UK Research and Innovation

CONVERGENT SCREEN TECHNOLOGIES AND PERFORMANCE IN REALTIME (COSTAR)

CALL INVITATION

UK Research and Innovation

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1. Introduction

UK Research and Innovation (UKRI) through the Arts and Humanities Research Council (AHRC) is investing in a new Research, Development and Innovation (RD&I) infrastructure for the Creative Industries. Infrastructure, in the context of this project, refers to the establishment of facilities, resources and expertise which we believe will make the most difference to the future of our target industrial sub-sectors.

The purpose of this particular investment, CoSTAR (Convergent Screen Technologies And performance in Real-time) is to underpin the UK's future competitiveness across the screen and performance industries; to ensure that these subsectors of the Creative Industries are able to identify, contribute to and exploit opportunities arising from current and future waves of technology development; and to build a more resilient creative technology ecosystem in the face of a rapidly changing international market.

The UK is currently benefitting from an unprecedented wave of international investment in screen production; it also currently leads the world in the adoption of new Virtual Production methods. However, the combination of LED volumes, real-time game engines and in camera GFX that comprise what is currently termed 'Virtual Production' is only the initial application of a cluster of technologies that will transform the way creative products, services and experiences are made, from games to live performance and on towards the connected virtual worlds of the Metaverse. CoSTAR's purpose is to ensure that through ongoing investment in a dedicated R&D infrastructure the UK can drive, rather than merely adopt, future waves of innovation.

CoSTAR is intended to be a networked infrastructure supporting a series of facilities operating in close collaboration. An initial call, now closed, asked for proposals to deliver a CoSTAR National Lab (Lot 1) and up to three CoSTAR Network Labs (Lot 2) which together will comprise the core architecture of the new infrastructure. The Network Labs will work close to the current challenges faced by industry while the National Lab will support research on future waves of technology. This call, which forms the third and final part of CoSTAR, is for the provision of an Insight and Foresight Unit (IFU), which will provide the infrastructure with intelligence on research, technology and industry trends relevant to the optimisation of CoSTAR.

This call for CoSTAR sets out a new long–term vision for Creative Research and Innovation by establishing the first R&D Infrastructure for the Creative Industries to match those that are seen as essential for other innovation-rich sectors to underpin to their long-term contribution to both economy and society.

Applied R&D for the Creative Industries is a relatively new concept, however CoSTAR benefits from the evidence gathered through previous AHRC and UKRI investments, particularly the Creative Industries Clusters Programme (CICP) and the Audience of the Future Challenge (AOTF). One thing that these applied R&D programmes have demonstrated is that public investment can harness the research excellence of our world-class University sector and the creative innovation and commercial insight of the UK's world-leading creative businesses. Significantly for CoSTAR, AOTF and CICP also demonstrated

that these initial public funds can drive significant co-investment from industry and from public partners who see the ability for R&D and the creative industries to drive local economic benefits. We are therefore looking for similar partnerships between Research Organisations, Industry and Public partners to come together to deliver the CoSTAR infrastructure and to leverage significant co-investment using AHRC's funding. We also believe that access to the CoSTAR infrastructure has the potential to foster the growth of new businesses around each CoSTAR Lab strengthening the local and national creative R&D ecosystem

2. Instructions for Respondents

Please refer to the two reference documents:

- **The Call Invitation** (this document) which provides information about CoSTAR
- **The Attachment Specification** setting out the information which applicants need to provide and the score weighting for each section

You are invited to respond via Je-S by 4pm on **28th March 2023**

Following the launch of the call, AHRC will hold a webinar on **16th February** which is open to all potential respondents to the call. This will deliver a full briefing on the IFU and offer the opportunity for potential bidders to ask questions.

To register for the webinar please use the AHRC event link, which can be found on the funding finder page.

To submit any questions in advance please email **CoSTAR@ahrc.ukri.org**

No reimbursement of any costs incurred in making submissions, presentations or responses can be entertained. Any information submitted will be retained and used solely for the purposes of this project and will not be used for any other purpose or shared with another organisation.

3. Eligibility

HEIs, IROs or RTOs as lead bidder. The lead bidder may partner with one or more research organisations and/or industry partners. Partnerships are not mandatory but it is likely that research organisations will need an industry partner in order to deliver the capabilities required, particularly around the panel and tracker survey.

4. CoSTAR Background

The UK's Creative Industries are world leading. From our film, television and games producers to our publishers, advertising, marketing and communications agencies and theatres, museums and galleries, they are, as HM Government has said, "at the heart of the nation's competitive advantage." However, the Creative Industries' ongoing success and strategic position is at risk from disruption from new waves

of technology that will transform the way creative products, services and experiences are produced and consumed. CoSTAR is a national response to these risks in the particular sectors where technology enabled transformation is most immediately apparent through the convergence of screen and performance technologies. Through CoSTAR AHRC is seeking to reinforce and sustain our competitive advantage in these sectors by investing in world-leading R&D and Innovation facilities and programmes (referred to in this document as "infrastructure") that can unlock the immediate and long term economic and creative value of a distinct set of emerging technologies.

The last decade has seen a new convergence of technology and media, with global giants such as Amazon, Netflix and Disney consolidating the technologies, production, and distribution of content together and achieving unprecedented market power. One side effect of this changing environment has been a significant and ongoing wave of new investment into studio facilities in the UK – from multi-billion-dollar inward investments by the world's largest media companies to smaller regional facilities.

However, within this period of global structural change, the last five years has seen another opportunity emerge. A suite of advanced computing technologies, some developed from within the creative industries, some from the wider digital technology sector, have converged to create new opportunities, methods and workflows with the potential to transform the production process across the whole sector. In film and hi-end TV - where adoption has been rapid - the implementation of this new creative technology stack has become known as "virtual production" built on real-time software engines from the game industry; but also including in-camera visual FX, performance capture; LED volumes, future networks, Machine Learning and more. The set of emerging tools and processes hold the promise of making content production cheaper, greener and better able to meet global market demand.

Virtual Production technologies have already had a significant impact in the screen industries, from ground-breaking productions such as Disney's *Star Wars* spin-off *The Mandalorian* to recent applications on HBO's Game of Thrones at Warners UK Leavesden studios. The potential for these same technologies to transform the performance sector has also been shown by projects such as The Royal Shakespeare Company's *Dream.online*. In the screen sector applications of these technologies will impact production companies; studio operators, performance companies, production technology groups; VFX providers and technology suppliers.

