided evidence from a wide range of services firms that the arts, humanities and social sciences (AHSS) play an integral role in business Research & Development (R&D) activities. Examples included: a theatre company bringing together teams of artists and mixed reality technologists to create new immersive experiences for the public, a university spin-out that combined linguistics and technological advances to help companies create sharper communications with their target audiences, and a global consumer brands company which integrated research in consumer psychology with science to develop new products which enhance consumer experience. Businesses invariably emphasised the interdisciplinarity of their R&D activities, challenging the view that AHSS and scientific R&D are always or even usually distinct and different activities.

In the briefing, we recommended changes that policymakers, businesses and data collection agencies could make to incentivise more R&D by service sector businesses, such as those in the creative industries. This included the recommendation that for the UK's R&D tax reliefs to remain internationally competitive and for high-growth sectors like its creative industries to retain their innovative edge, BEIS should in its Guidelines on the Meaning of Research and Development for Tax Purposes drop its exclusion of R&D in the arts, humanities and social sciences from its definition of 'science'. This would also be in keeping with international guidance as set out in the OECD's Frascati manual ([Bakhshi, Breckon and Puttick, 2021](#)).

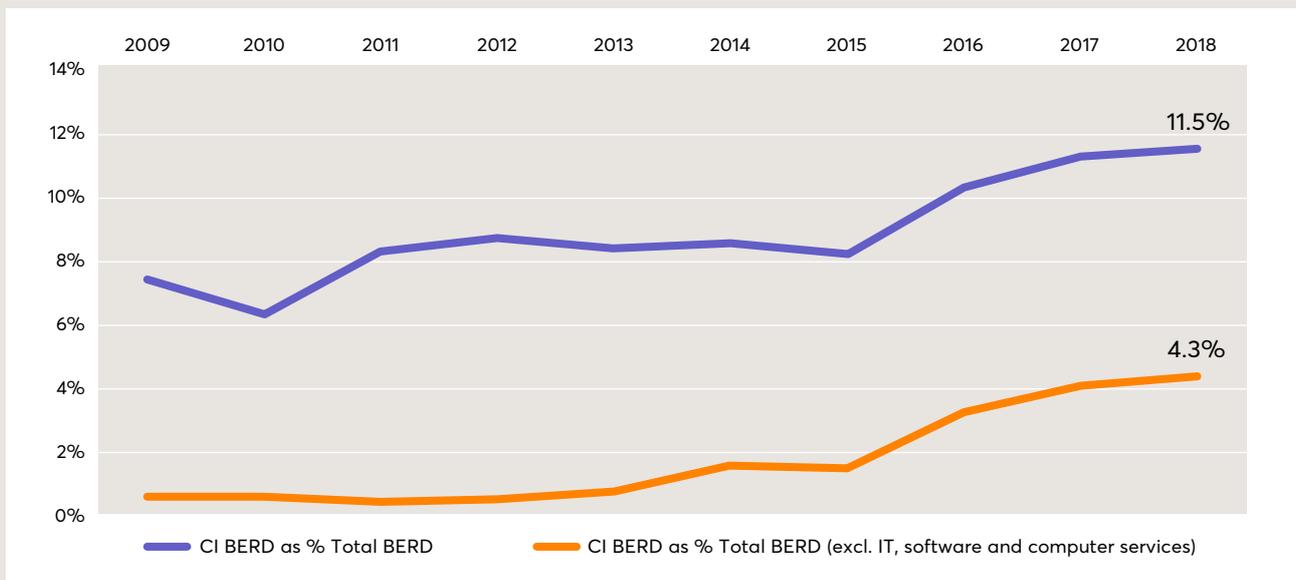
It would be in keeping with practice in a large number of other countries too (OECD, 2020<sup>1</sup>). As of 2020, fifteen countries in the OECD report to permitting social science and humanities R&D activities to benefit from R&D tax credits:<sup>2</sup> Austria, Belgium, Chile, Colombia, Denmark, France, Germany, Hungary, Italy, Korea, Mexico, Norway, Portugal, Russia and Spain. That number rises to 23 if we also include countries which administer their R&D incentives as tax allowances. Furthermore, interviews with national tax officials suggest that even in countries like Australia which do not recognise AHSS R&D as core expenditure for R&D tax relief purposes some expenditures potentially qualify as 'supporting activity' (Bakhshi and Puttick, *forthcoming*).

