HOW CREATECH IS RESHAPING THE CREATIVE INDUSTRIES

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ABSTRACT

Since OpenAI released its service ChatGPT in 2022, interest in generative artificial intelligence (AI) in the Creative Industries has surged. However, research from the University for the Creative Arts (UCA) shows that AI is only one of several disruptive *Industry 4.0* technologies infusing the sector. Companies such as Engineered Arts, who create humanoid robots for events, and MoveAI, who make 3D motion capture and real-time animation simpler, are examples of innovative businesses identified as *Createch*. During 2023, spokespeople for the Creative industries, such as Sir Peter Bazalgette, Co-Chair, Creative Industries Council, have acknowledged the growing significance of Createch.

Createch businesses bring creative and commercial opportunities. They also bring social and environmental harms (e.g., the carbon footprint from training and tuning machine learning models). A UCA survey conducted in 2022 shows these companies are often immature in terms of sustainability thoughts and action. Although 77% of Createchs in the survey said that sustainability is core to their strategy, only 5% have a sustainability policy. The research also shows that Createch businesses do not recognise the full impact of on their value chains and the behaviour of audiences and users. For example, Virtual Reality extends the reach of a live performance, but it can also generate increased electronic waste as users upgrade to the latest device.

In interviews, Createch founders identified a lack of relevant, practical information for them despite the availability of guides for the Creative Industry (e.g., the Green Theatre Guide). Founders mentioned areas such as strategies for decarbonising AI models, and responsible and ethical use of AI as important gaps. In September 2023, UCA launched a free online tool aimed at Createch founders and CEOs to close these gaps, as well as enabling business leaders to benchmark their sustainability maturity using a tailored *ZBIA* maturity matrix (Zero, Basic, Intermediate, Advanced).

Introduction

The word 'Createch' is recent. In 2016, the UK's Creative Industries Council identified that just as Financial Services has technology-enabled businesses called Fintechs, that similarly for the Creative Industries there are Createchs: "where creativity meets technology". While such a straightforward definition could apply to most organisations in the Creative Industries, the intent was to place the focus on technology-enabled start-ups and scale-ups that were pushing the boundaries of what technology could bring to the Creative Industries (See Figure 1).

Figure 1 The diverse Createch landscape.

While the Creative Industries have been lead adopters of technology for many years, it is only in the last few years that core human activities in creation and production have fallen within the grasp of technology with the arrival of generative artificial intelligence (AI).

Createchs have been quick to harness leading edge information and communication technologies (ICT), with generative AI as the latest. However, research by The Centre for Sustainable Design® (CfSD) at The University for the Creative Arts (UCA) shows that they often lack effective policies and strategies to address the social and environmental implications of the technology (Charter and Davis, 2022). Although it feels as if generative AI arrived fully formed, this is not the case. In the same fashion, current concerns regarding ethical use of the technology, job displacement, and artistic integrity were apparent from the start, but few have prepared for them. The current rapid pace of adoption by Createch (and the Creative Industries as a whole) underscores the urgent need for practical frameworks addressing ethical standards, regulatory compliance, and sustainability.

Generative AI in the Creative Industries is only the latest evolution of AI to have an impact on creative expression, continuing a line of scientific and technical progress in the arts that

starts in the 1960s. An early pioneer was Harold Cohen[1] (an artist and programmer) who created AARON, a seminal AI dedicated to creating 'evocative' art. Cohen continuously refined the programme, eventually enabling it to produce more complex and figurative works. Cohen's work is a collaboration between human and machine, raising questions at the time about creativity and the role of the creator that persist to this day.

In the 1990s, rapid innovation in computing power led to neural networks becoming practical for pattern recognition and simple generative tasks. This led to widespread use of machine learning and deep learning in the late 2000s and early 2010s. Introduced in 2014, Generative Adversarial Networks (GANs) became a ground-breaking technology for generative AI, enabling more realistic and creative outputs. They became popular for creating AI-generated images, videos, and music, and artists began to use AI as a serious collaborative tool. Projects like Google's DeepDream (2015) and the creation of the first AI-painted portrait (2018) made headlines. However, this also ushered in the first era of realistic deepfakes and growing concerns over ownership of creative works.