As these technologies become more accessible and develop further through the application of AI and Machine Learning, this transformation will extend across the creative industries through advertising, marketing and communication sectors, culture and heritage and far beyond linear experiences into the connected virtual environments that make up the metaverse – the next major phase in the development of the digital and creative economies. As the initial phase of what is intended to be a sustained Research Development and Innovation investment, CoSTAR starting point is today's virtual production environment but its future is in allowing the UK's creative industries a research infrastructure to explore the technologies and commercial opportunities of the metaverse.

Over the last five years, a series of public investments made by UKRI have shown evidence of the impact that can be delivered through applied creative R&D programmes including the *Audience of the Future Challenge* and the Digital Catapult/Arts Council England programme *Creative XR,* but these programmes have been project-based and time-limited. The extended timeframe and devolved decision making of The Creative Industries Clusters Programme has demonstrated how longer-term HEI/Industry partnerships supported by local, regional (and in the UK Nations) national economic partners can massively amplify the impact of UKRI funding raising more than £4 in co-investment for every £1 invested by UKRI through AHRC. It is because of this evidence that we are calling for similar partnerships to deliver the CoSTAR infrastructure with Ros RTOs or IROs leading consortia delivering the infrastructure.

The facilities delivered through CoSTAR will offer the UK's screen and performance sector a long-term infrastructure to build a new capability for the UK in Creative Technology R&D. Co-siting these Lab facilities with industry, rather than within Universities will ensure that they are always engaged with the cutting edge of industry practice; HEI leadership will ensure that the research and engineering teams within these facilities will conduct new high-quality R&D as well as support the development of innovative solutions; the participation of economic development partners will ensure that each facility in the network can support, sustain and grow a cluster of new high growth creative technology companies exploiting and commercializing the opportunities of this valuable and transformative R&D. Alongside these facilities an insight & foresight unit will gather data around CoSTAR's activities, placing them within the wider context and ensuring that learnings from CoSTAR benefit the wider industry, academia and policy. It will also address key challenges around these emerging technologies such as environmental sustainability.

5. CoSTAR Objectives

The Business Case for CoSTAR is to support UK screen and performance sector competitiveness by "equipping UK firms, assets and institutions with the capabilities, supporting environment and market insight necessary to play a leading role in current and future waves of global media and technology convergence." To do this, a further three sub-objectives were identified:

- To enable the technological participation of UK firms, assets and institutions in current and future waves of global media and technology convergence;
- To build, strengthen and deepen the UK creative technology ecosystem, maximise arising economic opportunities and support the commercialisation of creative industry technology IP; and
- To lead and coordinate the technological development of the UK screen and performance sectors.

Translating this into delivery terms gives the following overarching objective and sub-objectives.

Overarching objective for the Infrastructure

To underpin the long-term competitiveness of the UK screen and performance sector by **providing a highly capable R&D infrastructure** that enables **researchers, companies and institutions** across the UK to access to the **facilities, capabilities and insight** necessary to ensure that they can conduct **world class R&D** in the application of **current and future waves of advanced computing technologies** to transform the means of production across the screen, performance and allied sectors of the Creative Industries

Sub-objectives of the Infrastructure

1. To lead and coordinate the technological development of the UK screen and performance sectors developing new methods, solutions, processes, products and experiences

2. To build, strengthen and deepen the UK creative technology ecosystem including the pipeline for research talent and skills.

3. To maximise arising economic opportunities: to support the commercialisation of creative technology and creative content IP, products and services; and to support the formation and growth of highly capable Creative Technology firms.

4. To make a positive long-term contribution to the development of the UK Screen and performance industries across the the UK

6. CoSTAR Rationale

This call is for proposals to deliver the CoSTAR Insight & Foresight Unit (Lot 3). A previous call, which has now closed, concerned the CoSTAR National Lab (Lot 1) and Network Labs (Lot 2). All these facilities will operate in close collaboration as a networked infrastructure (see Governance below).

Our vision for CoSTAR as an infrastructure supporting R&D and Innovation for the screen and performance sectors relies on five essential insights which in turn define the capabilities and facilities the infrastructure will deliver.

1) **That there is a convergence of technologies that are, and will continue to, transform methods of production in the screen and performance sectors.** These technologies include the current Virtual Production model of real-time game engines, LED volumes and in Camera GFX but also includes XR technologies (Augmented Reality, Virtual Reality, haptics) Machine Learning and other forms of Artificial Intelligence and future display technologies. *As a developing infrastructure CoSTAR should not focus on specific technologies, which are subject to change, but on capabilities.*

2) **That to meet the needs of both researchers and industry CoSTAR needs to operate across a range of Technology Readiness Levels**[1]. Rather than operating exclusively at one stage in the innovation lifecycle, for example exclusively near-market, focussing on adoption or diffusion or exclusively in early-stage feasibility studies, the elements of CoSTAR should operate at different levels of applied research beyond the discovery phase. Thus we require proposals for the CoSTAR National Lab and Network Labs that will provide facilities and research and engineering expertise but operate at different Technology Readiness Levels (TRLs) .
    - *Network labs will work closer to the challenges faced by industry today, operating at higher TRLs (6-9), providing innovation solutions in advance of the market and working*

[1] Technology Readiness Levels (TRL) are a type of measurement system used to assess the maturity level of a particular technology. A technology project is evaluated against the parameters for each technology level and can then be assigned a TRL rating based on the projects progress.There are nine technology readiness levels. TRL 1 is the lowest and TRL 9 is the highest. See Glossary

hard to broaden access to experimental production technologies and facilities to new user groups across industry.

- *The National Lab by contrast will be a unique applied research facility, working at lower TRLs (3-6) with a larger research and engineering capability, working with industry on the next wave of technologies to enter the market in 3+ years.*

3) **That an essential function of CoSTAR is to support ambitious testbed projects that pump prime use of the facilities.** This will involve supporting ambitious multi-partner R&D collaborations similar to the demonstrator programme operated by the Audience of the Future Challenge. *A funding stream for 'Pilots and Demonstrators' will be established and delivered by the National Lab. This will support access to any of the CoSTAR infrastructure*.