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# How much R&D do the UK's creative industries do and how much qualifies for R&D tax relief?

The Office for National Statistics (ONS) Business Expenditure on Research and Development (BERD) survey shows that the creative industries are significant investors in R&D. This is the case even if the IT, Software and Computer services sub-sector, which accounts for a significant share of the creative industries, is removed from the calculation.<sup>3</sup> Figure 1 shows that in 2018, excluding IT, Software and Computer services from the creative industries and whole economy totals, the creative industries accounted for 4.3 per cent of whole economy BERD (11.5 per cent if we include the IT sub-sector). This creative industries R&D share is higher than the creative industries share in Gross Value Added (GVA) computed on the same basis (which in 2018, DCMS estimates suggest was 3.5 per cent when we exclude the IT sub-sector from the creative industries and whole economy GVA estimates and 5.8 per cent if we include it<sup>4</sup>). In other words, the creative industries make outsized contributions to R&D.

Figure 1: Creative industries R&D as percentage of the whole economy R&D



Source: ONS <https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/adhocs/12365rdperformebycreativeartsbusinesses2009to2018>

Unfortunately, because Her Majesty's Revenue and Customs (HMRC) only publishes its R&D tax relief statistics at the 2-digit SIC level, it is not possible to compare estimates of creative industries R&D spending derived from the BERD survey that is depicted in Figure 1 with the amount of creative industries R&D expenditure that actually secures tax relief. However, taking the Film, TV and radio sub-sector of the creative industries, which maps almost exactly to 2-digit SIC codes 59 and 60 (with the exception of photography SIC 74.2), we find that while this sub-sector accounted for 2.2 per cent of R&D expenditure in the 2018 BERD data, it accounted for only 0.3 per cent of all qualifying R&D expenditure in the 2018 HMRC figures (HMRC, 2021). This indicates that there is possibly a significant amount of R&D expenditure made by creative industries firms which is not being supported by the current system of R&D tax reliefs.

Consistent with this, Gkypali and Roper (2018) analyse wave nine of the Department for Business, Energy & Industrial Strategy (BEIS) UK Innovation Survey, which collects data on firms' innovation behaviours relating to the three-year period 2012-2014, and conclude that *"the creative industries are almost as engaged in R&D activities as manufacturing (and considerably more so than services)."* In particular, 35 per cent of creative businesses in the sub-sectors sampled had undertaken in-house R&D, compared with 38 per cent of manufacturing and 16 per cent of services (excl. creative) businesses, and 10 per cent had undertaken external R&D, compared with 11 per cent of manufacturing and 5 per cent of services (excl. creative) businesses.

Further evidence is provided in a more recent business survey of R&D in the UK's creative industries commissioned by the DCMS. This finds that as many as 55 per cent of the 625 creative industries firms surveyed reported to have undertaken R&D in the previous 12 months using the Frascati Manual definition (which includes AHSS R&D), but only 14 per cent said they had done so on the definition used for the purposes of R&D tax relief. (DCMS, 2020).

The comparatively low levels of creative industries engagement with R&D tax relief is all the more striking considering that for other sectors as a whole the value of R&D spending supported by R&D tax relief considerably outstrips the value of business R&D derived from the BERD survey. The Autumn 2021 Budget announced changes to address the fact that some of this gap is explained by companies being able to claim for R&D taking place overseas. However, if government is serious about backing innovation-intensive sectors in its plan for growth, addressing the sources of 'overspend' on R&D tax relief should not prevent it from addressing its creative industries blackspots.

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## How much creative industries R&D is accounted for by AHSS R&D?

Identifying how much of creative industries R&D expenditure is on AHSS R&D (and therefore not currently supported by tax relief) is difficult to say because the ONS's BERD survey does not currently split R&D expenditure by knowledge field.<sup>5</sup> Some indication of the potential contribution of AHSS disciplines to R&D more generally can be gleaned, however, by considering the innovation activity of businesses whose primary activities are in Social Sciences and Humanities R&D (as defined by the 4-digit SIC code for this activity). BERD data suggests that these businesses invested £120m in R&D expenditure in 2018 – a not insignificant number, considering this equates to over 1/3 of the equivalent figure (£348m) for biotechnology (ONS, 2020).