Another key component in enabling a step-change in capability was the availability of Big Data from internet sources and research sources of text, images and video to pre-train AI models. ImageNet, released by Li Fei-Fei in 2009, was amongst the first image datasets, and new algorithms such as transformers and diffusion made working with these images to create a new one based on text prompts an everyday reality. At the same time, these developments raised data privacy and intellectual property (IP) issues that remain unresolved.

During this period, generative AI started being integrated into various artistic processes, from generating visual art to composing music and writing. Tools like Jukedeck for music and Runway ML for visual art gained popularity. Platforms like DALL-E (by OpenAI) and Artbreeder made generative AI accessible to the public, leading to current debates on creativity, authorship, and the ethical implications of AI in the Creative Industries and the Cultural Economy more widely.

By the 2020s, generative AI had a more profound impact on filmed, recorded and live performance. This ranged from aiding in choreography, costume and set design, to scriptwriting and virtual production in film. Experimentation with AI for writing more complex and nuanced stories, poetry, and even novel writing became more prevalent. With the release of OpenAI's ChatGPT in 2022, generative AI entered the mainstream in the Creative Industries, with multiple applications in live events, gaming, film, advertising, etc.

However, as AI-generated content and art becomes more common, discussions around copyright, originality, and the ethical use of data in training AI models intensify. More challenging questions are being asked of Createchs about how far the social (Hagerty and Rubinov, 2019) (Irene Solaiman, 2023) and environmental (OECD, 2022) impacts of AI reach, with the answers often thwarted by a lack of transparency in the data about energy

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[1] In 2024, Cohen's work on art generation has been resurrected for a show at the Whitney Museum of American Art, New York. See https://news.artnet.com/art-world/harold-cohen-aaron-ai-whitney-museum-2418273

consumption, water use and labour practices provided by technology companies supplying infrastructure to Createchs (e.g., cloud hosting).

However, only focus on AI is to miss that a broader set of disruptive digital (Industry 4.0[2]) technologies are rapidly infusing the arts, culture and the Creative Industries. Technologies such as Virtual Reality (VR), Augmented Reality (AR), 3D printing, and blockchain are also on the rise, and AI is almost always part of the application. The widespread availability of these technologies (e.g., as Open Source), combined with cheap processing power and storage in cloud computing centres is making it easier for Createchs to get started and accelerating innovation. Increasingly, Createchs are an essential part of the supply-side of the different value chains for each sub-sector in the Creative Industries. This ranges from providing a platform for event planning and producing personalised experiences for audiences, to the equipment and software for virtual production of TV and film[3].

This paper uses recent research from CfSD to critically examine the rise of Createch against a background of technology-based transformation of the Creative Industries. In particular the paper focuses on the social and environmental sustainability impact of these businesses and the technologies that define them. The research is led by CfSD[4] and is supported by funding from Research England Strategic Priorities Fund. Research England is part of UK Research and Innovation, a public body funded by the UK government.

The rapid rise of Createch

The word 'Createch' is recent. In 2016, the UK's Creative Industries Council (CIC) identified that just as Financial Services has technology-enabled businesses called Fintechs, that similarly for the Creative Industries there are Createchs - "where creativity meets technology". While such a straightforward definition could apply to most organisations in the Creative Industries, the intent was to place the focus on technology-enabled start-ups and scale-ups that were pushing the boundaries of what technology could bring to the Creative Industries. Today, there are several definitions of Createch in use, some remain broad and others are more specific. Broad definitions include:

"Createch, the special combination of creativity and technology in creative industry sectors......" from Professor Christopher Smith, Executive Chair of the UK Arts and Humanities Research Council.

"Createch is the beneficial symbiosis which occurs when creative designers collaborate with technologists such as engineers, programmers or data scientists. " from Sir Peter Bazalgette, Co-Chairman, Creative Industries Council.

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[2] Industry 4.0 (used interchangeably with '4th Industrial Revolution') is used to describe smart production facilities based on technologies such as AI, robotics, 3D printing, virtual reality and other forms of advanced technology.