4) **That the disruptive transformation of screen and performance production processes has the potential to drive new business models and market sectors.** CoSTAR has the opportunity ito support the development of a range of new CreaTech companies developing and exploiting technology IP or process and service innovation. As we move from the current model of Virtual Production for linear content to a creative economy rooted in the Metaverse new business models and economic niches will be enabled. We see the facilities and expertise offered by the National and Network Labs as nodes in the CoSTAR infrastructure around which these new ventures will cluster. Thus *the infrastructure requires a highly capable commercialisation, Knowledge Exchange, Commercialisation and Enterprise function as a single front door to CoSTAR. Again this will be delivered by the National Lab on behalf of the whole network.*

5) **Democratising access to these new technologies and processes, reducing cost and widening the adoptive base must be a major driver for CoSTAR.** This will include extending access and adoption more widely across the Creative Industries but the focus must remain rooted in the screen and performance sectors.

6) Currently, there is a lack of information coordination in the sector, meaning that firms face significant challenges in tracking the new facilities, firms and ways of working that keep emerging. They lack the oversight and information to understand what progress is being made elsewhere and by whom, and who to approach to find potential partners for longer-term, collaborative R&D, which stymies the ability to build on progress made elsewhere. A key part of the CoSTAR infrastructure must therefore be a body that tracks and reports on overall market and technological progress, and whose responsibility it is to make sure that key information is disseminated across the sector as a whole, as well as to look further ahead and identify where technologies and markets may go next, to enable the sector to prepare.

6.1. Infrastructure Funding

CoSTAR receives most of its funding from UKRI's Infrastructure Fund (IF) which has characteristics which may distinguish it from other research calls bidders may have responded to in the past. This should be born in mind when preparing responses.

- The IF provides funding to establish or upgrade an R&D facility
- It funds design, construction and testing of facilities up to the point where they are deemed fully operational
- CoSTAR IF funding supports the building, commissioning and testing-in-use of the new infrastructure
- The Insight & Foresight Unit constitutes the establishment of a data infrastructure

6.2. Sustainability

The close involvement of industry and other public partners is essential to CoSTAR. Ultimately, we do not expect CoSTAR to be sustained from AHRC and Infrastructure funding alone, but rather through the diversification of revenue streams and the development of new services and activities beyond the current requirement specified by AHRC. The development of these services will be the province of the winning bidders so long as the requirements of the current funding are met throughout the period. We anticipate that a future mixed funding model will be central to the thinking of bidders and their industry (and other) partners.

Sustainability of the infrastructure, including the ability of bidders to plan for the diversification of revenue streams will be an assessment criterion for proposals.

7. Summary of Lots/Services

Lots	Services to be delivered
1 Services associated with the National R&D Lab (Previous call)	• Development, management and maintenance of a national RD&I facility, delivering its own extensive research programme of applied R&D (TRLs 3-6) and accessible to third party industry and research groups • Oversight and delivery of a series of demonstrator/pilots to ensure market driven access to this and other CoSTAR facilities, including operational support and expertise • Knowledge Exchange, Commercialisation and Enterprise
2 Services associated with the (up to) three Networked R&D Labs (Previous call)	• Development, management and maintenance of smaller, R&D facilities working closely with current industry challenges (TRLs 6-9) • Network Labs may be specialised by geography, serving particular regions, or by subsector, serving particular industrial and research communities, or both
3 Services associated with	• Collection and management of primary data from National and Network labs, tracker survey and ad hoc research projects • Collection of secondary data

the Insight & Foresight Unit	• Compilation and analysis of data • Dissemination of data & insights within CoSTAR and externally to relevant groups

7.1. Description of Lots/Services

Lot	Service	Outline description
3	CoSTAR Insight & Foresight Unit	The successful bidder for this unit will set out a programme to: • generate insight and foresight to understand and inform the development of convergent screen technologies and their markets from primary data collection and secondary data interpretation. • ensure that data and learning from CoSTAR activities is captured and disseminated to all relevant parties • inform policy and strategy for CoSTAR and for public investment in the sector more broadly • become a leading authority on the development of convergent screen technologies and their markets

7.2. Bidding Rules and Preferred Bidder Status

- AHRC will award 1 grant
- The Assessment will conclude with the identification of a preferred bidder for the provision of the Insight & Foresight Unit
- Subsequent to the identification of preferred bidders, AHRC must submit a Final Business Case (FBC) to BEIS and receive HM Treasury approval before Grants can be awarded
- Preferred bidders should expect to work with AHRC in compilation of this FBC as well as on preparation and planning activities in the time between the submission and approval of the FBC to ensure timely project start.

8. CoSTAR Timetable

Lot 3: Insight & Foresight Unit	Timing

Call Opens	8th February 2022
Call Closes	28th March 2023
Call assessment	April-May 2023
Preferred Bidder identified	31st May 2023
Grant Award	September 2023
Set up, recruitment and planning	2023/24
IFU initial programmes operational	2024/25

9. CoSTAR Funding

Funding for CoSTAR covers a period of 6 years. All components are expected to be implemented within this timeframe from 2023/24 to 2028/29.

The funding package is set out in the table below. These tables exclude administrative costs borne by the Government.

Overall CoSTAR funding Package, £ million

	'23/24 Y1	'24/25 Y2	'25/26 Y3	'26/27 Y4	'27/28 Y5	'28/29 Y6	Total
FUNDED BY:							
Govt: UKRI Infrastructure Fund	6.95	15.65	9.3	12	13.4	13.8	71.1
Govt: AHRC World Class Labs	-	-	-	-	-	-	-
Minimum Third Party	1.8	4.8	2.2	3.5	3.8	4.0	20.1
Total	**8.75**	**20.45**	**11.55**	**15.5**	**17.2**	**17.8**	**91.2**

£ Numbers subject to rounding

Lot	Service	Total Costs over 6 years (Capex and Opex)	Funding	
			Government	Minimum Third Party
1	National R&D Lab incl. Demonstrators & Pilots and KE, Commercialisation (previous call)	66.7	51.1	15.7
2	Three Networked R&D Labs (previous call)	17.0	12.5	4.5
3	**Insight & Foresight Unit (this call)**	7.5	7.5	0.0

	Total	**91.2**	**71.1**	**20.2**

£ Numbers subject to rounding

9.1. Lot 3 (Insight & Foresight Unit) funding projection by Year

These are the proposed indicative figures that should be used as a guide when constructing your responses.