While direct evidence of AHSS R&D in the creative industries is therefore currently lacking, there is a good deal of indirect evidence through the strong link between AHSS-related skills and innovation activities. This is highly suggestive because R&D processes within the creative industries tend to be more human capital intensive than in other sectors (Bakhshi, Hargreaves and Mateos-Garcia, 2013). One reason for this is that practice-oriented experimentation is typically more interpretative and intuitive than R&D in other sectors (Bakhshi, Schneider and Walker, 2009). Consistent with this, Müller et al. (2009), for example, find that firms with high levels of arts and humanities graduates are more likely to conduct in-house R&D, and Lee and Drever (2013) report a significant positive correlation between the employment of staff in creative occupations and likelihood of firm-level product innovation. Siepel et al (2016) use UK Innovation Survey data to show that 'arts skills' such as design, graphics and multimedia are significant complements to STEM skills in driving both new-to-firm and new-to-market innovations. These findings imply that non-scientific human capital contributes significantly to firms' R&D activities. Case study evidence (Bakhshi & Mateos-Garcia, 2010; Lomas, 2017; Bakhshi et al., 2021) also suggests that AHSS disciplines are a vital part of the R&D activity of firms in the UK's creative industries and that firms will invest more if incentivised to do so.

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## Are there market failures in AHSS R&D?

The lack of firm-level data on investment in R&D by knowledge field clearly makes it challenging to provide quantitative evidence of market failures in any one field: this applies as much to science as it does to AHSS. Market failures in R&D may arise if: i) firms cannot appropriate fully the returns from their investment in R&D (for example, if some of the value is appropriated by other firms in the market, known as positive 'knowledge externalities') or ii) if asymmetries in information between company and investor or other imperfections in financial markets create barriers to R&D finance that would not exist if markets were perfect.

To generate evidence on knowledge externalities, ideally we would use firm-level data to show that performance in a firm is positively influenced by investment in AHSS R&D in an 'adjacent' firm, controlling for other factors.<sup>6</sup> Whilst firm-level data on AHSS R&D investment is unavailable, [Goodridge et. al., \(2017\)](#) test for externalities from a range of non-scientific R&D investments at the UK industry level, including investments in artistic originals and architectural and engineering design. They detect a significant positive correlation between non-scientific R&D in one industry and the returns to investing in non-scientific R&D in other industries, which is consistent with positive knowledge externalities between industries.

To gather evidence of market failures in access to AHSS R&D finance, ideally we would show that firms investing in AHSS R&D face a higher cost of capital than they would do if financial markets were perfect. (In the same way that to evidence market failures in access to scientific R&D finance we would need to show that firms investing in scientific R&D face a higher cost of capital). Indeed, there is a great deal of evidence to suggest that creative businesses face especially great challenges in raising finance because of the intangible nature of their products and the exceptionally high levels of product market

uncertainty (what Caves, (2000) calls the 'nobody knows' property; see also de Vany (2003)'s classic text on the film industry). Consistent with this, de Novo et. al., (2022) find that more innovative creative businesses in the UK are, other things equal, more likely than less innovative firms to rely on internal and informal sources of finance. And while they are more likely to seek venture capital than their less innovative counterparts, they are no more likely to secure this funding.

The lack of data on R&D by separate knowledge field which prevents econometric analysis of market failures for AHSS should not, however, inhibit policy changes that would make R&D tax reliefs fit for purpose for the creative industries. Indeed, the absence of this data (rightly) has not prevented the government from using tax reliefs to incentivise scientific R&D.

Mindful of the challenges in gathering quantitative econometric evidence of AHSS R&D market failures, in the remainder of the paper we present three anonymised qualitative examples based on real companies (two from within the creative industries themselves, and one example of a business in the health sector using advanced creative technologies) which illustrate how concerns about imperfect appropriability and barriers to R&D project finance give rise to market failures in AHSS-related R&D.

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# Three case studies of market failure in creative industries R&D

## Case study 1: Brand experience agency

These two examples of R&D involving AHSS are drawn from a leading brand experience agency. They are projects which have stalled reflecting market failures (risk finance and knowledge externalities), involving essential expenditures which are AHSS-related and therefore out of scope of the definition used by HMRC for R&D

tax relief purposes. Whilst further technological developments may be sought, and would be within the current scope of R&D tax relief, much of the development of the projects for different applications would involve seeking advances in a number of AHSS fields, work on which would be specifically excluded from relief.

**1. The agency has developed its own intellectual property in an intelligent wayfinding system.**

It is the result of a self-funded piece of early-stage R&D that the agency developed which sought to advance the knowledge base in the area of spatial technology. By blending spatial computing, AI and projection mapping, the wayfinding system tracks an environment, reads activity and responds in real-time with a smart projected interface that helps users orientate safely.