[3] Virtual production for film and TV is also relevant to live performance. The UK government has recently awarded funding for Convergent Screen Technologies And performance in Realtime (CoSTAR). This funding is to design, build, develop and test state-of-the-art R&D and innovation for the screen and performance.

[4] Website is https://www.cfsd.org.uk

For the past three years, while the authors have researched Createch's economic, environmental and social impact[5], they have identified that the essence of all of the Createch definitions is that they encompass a wide range of creative endeavours grounded in unique software and hardware assets and IP. They only exist because of the specific capabilities of digital technologies. This research has led to a more specific definition:

"A growth-oriented business or organisation that is in either the Cultural Sector or Creative Industries that designs or delivers creative experiences, products, or services, and has technology assets that are central to the value proposition."

Examples of Createch companies are:

- Engineered Arts who create humanoid robots for events.
- MoveAI, who make 3D motion capture and real-time animation simpler for creatives.
- 3Dctrl who offer a virtual production studio in the cloud for creating 3D experiences.
- Kagenova who are building a photorealistic metaverse for next-generation immersive experiences.
- Numerion Software who provide cutting edge software innovation in cloth and flesh simulation.
- ElevenLabs whose platform can create naturalistic human speech from text.

There is a tendency in media reporting of Createch to highlight immersive events for the public (e.g., use of VR in museums). However, this obscures the position of these companies in Creative Industries value chains. These are supply-side businesses whose customers are theatres, event organisers, film and TV production companies, games studios, media companies, etc.

CfSD survey research[6] and analysis of Companies House records[7] in 2022 shows that over 90% of Createch companies operate business to business (B2B) or hybrid models. Only 8% of those surveyed offer products and services solely to consumers and audiences. This distinction is important, as B2B businesses must integrate sustainable practices into a knowledgeable customer's supply chain, demonstrate alignment with customer values, and comply with procurement rules, regulations and standards.

From the 2022 CfSD survey, the most quoted technologies used by Createchs are (in decreasing order of importance, but they are all energy-intensive):

1. AI in all its forms[8].
2. 3D scanning and capture of people and things; modelling of 3D objects to create avatars or digital goods; 3D printing.
3. VR, AR and Extended Reality (XR).

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[5] See multiple research publications athttps://cfsd.org.uk/research/
[6] 83 companies responded.
[7] 1900 records examined.
[8] For an overview of the different types of AI in use today, please visit https://www.ibm.com/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks/

4. Blockchains and applications such as non-fungible tokens (NFTs).
5. Metaverses.

It is important to note that in the Creative Industries, there are numerous examples where AI works in conjunction with other technologies in the list. For example, NFTs and modelling of 3D objects for fashion, marketing and immersive experiences increasingly use generative AI, as do many platforms for music and video production.

Createchs have a higher R&D intensity than the rest of the Creative Industries. As a result, Createchs are more likely to seek on grants and venture funding (confirmed through interviews with founders and CEOs). For example, research commissioned by the Creative Industries Council in association with Moore Kingston Smith and Digital Catapult found that £1bn of Venture Capital investment flowed into UK Createch in 2020 alone[9].

As mentioned in the CfSD definition, Createchs are growth-oriented as well as creative. Createch in the UK has consistently achieved double digit growth rates, outperforming the rest of the Creative Industries and the UK economy. This trend looks set to accelerate as market demand for tools to support live shows, virtual production, digital fashion, immersive gaming, and such, increases. A projection made by CfSD in 2022 (Charter and Davis, 2022) suggests that this could deliver a UK Gross Value-Add (GVA) of over £225bn by 2030.

While these companies are quick to deliver innovation in products, services, processes, audience engagement, and creative possibilities, CfSD observes that their rapid rise is accompanied by potential social and environmental harms, such as copyright challenges, labour abuses, a large carbon footprint and increased electronic waste. Sometimes, these harms result from supplier practices (e.g., data centres that have not decarbonised). However, the business model choices of Createch may result in users upgrading their devices, causing electronic waste. Not observing responsible content and technology practices also play their part.