£m	**'23/24 Y1**	**'24/25 Y2**	**'25/26 Y3**	**'26/27 Y4**	**'27/28 Y5**	**'28/29 Y6**	**Total**
Lot 3: IFU	1.25	1.25	1.3	1.3	1.3	1.1	**7.5**

9.2. Impact and Performance Monitoring

UKRI/AHRC will monitor and evaluate performance and progress of the project to ensure that the agreed and specified objectives and timeframes are being met, including securing the services of an independent specialist agency, body or such other qualified and experienced organisation and access to information in line with our fiduciary responsibilities.

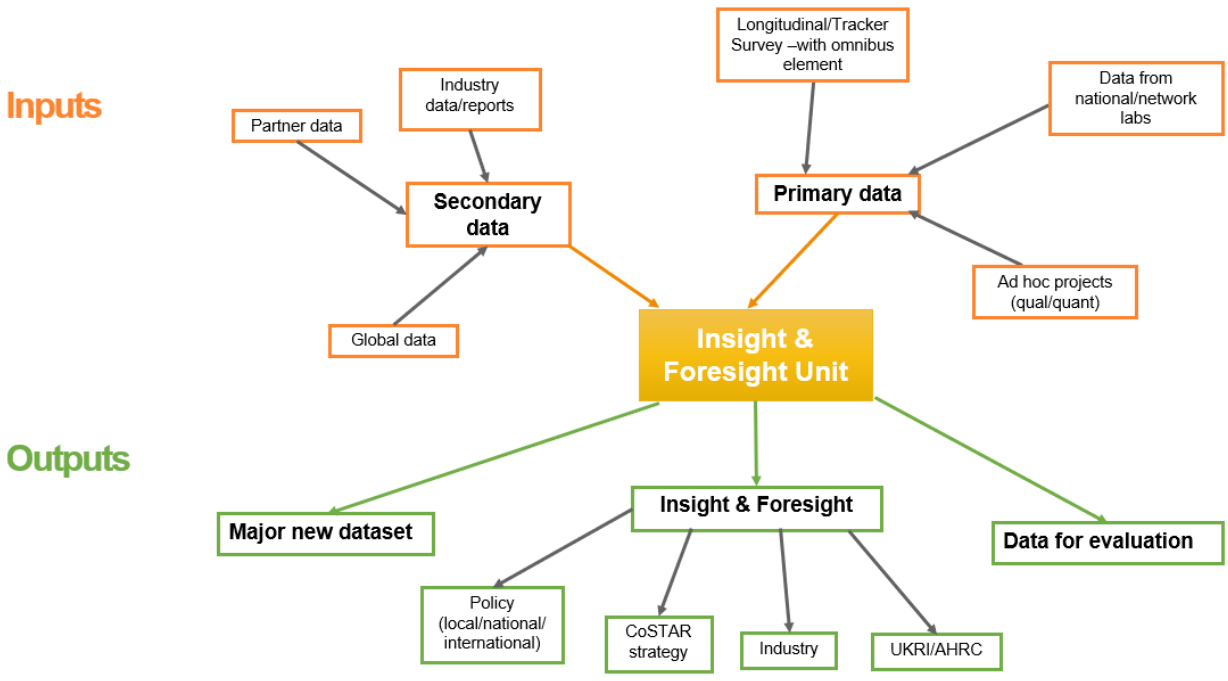
10. CoSTAR Insight & Foresight Unit

• *A Research unit with a core remit to produce insight & foresight relating to CoSTAR and the wider industry and research community engaged in the application of creative technologies to advanced media production and performance* • *Collection, analysis and communication of quantitative and qualitative data relating to CoSTAR's activities and the wider national & international context within which it operates* • *Management of unit for a period of 6 years*	
Who will setup and run it?	HEIs, IROs or RTOs leading partnerships with one or more research organisations and/or industry partners Partnerships are not mandatory but it is likely that research organisations will need an industry partner in order to fulfil the requirements, particularly around the panel and tracker survey.
What does it do?	The IFU will be a cohesive, focused unit which is integral to the wider CoSTAR infrastructure, whilst also looking outwards and actively engaging with industry, policy and academia. The IFU will collect and manage data from the CoSTAR national and network labs. It will also create new datasets through the establishment of a longitudinal survey, including an omnibus element, which will track the development of the sector, as

	well as the delivery of ad hoc qualitative and quantitative projects that support the unit's research objectives. Bringing this data together with secondary data from partners, international sources, and industry datasets and reports, the IFU will proactively disseminate insights to relevant parties across industry, policy and academia. Alongside this, as outlined above, it will take a key role in the management of CoSTAR, working closely with the labs to ensure high quality data is collected, and that strategic direction is informed by the insight and foresight it provides. The IFU will not be evaluating the CoSTAR labs, but will make available raw data it captures to support evaluation where relevant. Focusing on industry and academia applying creative technologies to advanced media production and performance, the IFU will research the development of, for example: • technology • new ways of working • facilities • businesses • regional economies • audiences • demonstrator projects The core research themes, which we expect will evolve and grow through the grant period, will be: • creative R&D • transformation of production through new technology • market development, including supply chains, audiences and businesses • decarbonisation of production • equality diversity and inclusion within transformation of production For each of its research foci and themes, the IFU will deliver a programme of work designed to: • monitor and predict direction of travel of the sector • communicate this insight and foresight to CoSTAR National and Network labs, AHRC, and the sector at large • develop and deploy a robust set of methodologies supporting an unrivalled evidence base for CoSTAR, and the UK, of what works well, what might be improved and to-date under-explored opportunities Insight around the decarbonisation theme will be a key output for the IFU. Too little is presently known about the overall current, or the expected future, carbon impact of the screen and performance sectors and how this might be reduce through the adoption of technology. Although work is being done to fill this evidence gap, aggregated, sector-wide analyses do not presently exist, nor do assessments of the potential environmental implications of new production techniques like virtual

	production. The IFU will therefore make a significant contribution to this evidence-base.
Operational assumptions	• Single Research Organisation/small consortia, with industry partner(s) • Lead partner must provide clear "front door" for external stakeholders (research, industry and policy) to all IFU capabilities • IFU will form a coherent, focused unit with clear outputs & communications • With regard to the quantitative surveying, bidders should detail in their application: ○ the number of panels they propose to establish, and their characteristics ○ the volume of surveying, frequency of sampling and sample size(s) ○ any specific methods they expect to incorporate into the quantitative surveying, with justification for their selection
Funding and Governance assumptions	• AHRC will fund the CoSTAR IFU to a limit of £7.5m at 100% FEC over the period of the Grant • No minimum level of Co-investment has been set but bidders should present any plans for co-investment and diversification of revenue streams and how these will contribute to the sustainability of the IFU. • IFU director will be member of CoSTAR strategy board from autumn/winter 23/24 • Setup 23/24 • Initial Operational testing 24/25