It would, for example, help consumers safely social distance in crowded interiors. But its applications extend beyond COVID-19, too. This technology could have wider positive benefits around influencing behavioural change in indoor environments.

For example, one application could be to increase safety by better control of crowd flow at stadiums. Exits and navigational pathways could be made clear (increasing safety). In turn, this could reduce psychological stress and increase the crowd's overall confidence.

The agency has not advanced the project beyond the prototype stage due to a lack of access to finance. Taking it further on a self-funded basis would have been prohibitively high risk. To enhance the system, R&D expenditure on the staff costs of experience designers, licensing costs (for component pieces of technology e.g sensors) and user testing costs would all be required.

**2. The same agency has developed a huge, high-definition interactive screen that reacts and adapts in real-time.** The screen enables a unique, immersive and interactive experience creating a content experience that makes information/storytelling /visual arts more exciting, encourages exploration and rewards attention. By combining 3D scenography, spatial audio, digital media and kinetics, the screen harnesses the power of curiosity, captures attention and entices engagement.

Presently, the screen is a bespoke tool for a specific client. Its scale makes it difficult to adapt for use across a wide range of brand experiences without significant risk and high cost. If it reached mass adoption, the screen could help us understand how extended reality experiences elicit responses like curiosity, attention, delight or feelings of inspiration.

With funding, the screen would become a more versatile, reusable, technology platform. The agency describes it as becoming a 'productised engine' that would be more cost-effective for the end-user and open to a broad range of applications across the brand experience industry.

The R&D expenditure required to make enhancements would be across software licenses (e.g. Unity engine), external studio space and studio operators rental costs (for testing and additional proof of concept work), and internal staff costs for personnel such as software developers and engineers, and creative roles including experience, graphical and audio designers.

## Case study 2: A global design, architecture, engineering and planning firm

**This example of R&D involving key AHSS-related investment comes from a global design, architecture, engineering and planning firm. The R&D needed has been inhibited by market failure**

**(knowledge externalities), and where critical AHSS expenditures are currently not recognised as qualifying for R&D tax relief.**

A key focus area for one of the firm's regional Science & Technology practices is innovation in social sciences by the means of combining a variety of established disciplinary practices, but putting them together in a new way or context to seek new health and wellbeing benefits for users.

The process of making an interior space suitable for occupation involves a mix of inter-related factors, such as the accumulation of volatile organic compounds in finishes, variable exposure to full-spectral daylight and design of interiors for health and wellbeing. But many of these are not

currently measurable, and likely to be considered to fall within the AHSS exclusion for the purposes of R&D tax relief.

Experimenting with these factors and other elements such as occupational density and landscape, would seek to establish a definite answer of 'what works', by means of a uniform and well-defined 'post-occupancy evaluation' (POE) process. An initial industry proposal would see a mandatory minimum POE, which would assess and evaluate signs of 'distress' and the building effectively not working, by means of

energy environmental modelling, and occupant satisfaction surveys. It should be noted though, that environment psychologists do not recognise this approach, viewing it as a stop-gap measure to try and gain some long-term momentum for a more comprehensive approach.

Developing and analysing this body of information would produce quantifiable evidence that would align more closely with traditional 'hard science'. In architectural practice, this type of project is excluded from the scope of R&D tax reliefs (and nor is it supported by Innovate UK).

Whilst many in the architectural profession are trying to promote post-occupancy evaluation, in practice there is no motivation for those on standalone projects to choose to bear wholly those costs. This could be characterised as either reflecting knowledge externalities or coordination failure, but either way it is market failure.

R&D expenditure required to carry out this evaluation would primarily relate to internal staff costs (including architects and designers), as well as potentially the involvement of third party specialist design consultants and testing facilities.

### Case study 3: A global healthcare company

**This company's operations span a range of global practices including advertising and promotion, strategic consulting, healthcare professional marketing, medical communications, consumer health and wellness, global health and speciality practices like pharmacy, payer and patient engagement.**

**The following R&D projects involving AHSS-related investments which have considerable potential for economic and social value have, at least for now, been shelved reflecting barriers to project finance and the existence of positive externalities.**

#### 1. Conversation Handler Tool

The company developed a white label 1:1 Conversation Handler Tool, which is a VR experience designed to support medical professionals and patients during diagnosis. The tool allows patients to partake more actively in the diagnosis of conditions. The innovation to create this technology was funded internally by the company in the hope of being able to commercialise it to clients.