Sustainability and Createch

In 2022, CfSD designed a survey to gather basic information about UK Createch companies and to close gaps in understanding regarding their sustainability maturity. The survey questions covered:

- Basic demographics and company information, Createch classifications, alignment to other Creative Industry sub-sectors, alignment with Creative Clusters, regional hubs and similar.
- Sustainability mission, strategy, and plans.

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[9] See report at https://mooreks.co.uk/insights/the-createch-report-2021-venture-capital-firms-back-uk-as-global-createch-hub/

- Organisational responsibility for sustainability (for example decarbonisation plans, environmental management measures).
- Role of technology in delivering on environmental and social plans.
- Challenges with technology in this context (for example skills, knowledge etc).
- Measuring and reporting (for example against the UN SDGs, net zero), and involvement in formal initiatives such as the Global Reporting Initiative (GRI).
- Internal and external forces driving sustainability.
- Investor views on sustainability.
- Customer views on sustainability.

The survey was run from early February until April 2022 using a dataset assembled by Trevor Davis & Associates Ltd. All companies identified in the dataset were emailed, and additional requests for participation went out on twitter and LinkedIn. In addition, the CIC, the Digital Catapult, Creative Clusters, LEPs/Growth Hubs, PEC, and the Welsh Government used their channels to invite participation. 83 people responded.

Nearly 80% of those surveyed in 2022 consider sustainability as core to strategy. In interviews with founders and CEOs the authors found them purpose driven, viewing sustainability as an opportunity with staying power for their business. In many cases sustainability is personal for them and they have taken steps to get self-educated about sustainability. However, they walk a tightrope with investors to balance growth and sustainability.

However, only 5% have a sustainability policy on their website or app and 60% said they had no documented sustainability policies. Roles and responsibilities for sustainability are also a gap: 22% reported that no one is responsible (or everyone, which amounts to the same outcome). The ability to measure and report sustainability metrics is also an issue for Createchs. 70% said that they could not measure key environmental and social metrics over the lifecycle of their products and services.

To better understand the sustainability maturity of the Createchs in the survey, the authors employed a Zero, Basic, Intermediate, Advanced (ZBIA) maturity profile. This is a quantitative approach to scoring maturity level at an organisational level. The algorithm developed assesses awareness and understanding of sustainability in terms of availability and application of policies, formalised roles and responsibilities, measurement and reporting frameworks, engagement with standards and regulation, participation in Creative Industries sustainability initiatives, evidence-based offsetting, etc.

The survey showed that over 70% of the companies surveyed are at Zero or Basic levels of sustainability maturity using the ZBIA maturity profile (see Table 1).

Table 1 Sustainability Maturity results from survey.

	Sustainability Maturity Level			
	Zero	**Basic**	**Intermediate**	**Advanced**
Proportion of Respondents (n=83)	38%	36%	16%	10%

59% of survey respondents (Createch founders and CEOs) are worried about the future impact of AI technologies on their business models. The impact on social and environmental sustainability of technologies such as AI cannot be understated, and this is important as AI underpins much of what Createch companies offer. For example, GPT-3 (widely used for generative AI) carbon emissions due to training are estimated at 552t CO_2e (Patterson et al., 2021)[10]. GPT4 is likely a magnitude higher. As well as power, data centres consume water directly for cooling; in some cases 57% sourced from potable water, and indirectly through the water requirements of non-renewable electricity generation. There are also questions about labour practices. For example, OpenAI is reported to have used Kenyan workers on less than $2 per hour to make ChatGPT less toxic[11].

Blockchain is another technology that raises red flags: 72% of survey respondents identified blockchain as having a major negative sustainability impact. As with so much in ICT, algorithms and hardware choices make a big difference to environmental impact. With blockchain, as an example, the switch from Proof of Work to Proof of Stake algorithms is making a difference, but concerns for the future remain[12].

Naturally, Createch businesses share many of the basic sustainability challenges as any other business in the Creative Industries. Immediate actins they can take include:

- Decarbonising their energy supplies.
- Selecting lower impact modes of transport for staff and audiences.
- Looking at end of life and locally sourcing sustainable materials.
- Improving resource efficiency and moving towards more circular models.
- Etc.