Illustration of IFU activities



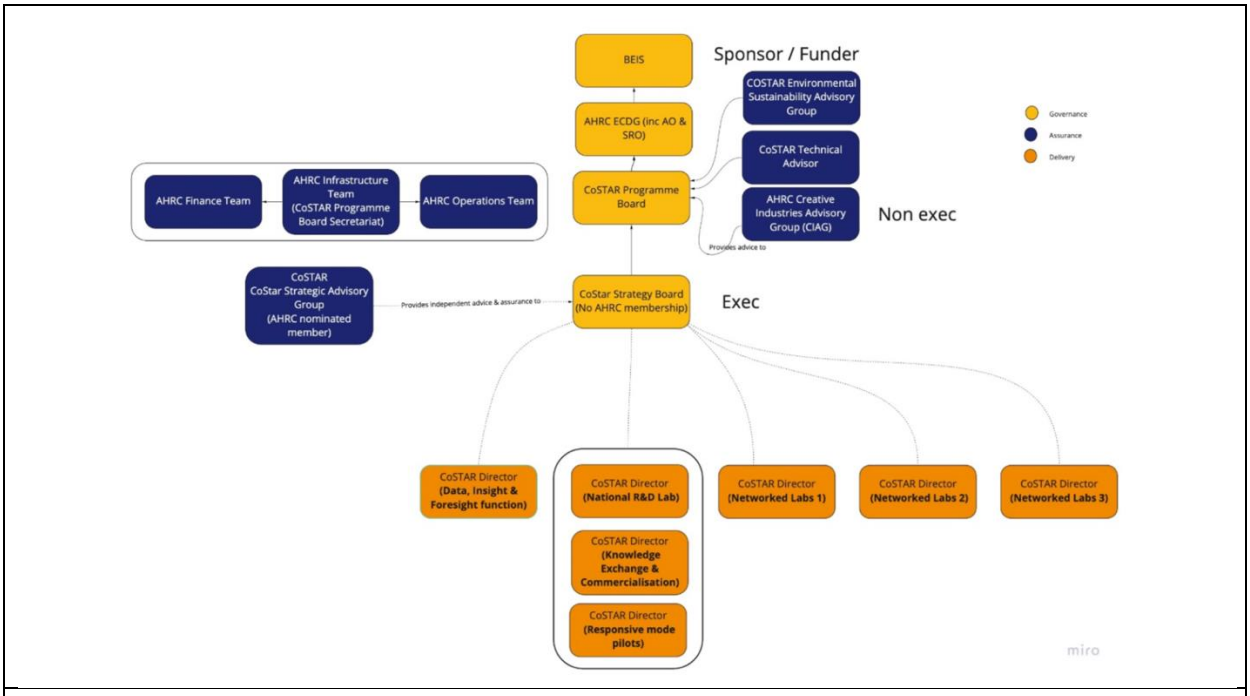
11.Governance and Management

CoSTAR is a new infrastructure and as the first national infrastructure commissioned and delivered through AHRC requires a new and robust Governance Structure. The Governance arrangements need to be balanced with a clear operating structure with successful bidders being given space to manage the delivery of the elements for which they are responsible and make the necessary agreements with partners (including non-AHRC funding partners) to contribute to, and expand, the capability of the network.

11.1. Governance Model

- AHRC will appoint a Programme Board responsible for the delivery of the CoSTAR Infrastructure against its Business Case, reporting to AHRC senior management, UKRI and BEIS on performance of the programme
- Each of the elements of CoSTAR: CoSTAR National Lab (including Demonstrator and Pilots Programme and Knowledge Exchange, Commercialisation and Enterprise Function); up to 3 Network Labs; and the Insight and Foresight Unit will be funded through individual Grant Awards.
- However, it is an overriding objective of CoSTAR that it functions as a national infrastructure and operates through close coordination and collaboration between the elements within the network. This strategic co-ordination and close co-operation on a day-to-day basis will be managed by a CoSTAR Strategy Board comprising the Directors of the different Labs and programmes.
- This Strategy Board will be responsible for reporting to the Programme Board within the AHRC governance structure.
- The Strategy Board will appoint its own CoSTAR Advisory Group in consultation with AHRC.
- Whether the Strategy Board would benefit from an independent chair, or a chair elected by the members, is something that will be formalised at the Final Business Case stage.

The governance and management structure for CoSTAR may develop over time, subject to the agreement of Grant Holders and AHRC. During the development of CoSTAR, we have considered the merits of the initial structure evolving into more formal agreements between the operating partners, up to and including the formation or a new organisation, potentially with IRO status, to operate the CoSTAR infrastructure in the long term. We believe that this model is worthy of investigation over the initial period of set up and operations funded by this call.



Proposed CoSTAR Governance Structure

12.About UKRI

Launched in April 2018, UKRI is a non-departmental public body sponsored by the Department for Business, Energy and Industrial Strategy (BEIS).

Our organisation brings together the seven disciplinary research councils, Research England, which is responsible for supporting research and knowledge exchange at higher education institutions in England, and the UK's innovation agency, Innovate UK. Our nine councils work together in innovative ways to deliver an ambitious agenda, drawing on our great depth and breadth of expertise and the enormous diversity of our portfolio.

Through our councils we maintain and champion the creativity and vibrancy of disciplines and sector-specific priorities and communities. Our councils shape and deliver both sectoral and domain-specific support.

Whether through research council grants, quality-related block grants from Research England, or grants and wider support for innovative businesses from Innovate UK, we work with our stakeholders to understand the opportunities and requirements of all the different parts of the research and innovation landscape, maintaining the health, breadth and depth of the system.

Our vision is for an outstanding research and innovation system in the UK that gives everyone the opportunity to contribute and to benefit, enriching lives locally, nationally and internationally.