The company felt that an immersive VR experience poses questions and allows medical professionals to get a different insight into a patient's experiences and emotions. For this project, the VR tool was converted to a web-

based application during the pandemic as there were no events to showcase its uses. As a result, the VR experience, which the company believed to be more effective for patient psychological and behavioural understanding (due to it being more faceted than the web-application) has for now been shelved due to high end-user cost and pandemic-induced realities.

Improved diagnostics enabled through technology and software has clear benefits and positive externalities. If this market-leading tool were brought to fruition and adopted, the learning from its usage could potentially influence and spark innovation in other software-led diagnostic tools.

## 2. Innovative installation experience

The company developed an installation experience designed to increase public awareness of rare medical and health conditions.

The installation was a physical piece of tech which allows information to be overlaid on it, creating an engaging AR-style experience without a need for the user to have a device. The format thus removes barriers to entry for the end user. Furthermore, by creating the installation in the form of a teddy bear it is captivating, particularly for younger children, which is an important consideration when displaying information about rare diseases which can otherwise be unsettling.

The installation experience offers insight into ineffective symptom management and visually illustrates how treatment failures affect patients, offering many benefits. The public would gain an increased awareness of these diseases – but there are potential gains in terms of diversity and inclusion too, insofar

as people suffering from these diseases could be understood and accommodated in a world that understands their challenges. Ultimately, this could lead to an increase in R&D for assistive solutions or even treatments.

While the technology work required to create these products was routine (and not, perhaps, sufficiently 'innovative' on technological grounds alone as it pertains to current R&D tax relief guidelines), significant resource was invested in designing a unique experience with a singular presence in the market. Moreover, there was time spent and considerations made on the format and engagement elements so that key (but potentially difficult) medical information could be shared in a way that caused minimal distress or discomfort to the audience.

Both of these projects were shelved due to a lack of project finance removing the chance for the company to bring them to market, enhance, optimise or extend the experience and the broader benefits of increased public awareness and understanding to be realised.

## 6

# Conclusion

In the Autumn 2021 Budget and Spending Review, the UK Government restated its commitment to increase public investment in R&D as a means of increasing innovation and productivity. It also recognised the crucial role public R&D and innovation would play in driving solutions to other societal challenges. As well as its commitment to public R&D, it noted that business investment in R&D at 0.9 per cent was low relative to the OECD average of 1.5 per cent and very considerably lower than leading nations like Korea, Japan, Germany and the US.

Our argument is that by excluding AHSS R&D from its R&D definition for the purposes of tax relief, the government risks missing out on fully incentivising R&D investment in the creative industries, one of the few industrial sectors where an extensive body of evidence shows the UK is a world leader (Nathan, Pratt and Rincon-Aznar, (2015); Nathan, Kemeny, Pratt and Spencer, (2016)). Dropping the AHSS exclusion would also bring the UK into line with countries like Germany, Korea, Austria and Norway – all of whose governments recognise the strategic importance of their creative industries.

## Endnotes

1. OECD (2020) OECD Compendium of Information on R&D Tax Incentives, 2020. DOI: <https://www.oecd.org/sti/rd-tax-stats-compendium.pdf>
2. Although the OECD's reporting refers only to the humanities and social sciences not the arts, interviews with national tax officials suggest that the arts are often a core part of SSH R&D. For example, an Austrian tax official explains, 'The Arts are included in the R&D Tax Credit, as long as it meets the Frascati definition'. Bakhshi and Puttick (*forthcoming*).
3. We use the Department for Digital, Culture, Media and Sport's (DCMS) selection of 4-digit Standard Industrial Classification (SIC) codes to define the creative industries. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/829114/DCMS\\_Sectors\\_Economic\\_Estimates\\_-\\_Methodology.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/829114/DCMS_Sectors_Economic_Estimates_-_Methodology.pdf)
4. <https://www.gov.uk/government/statistics/dcms-sectors-economic-estimates-2018-gva>
5. Canada is an example of a country which collects detailed data on R&D spending by knowledge field, using the OECD's Field of R&D (FORD) knowledge field classification. <https://www150.statcan.gc.ca/t1/tb1/en/tv.action?pid=2710034301>
6. That is, 'adjacent' in knowledge space.

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