However, the dominant role of ICT in their business brings material differences and questions that are difficult to answer because of a lack of informed sources of support:

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[10] OpenAI has released no official figures, highlighting the transparency issues that Createch companies face when seeking to evaluate their impact and that of their suppliers.

[11] See https://time.com/6247678/openai-chatgpt-kenya-workers/

[12] For a straightforward explanation the carbon footprint of blockchains and NFTs, see https://qz.com/1987590/the-carbon-footprint-of-creating-and-selling-an-nft-artwork

- Energy efficiency of their platform, app or devices: a. How will the development team optimise the energy usage during design and development processes? b. What hardware and coding techniques will be used to ensure that the business consumes minimal energy to offer its products and services? c. What strategies will be employed to minimise CO2 emissions when training AI models or running inferences?

- Carbon footprint and net zero: a. Can the development team estimate ICT contribution to the Scope 3[13] carbon footprint during development, operation, and maintenance? b. What strategies will be employed to select and manage cloud and other infrastructure choices to achieve net zero status? c. Will hosting providers commit to using renewable energy sources or have evidence-based carbon offset programmes in place?

- Responsible Computing: a. How will the development team adhere to Responsible Computing principles, such as driving positive impact for society at large, using data in ways that are fair and transparent, minimising resource consumption and e-waste? b. Will the technology platform be designed for longevity and easy updates to reduce the need for frequent replacements? c. Can the team provide details on how they plan to recycle or dispose of electronic waste generated during the life of the business?

- UN SDGs alignment: a. How does the business's use of ICT contribute to achieving the UN SDGs, particularly in areas such as responsible consumption and production (SDG 12), climate action (SDG 13), and partnerships for the goals (SDG 17)? b. Can business leadership provide evidence of progress against the UN SDGs? c. Can the team commit to using sustainable business practices, materials and processes in their development and operational practices, aligning with the UN SDGs?

- Environmental impact assessment and monitoring: a. Will the development team conduct an environmental impact assessment (EIA) during planning, implementation and maintenance phases? b. How will the platform's environmental performance be monitored and reported throughout its lifecycle and across the entire value chain? c. Will the leadership commit to making improvements and adjustments based on the EIA and ongoing monitoring?

The Music Climate Pact, AdNetZero, the Theatre Green Book, and Purpose Disruptors are among the established sustainability initiatives that organisations in the Creative Industries engage with. These are typically organised by sub-sectors within the Creative Industries (such as music, performance and the visual arts). One-third of the survey respondents replied that they already participated in one or more of these industry initiatives for sustainability. However, they also mentioned that none of these initiatives are directly aimed at Createch, such as not offering carbon calculators that meet the needs of a typical

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[13] Scope 1 emissions are direct emissions (i.e., under the immediate control of an organisation). Scope 2 emissions indirectly arise from an organisation's consumption of purchased energy. Scope 3 emissions arise from sources connected to a business, rather than from the business itself.

Createch. More fundamentally, founders and CEOs interviewed expressed the view that business support for Createch is fragmented and weak.

In the UK, according to interviewees, the most relevant Createch support can be found InnovateUK, the government's Creative Clusters programme and the Digital Catapult. However, this support is focused more at business start-up and R&D assistance rather than sustainability. As the UK Creative Industries Sector Plan[14] takes a greater role in steering investment in publicly-supported bodies this may change (e.g., Goal Three of the Plan states "maximise the positive impact of the creative industries on individuals and communities, the environment and the UK's global standing").

Looking internationally, in 2024, CfSD has analysed 210 creative support networks world-wide in terms of their focus on Createch, sustainability and entrepreneurship. **Only seven have a focus on Createch and sustainability**.

In practice, this means there are few forums where Createch founders and leaders can meet to acquire sustainability skills and knowledge, learn how to quantify their impact, and connect with like-minded others to innovate and solve problems. This recent analysis also shows inclusion and participation gaps for youth, early career artists and entrepreneurs in the Global South, women, rural communities, and Small Island Developing States, to mention a few. Clearly, the Createch support gap needs to be addressed globally.
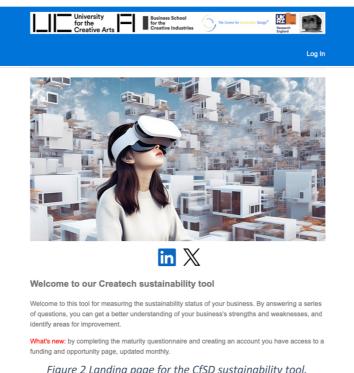

Figure 2 Landing page for the CfSD sustainability tool.