Research and innovation enriches and improves our lives and increases prosperity by creating knowledge that enables us to understand ourselves and the world around us. This also empowers us to focus on the many challenges we face as individuals and as communities, nationally and globally.

We will work with partners to shape a dynamic, diverse and inclusive system of research and innovation in the UK that is an integral part of society, giving everyone the opportunity to participate and to benefit.

Our mission is to convene, catalyse and invest in close collaboration with others to build a thriving, inclusive research and innovation system that connects discovery to prosperity and public good.

We bring together nine organisations with great depth and breadth of expertise, allowing us to connect research communities, institutions, businesses and wider society, in the UK and around the world.

This combination enables us to work across the whole research and innovation system, informed by our networks and expertise.

As the UK's largest public funder of research and innovation it is our responsibility to ensure the health of the system, now and in the future. As a steward of this system, we will work together with many other organisations.

These include our close partners at the heart of the research and innovation system such as higher education institutions and institutes, innovative businesses, investors, not-for-profit organisations and policy makers, and a wider set of partners such as those in the education system and civil society.

We will fulfil our stewardship role through the ways in which we catalyse, convene, incentivise, invest in and conduct research and innovation.

13. The UKRI Infrastructure Fund

The majority of the public sector funding for CoSTAR is from the Infrastructure Fund.

Research and innovation infrastructure is fundamental to delivering the UK's wider ambitions of increasing UK investment in R&D to 2.4% of GDP by 2027. The 2020 Government Research and Development Roadmap highlighted how UKRI will provide a long-term, flexible pipeline of research and innovation infrastructure investment priorities for the next 10 to 20 years. The roadmap builds on the recommendations from UKRI's infrastructure programme published in the UKRI's Opportunity report and Landscape Analysis.

The Infrastructure Fund will support step-changes in infrastructure capability and/or capacity, including:

- new infrastructure;
- major upgrades;
- repurposing;
- transformative developments

14.About AHRC

The AHRC is the UK's largest provider of response led and strategic funding, advanced skills training and career development across the whole range of arts and humanities.

Our ambition is to sustain a rich, diverse and powerfully creative research ecosystem, which will engage with other constituents of UKRI and stakeholders across the United Kingdom and the world. The AHRC is committed to UKRI's holistic vision of science, in which humanities and arts research is enriched and emboldened by engagement with technology, medicine and our environment, and informs and enriches those disciplines in turn. We will place our values, creativity and imagination at the heart of the reinvention of public life, successful economies, constructive civil discourse and a rich cultural infrastructure.

The AHRC reflects and supports a hugely diverse research community. We fund world-class research in all regions and nations of the UK, distributing funds without detriment to excellence, and we are deeply committed to international connectivity and to promoting and embodying values of equality, diversity and inclusion. We have spearheaded a successful collaboration of public and private partners in the Creative Industries, drawing on the strength of content and creativity among our researchers and IROs to provide business-facing and innovative outcomes, many of which have proved essential through the COVID-19 pandemic. We will embed this success into a permanent transformation of the AHRC's aims and objectives, to carry forward UKRI's mission to convene, catalyse and invest to build a thriving and inclusive research and innovation system, involving research that connects discovery to prosperity and public good.

15.Glossary of Terms and Abbreviations

AHRC	Arts and Humanities Research Council and is part of UKRI
BEIS	Department for Business, Energy and Industrial Strategy
CoSTAR	**The Co**nvergent **S**creen **T**echnologies **a**nd performance in **R**ealtime infrastructure
CoSTAR Infrastructure	The network of facilities, programmes and capabilities funded through this and future calls drawing on UKRI Infrastructure funding
CoSTAR Network	The network of lead organisations managing the delivery of CoSTAR infrastructure components and their partners
Creative Industries	Industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property. The creative industries, as defined by Department for Digital, Culture, Media and Sport (DCMS) include all, or part of, the following 9 industry sectors: Advertising and Marketing Architecture Crafts Design and designer fashion Film, TV, video, radio and photography IT, software and computer services Publishing Museums, galleries and libraries Music, performance and visual arts
Creative R&D	A broad term used here to describe applied R&D and innovation in the Creative Industries. Whilst this term is recent and still to take on formal definition, we use it here to describe the R&D and innovation processes that act as mid and high technology Readiness Levels (TRLs 3-9) in research Organisations, RTOs and industry, often working in collaboration. The lack of correspondence between academic disciplines and the industrially defined Creative Industries fields makes it more difficult to identify enquiry-lead research that corresponds to Creative R&D.
Creative Technologies/ CreaTech	An intertwined portfolio of advanced computing technologies (XR/VR/AR, realtime software engines and GFX, LED production volumes) which, when brought together with AI, Machine Learning and Distributed Ledger technologies are central to the evolution of the Creative Industries. CreaTech is a term increasingly used to also describe an emerging group of businesses within the Creative Industries

	that develop products, platforms, services and experiences using these technologies.
DCMS	Department for Digital, Culture, Media and Sport
HEI	Higher Education Institution
IRO	Independent Research Organisation
Lots	Packages (or bundles) of work, goods services, etc. for competition purposes
Metaverse	Confluence of technologies from XR to Internet of Things (IoT), 5G, advanced networks, graphics, displays and the cloud used to build persistent online (virtual) spaces used for work, entertainment, play and learning. These spaces will increasingly be interconnected allowing users (or their digital twins/avatars) to move between them. Can also be thought of as the next iteration of the Internet, blending physical and digital worlds.
Middleware	Middleware is a type of computer software that provides services to software applications beyond those available from the operating system. It can be described as "software glue".
NESTA	A registered charity to support UK Innovation and drive social good
R&D	Research and Development
RD&I/RDI	Research, Development and Innovation
RTO	Research & Technology Organisation
SME	Small and Medium (Business) Enterprises
Technology Readiness Level/TRL	A method for estimating the maturity of technologies and/or technology programmes. Originally developed by NASA in the 1970s. Used internationally by research and innovations projects, the TRL scale has been adopted as ISO 16290 standard. Exact TRLs can be established by a technology readiness assessment (TRA) but are usually measured on a 9 point scale, below adapted from that used in the EU Horizon 2020 programme. 1. Basic principles observed/reported 2. Technology concept formulated 3. Experimental proof of concept 4. Technology validated in lab environment 5. Technology validated in relevant (industrial) environment 6. Technology demonstrated in industrial environment 7. System prototype demonstrated in operational environment 8. System complete and demonstrated 9. Operational product in proven operation.
UKRI	UK Research and Innovation is a non-departmental public body bringing together the 7 Research Councils, Research England and InnovateUK.

	UKRI is sponsored by BEIS and its funding represents a significant proportion of the UK Government R&D budget, often referred to as 'the Science Budget'.
Virtual Production (VP).	Though sometimes used to refer to the broader cluster of advanced computing technologies associated with the Metaverse (see above) VP has become more commonly used to refer to a subset of those technologies (and the processes and workflows that integrate them) in the current transformation of linear film production. Central to this are the use of real-time game engines, LED volumes, in-camera GFX, previsualisation and VR. The presence of 'brain bars' on set accommodating new crew roles are distinctive of productions that have incorporated VP methods
XR	Extended Reality technologies – coverall phrase embracing VR (Virtual Reality), AR (Augmented Reality), MR (Mixed Reality) and Haptics

16. Further information on the National & Network Labs (Lots 1 & 2)

Lot 1: CoSTAR National Lab

16.1. CoSTAR National Lab: R&D Facility

• *A Research, Development, and Innovation facility with a core remit to explore the next wave of solutions in the application of advanced computing and creative technologies to the transformation of production processes in the Creative Industries.* • *Working primarily through applied R&D models at Technology Readiness Levels 3-6. Comprising a single location co-sited with* major screen production facility or studio. • *Management of facility for a period of 6 years*	
Who will setup and run it?	HEIs, IROs or RTOs leading partnerships with at least one Commercial Studio partner and one Local Enterprise Partnership (LEP), Local Authority or equivalent regional funding body. Bidders should demonstrate support from a range of key industry partners/customers from screen and performance production and creative technology sectors. Bidders should set out the positive contribution their proposal can make to establishing and delivering a national core facility.
What does it do?	The National R&D Lab will offer the dedicated space, the technologies and the people through whom Creative Industries organisations can solve future challenges in technology-enabled production. We assume the lab will provide access to a full-scale virtual production stage but also dedicated multifunctional research spaces and research/engineering teams across a range of capabilities and technologies. The Lab should have its own highly capable research, engineering and technical support staff, working to a CTO and Director of Research, dedicated to pursuing a wide-ranging research, development and innovation programme. The staff and technical facilities should provide capacity across a wide range of creative technologies relevant to future application across screen and performance production. Rather than define its research activities through the specification of technologies the lab should organise its R&D teams and programmes around providing ongoing capabilities and areas of enquiry. These capabilities should include research and engineering teams devoted to addressing future needs in: • Asset Creation • Realtime Processes & Workflows (incl. distributed and virtual) • Performance and Performers • Worldbuilding • Networks • Automation • Interactivity & Virtual Spaces

	• Democratisation (expanding user groups, use cases, reduced costs etc) • Standards R&D in new technologies and new processes will inevitably create new IP and know-how but this does not guarantee that such IP is exploited. The National Lab R&D teams will work closely with the KE, Commercialisation and Enterprise Function to ensure that opportunities for commercialisation of knowledge created in the lab is maximised (see 9.3 below) Through its work, the Lab will assume a global leadership position in advancd created production and the evolving areas of Creative R&D and Creatuve technology. Its catalytic effect should help draw in both inward investment to the UK and help to bolster economic development in the area where it is located as new start-ups and extant businesses in associated areas seek location close to this important new facility.

Operational assumptions	• There will be one physical Lab
	• It will be co-located with an existing or developing facility rather than in a university setting
	• It will offer a full virtual production stage alongside specialised research and development lab space
	• It will make capital investments in hardware and software technologies, research and creative technology skills for the Lab. These might include (but not be limited to)
	  ○ Real-time software engines
	  ○ Performance Capture – Motion capture and volumetric capture
	  ○ Artificial Intelligence and Machine Learning
	  ○ Future Networks – 5G and 6G
	  ○ Bio-sensors
	  ○ Current and future Display technologies
	• It will be used by projects led by Film TV, Games and Performance companies seeking to solve distinct technical, creative or process challenges associated with advanced production methodologies.
	• It will seek to identify new market niches within the emerging value chain of advanced production and support the formation and/or spin out of new companies to exploit those opportunities.
	• The lab will provide workspace for its own team and well as accommodation for partner teams using the facilities, visiting researchers and industry fellows

Funding and Governance assumptions	• The budget will cover capital, operating and staff costs • A new organisation formed by the private and public partners in the project consortia may be set-up to manage and operate the Lab, subject to continuing elegibility for AHRC funding. • Setup 23/24 • Ramp up 24/25 • Fully Operational 25/26

16.2. CoSTAR National Lab: Demonstrator and Pilots Programme

Support for ambitious demonstrator and/or pilot projects giving organisations from target Creative Industry sub-sectors funded access (subject to status) to the National and Networked Labs and facilities. A central objective of this programme will be the participation of SMEs.	
Who will setup and run it?	**To be included as part of response for Lot 1. Delivered as part of the CoSTAR National Lab infrastructure on behalf of the CoSTAR network.**
What does it do?	The Demonstrator and Pilots Programme provides a responsive mode for CoSTAR through which a diverse range of Creative R&D projects can be supported to use infrastructure and pump prime the network. Demonstrators are large scale collaborative trials, pilots are smaller scale proofs of concept. Both will be expected to have practical, demonstrable outcomes. It will look to fund or co-fund projects with significant technical, creative or process challenges that • Would prove or test new or experimental processes, creative technologies or workflows at scale • Would support new collaborations, cross-overs between disciplines or application of technologies or processes new to the creative production sector • Have a significant innovation contribution from SME's and/or will be of benefit SMEs The complexity, scope and proximity to market of those challenges will help determine whether are best addressed by work in the National Lab, within the Networked Labs or in combination. Assessment of applications by experts across the CoSTAR infrastructure will help match the right facility and set of expertise to the problem to be solved. The programme will be open to all qualifying organisations from across the UK's screen, performance and CreaTech sectors with opportunities to collaborate and/or trial outputs in other associated Creative Industries sectors e.g. Marketing/Communications & Advertising and GLAM. One key outcome of the Demonstrator/Pilot Programme will be to provide ongoing, tangible, real-world examples of how the CoSTAR infrastructure support the next generation of innovative UK content in Film, TV, Games, Performance and beyond, helping the UK to maintain its position as the best place to make content, and makers of the best content, in the world.
Operational assumptions	• The Demonstrator and Pilots Programme will managed and operated by a team within the National Lab • It will establish a responsive funding programme that seeks applications from qualifying organisations to undertake Creative R&D using any of the CoSTAR facilities – both in the National Lab and the in the Networked Labs.