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[14] https://www.gov.uk/government/publications/creative-industries-sector-vision

Providing tailored support for Createch

As a practical step to providing Createch companies with tailored self-help support, CfSD launched a sustainability maturity tool in September 2023. The tool makes extensive use of the 2022 survey results and subsequent interviews and focus groups.

This free online tool aims to assist these companies in benchmarking their sustainability maturity and developing actionable plans (see Figure 2).

Helping people to get started on their sustainability journey is a key objective. Importantly, the tool is designed not to overlap with complementary tools that are already available that are already available (such as carbon calculators). Instead, links are provided to those that are most relevant to Createch.

The tool is designed specifically for founders, CEOs, and CTOs of Createch companies, and focus groups and pilots. Indeed, Createch leaders assisted in shaping the tool and the development roadmap. The resulting tool addresses the low sustainability maturity in the Createch sector and the increasing energy intensity because of technologies like generative AI and blockchain, as well as stressing the importance of embedding sustainability into business models and strategies.

Benefits of the tool include expert-written actionable guidance on Createch and sustainability, consolidated educational information, links to relevant external content (such as sources of grants), and a benchmarking questionnaire to measure progress in sustainability maturity based on the ZBIA Sustainability Maturity Profile.

By January 2024, over 220 people from 20 countries had used the tool, validating the international interest in tailored guidance for Createch and sustainability. The maturity checklist and benchmarking is the most popular section, with information on carbon accounting and offsets, responsible content (including AI ethics) and calls to action also frequently visited.

Although the focus is on start-ups and scale-ups, the diversity of visitors to date shows it is applicable to the wider Creative Industries and experts in sustainability.

Based on tool feedback, CfSD's intent is to further plug the gap in support by creating a network of Createch entrepreneurs who are not just passionate about sustainability but want to act to reduce impacts and explore opportunities related to sustainability in their business.

CfSD research indicates that a P2P network is the best format for creating a thriving and responsible community among creatives and technologists in Createch, as opposed to a more centralised approach. There are also successful prior experiences with P2P networks for creatives, such as the 'Creative Bubbles' facilitated by Wilson's Republic CIC in Huddersfield. Creative Bubbles are small groups of diverse creatives, brought together online or in person to collaborate on common challenges and co-design solutions.

A dedicated P2P network will enable this community to push the boundaries of what's possible with technology, and contribute meaningfully to the health and sustainability of our planet in terms of climate change, inclusion, social justice, etc. The aim is to start the network with presentations and open webinars on key sustainability issues for Createchs (e.g., reducing carbon footprint), followed by broader open discussions. To determine issues to be covered, CfSD will aim to listen to, and crowdsource ideas from, network members.

In the medium to longer term, the additional features and benefits of the network will include:

- Awareness raising, knowledge and skill development: access to workshops, seminars, and training in areas such as regulations and standards relevant to Createch, the United Nations Sustainable Development Goals, calculating carbon footprints, responsible AI, lifecycle analysis, Circular Economy etc. In addition, informal interaction within the community and discussion of case studies can help members stay updated with the latest trends, technologies, and sustainable business practices.
- Access to resources and funding: information about funding opportunities, grants, and investment sources for Createch R&D and business expansion (into international markets, for instance). Potentially, direct financial support or connections with investors could be included.
- Collaboration and innovation: most Createchs are small and micro-sized, so bringing creative ideas to fruition needs a collaborative effort. The network makes it easier to establish projects that lead to innovative outcomes (and creative solutions to environmental and social issues).
- Global perspective and cultural exchange: as a global network, there is the added benefit of cross-cultural interactions and a global perspective, which enhances creativity and opens international opportunities.