	• It will match applications for funding with best-fit facilities in terms of capability, capacity and geography. • It will look identify any opportunities to test and optimise innovation outputs from the main R&D Lab through the funded projects. • It will provide access to the CoSTAR facilities and flexible workspace to accommodate the demonstrator/pilot teams
Funding and Governance assumptions	• Setup on a parallel timeline to the National Lab and will be co housed. • Setup 23/24 • Ramp up 24/25 • Fully Operational 25/26

16.3. CoSTAR National Lab Knowledge Exchange, Commercialisation and Enterprise Function

A dedicated team to lead R&D Knowledge Exchange in the Creative Technology space, drive commercialisation of product, process, and technology IP developments from the CoSTAR National and Networked Labs and provide enterprise support to businesses using the infrastructure.	
Who will setup and run it?	**To be included as part of response for Lot 1 and to be delivered by a dedicated team within The National Lab on behalf of the whole CoSTAR network**
What does it do?	• The role of the KE, Commercialisation and Enterprise team to help and encourage commercialisation of outputs from the National and Networked Labs. • The team will: • Provide expert KE, Commercialisation and Enterprise advice to users of the CoSTAR Network and to the National and Network labs around the potential to commercialise the outputs of R&D they conduct. • Establish a programme of showcase events for researchers, investors and industry using the facilities of the CoSTAR Network and promoting the outputs and activity of the labs. • Establish relationships with investors including regular briefings on the outputs that labs are seeking to commercialise. • Explore the potential for developing and delivering (in parrnership) incubation and acceleration programmes for creative technology companies connected with the CoSTAR infrastructure and the National and Network labs • Raise external, partnership and third party funding for KE, commercialisation and enterprise activities of the National Lab

Operational assumptions	• It is a small team of specialist managers managing delivering a knowledge exchange and commercialisation function. • It will be co-located in the National Lab facilities owned by members of project consortia • It will set-up and run a knowledge exchange programme focussed on the technology focus areas for CoSTAR • The scale and frequency of this programme is to be determined but should offer meaningful coverage of emerging UK talent in this space • The commercialisation programme will include showcasing to venture capital and other funders and successful integration into the wider UK technology start-up ecosystem is a key factor of success.
Funding and Governance assumptions	• The function will be setup on a parallel timeline to the National Lab and will be co-housed. • Setup 23/24 • Ramp up 24/25 • Fully Operational 25/26

17.Lot 2: Three Networked R&D Labs

Support to refurbish, upgrade or enhance a maximum of three RD&I Labs working at higher Technology Readiness Levels (6-9) and working closely with industry. Co-sited with a screen production facility, studio or performance company. Management and delivery of the facility for a period of 6 years.	
Who will setup and run it?	HEIs, IROs or RTOs in partnership consortia with at least one of a production facility, studio or performance company and a Local Enterprise Partnership (LEP), Local Authority or equivalent regional funding body. Lead organisations can bid for one, two or a maximum of 3 Network Labs. Bidders for Network labs should outline how their proposal is advantageous in its contribution to regional and national ecosystems. The geographical distribution of the Network Labs and the National Lab will form a coordinated CoSTAR national infrastructure providing access to facilities for companies and researchers across the UK.

What does it do?	• Each Network Lab will be co-located with an existent or developing production facility used by the screen or performance sector
	• Each Network Lab should demonstrate how it serves the needs of an identifiable geographic community or a specialised sub-sectoral community (or possibly both)
	• Each lab should show how it can make a long term impact on its region and/or sector
	• The facilities and capabilities offered by each Network Lab should reflect this, making capital investments in hardware and software technologies, research and creative technology skills and staff for the Lab to deliver against some of the following R&D capabilities:
	  ○ Asset Creation
	  ○ Realtime Processes & Workflows (incl. distributed and virtual)
	  ○ Performance and Performers
	  ○ Worldbuilding
	  ○ Networks
	  ○ Automation
	  ○ Interactivity & Virtual Spaces
	  ○ Democratisation (expanding user groups, use cases, reduced costs etc)
	  ○ Standards
	• It will focus on the development of solving practical technical, creative or process innovation challenges faced by companies in the screen and performance sector at high Technology Readiness Levels (TRLs 6-9)
	•

Operational assumptions	• It has a small team of specialist researchers and engineers. • These will be co-located on site at the Network Lab or in office facilities owned by members of the Network Lab consortia

	• It will set-up and run research and experimental production facilities
	
	• It will make capital investments in hardware and software technologies, research and creative technology skills for the Lab appropriate for the needs of its geography or sectoral focus. These might include (but not be limited to)
	  ○ Real-time software engines
	  ○ Performance Capture – Motion capture and volumetric capture
	  ○ Artificial Intelligence and Machine Learning
	  ○ Future Networks – 5G and 6G
	  ○ Bio-sensors
	  ○ Current and future Display technologies
	• It will collaborate with the National Lab in the delivery of the Demonstrator/Pilot programme including hosting projects for which it should be eligible to bid for funding.
	• It will collaborate with the KE, Commercialisation and Enterprise team hosted at the National lab to test and deploy IP developed across the CoSTAR infrastructure, deliver KE programmes, maximise exploitation of IP and support business growth opportunities.
	• It should work with partners to support co-location and enterprise support for companies using the Network lab facilities.

Funding and Governance assumptions	• That budget will cover capital, operating and staff costs • Setup 23/24 • Fully Operational 24/25 • Funded until 28/29

17.1. Funding projections by Year - Lots 1 & 2

Service £m	'23/24 Y1	'24/25 Y2	'25/26 Y3	'26/27 Y4	'27/28 Y5	'28/29 Y6	Total
Lot 1 TOTAL	5.3	16.6	6.5	11.9	11.9	14.4	66.7
Lot 2 TOTAL	2.1	2.6	3.8	2.2	3.9	2.3	17.0
TOTAL Lots 1 & 2	**7.5**	**19.2**	**10.3**	**14.2**	**15.8**	**16.7**	**83.7**