The future

Billions of pounds are being invested in AI, both for R&D and commercial exploitation. McKinsey estimated that generative AI alone is worth $4.4 trillion to the global economy annually. They expect generative AI will match average human performance in a variety of creative tasks by 2030. To quote from McKinsey:

"Professionals in fields such as education, law, technology, and the arts are likely to see parts of their jobs automated sooner than previously expected."

So-called AI 'winters'[15] have repeatedly overturned projections such as these, but the pace of improvement in generating novel text, images, voices, music and video is much higher

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[15] The phrase "AI winter" is used to describe periods when the reality of what AI can offer does not match the hype. This leads to a cooling of investment.

than many computer scientists and business leaders predicted. Also, although the number of use cases in the Creative Industries for the technology is expanding alongside their capabilities, there will be substantial financial and technological risks to overcome (Davis et al., 2023).

What is less obvious is the investment and progress with other Industry 4.0 technologies. For example, after several years of incremental developments, Apple entering the VR market has spurred renewed interest in professional and consumer devices. Likewise, investment in robotics, 3D printing, blockchain etc continues, with the Creative Industries benefiting from widespread automation of the manufacturing industry. As examples, robotic cameras for recording live performances rely heavily on technology originally developed for quality control, and NFTs use approaches developed for the financial sector).

Audiences

Billions
- Location and Device Power
- End-of-Life Processing of VR and other user devices

Production

Tens of Thousands
- Studio and Equipment Power
- Air Conditioning
- Water
- Cooling for On-Premise Servers and Developer Workstations
- Waste Electronics
- Packaging Waste
- Transportation of Physical Items
- Employee and Freelance Commuting

Createch

Thousands (and Growing)
- Office and Equipment Power
- Air Conditioning
- Water
- Cooling for On-Premise Servers
- Embedded Carbon in Trained AI Models and Bought-In Content
- Waste Electronics
- Employee and Freelance Commuting

Technology Services

Millions of Data Centres
- Data Centre and Network Power
- Air Conditioning for Offices
- Water for Cooling Servers
- Waste Electronics and Industrial Packaging Materials
- Employee Commuting

Figure 3 The extended value chain that Createchs operate in ('the world behind the screen').

With the expanding usage of these technologies, comes an increasing need to confront the sustainability challenges they pose. As understanding of 'the world behind their screens' grows (see Figure 3), the sustainability agenda for Createch companies (and their customers in the Creative Industries) is shifting from "the basics". Scope 2 emissions, climate change, net zero, and responsible approaches to production and events are currently the main focus. As an illustration, the Equity UK green rider for actors and production companies, supported by actors like Mark Rylance, Gemma Carterton, and David Harewood, also reflects the current emphasis.

Rapid adoption of generative AI has catalysed Createch founders and CEO to take a broader and more urgent perspective to address:

- Regulations specifically aimed at AI and cybersecurity e.g., the UKs pro-innovation approach to regulation, the EU AI Act etc.
- Venues, broadcasters and media companies demanding evidence of compliance with a wide variety of environmental and social governance standards, frameworks and laws.
- The value chain wide impact on climate and nature from their operations. Hence, a shift to greater focus on Scope 3 emissions. This requires, for example, major cloud providers such as Amazon, Microsoft and Google to provide data transparency regarding the energy mix involved at each data centre and for each process.
- More demanding ICT workloads and associated expansion in data centres and supercomputing clusters (both energy and water intensive). For example, the Meta AI Research SuperCluster uses 16,000 specialist processors each rated at 300W.
- The ethics and social justice implications of their businesses (e.g., how stories about climate change are told, preventing misuse of image generation services for deepfakes, handling job losses in areas such as voiceovers when AI generated voices become indistinguishable from human beings etc.).
- Growing consumer and regulatory pressures to curb demand (particularly in fast fashion) and adopt circular business models amongst other approaches to address resource scarcity and waste. In fashion, for example, the use of generative AI' to create 'artificial humans' for photoshoots is seen as a way to reduce travel.

While generative AI has been the catalyst for greater scrutiny, Industry 4.0 technologies in their entirety are now under the sustainability microscope (alongside existing disruptive technologies such as streaming). AI is frequently used with other technologies, and this integration amplifies issues related to data privacy, copyright, and any ethical concerns. AI improves the capabilities of these other technologies but raises concerns about their energy consumption and social impact. Consequently, stakeholders are calling for responsible innovation that balances technological advancements with ethical, environmental, and societal considerations.

So, what comes next? Between 2020 and 2023, CfSD held a series of workshops and webinars with stakeholders from across the Creative Industries and government which provide an insight into what the future might bring in terms of technology and sustainability. The good news is more data centres powered by renewables (e.g., Microsoft's recent 12GW renewables agreement[16]), more energy efficient AI models, smarter coding strategies, automated data collection for sustainability reporting etc.

While some of the conclusions have been overtaken by events (e.g., generative AI as a source of anxiety over job losses), others remain valid, particularly the ongoing need to close skills gaps. Many of the Createchs the authors have studied were founded by

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[16] See https://www.orrick.com/en/News/2024/01/Microsoft-and-Qcells-Reach-Historic-12GW-Renewable-Energy-Agreement

entrepreneurs fresh from creative degrees or from creative professions. Their learning path usually does not include detailed understanding of technology and sustainability. Likewise, where Createchs are founded by a technologist, it is unlikely they will have a detailed understanding of sustainability (although the British Computer Society is addressing this through Continuing Professional Development).

Finally, generative AI has further highlighted the synergy between 'creative' subjects and Science, Technology, Engineering and Mathematics (STEM) and how this underpins the future of the Creative Industries to the UK (and global) economy. For Createchs to thrive, there needs to be a greater appreciation of the role of the arts, and education providers need to deliver STEAM, not STEM.

Call to action

In an interview with Studio International shortly before he died in 2015[17], Harold Cohen spoke of how (in the 1960s) he was the only person who saw "the computer to be potentially an autonomous art-making entity." Even the programmers and other scientists and technologists he worked with did not. Generative AI 60 years later is another step forward in that direction, but it appears that we have nor prepared well for its arrival. Cohen did not foresee the environmental impact of AI, but he spoke often of the social impacts such as authorship and labour.

This paper argues that the emergence of generative AI is only one part of the wider transformation that the Creative Industries are experiencing. Just as a broader set of Industry 4.0 technologies has changed other industries, the same is now happening in everything from live performance to film. AI is a foundational technology for almost all Industry 4.0 use cases, and so concerns about AI and sustainability apply to Industry 4.0 as a whole. Despite these technologies having long development cycles, the sustainability implications are only recently coming to the fore in the Creative Industries.

Technological innovation continues as B2B Createch businesses are investing in R&D (backed by grants and venture capital). While Createchs bring innovative products and services to their arts, entertainment and media customers, the majority of Createchs surveyed by CfSD have low maturity levels in social and environmental sustainability. These companies struggle to improve as they face a fragmented landscape for support. Hence, the paper emphasises the urgency for Createch businesses and the wider Creative Industries to act now:

- **Embrace sustainability holistically**, using the CfSD tool for benchmarking and for guidance on how to develop robust policies, strategies and action plans.
- **Use AI and other Industry 4.0 technologies responsibly**, with the CfSD tool providing a foundation for understanding their social and environmental impacts, as well as how to mitigate them.

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[17] https://www.studiointernational.com/index.php/harold-cohen-video-interview-2015

- **Enhance skills and knowledge** on sustainable and ethical technology use, leveraging all available education and training resources. 40% of survey respondents identified a lack of knowledge or expertise as the most important barrier to improving their sustainability maturity. Again, the tool provides links to reliable sources.
- **Support each other** by engaging in CfSD's ambition for a P2P network, fostering community-driven knowledge sharing, innovation, and bottom-up sustainability initiatives within the sector.

A positive future for Createch hinges on matching innovation with responsibility, ensuring that technological advancements enhance rather than compromise creative integrity and environmental sustainability. As continue to integrate these technologies into their products and services, it's imperative to balance their transformative potential with mindful stewardship and action. Only in this way can we ensure they enhance rather than overshadow the human element that lies at the heart of the Creative Industries.

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