Emerging technologies and their potential impact on the communications industry

BBC response to Ofcom's call for inputs

September 2020

Overview

1. We welcome Ofcom's timely call for input on *'Emerging technologies and their potential impact on the communications industry.'* The BBC is unique in its position in the broadcast and media ecosystem, bringing together live and on-demand, broadcast and internet-delivered, and across video, audio and text. The BBC accounts for roughly 24% of all UK video, audio and online time spent by the average adult in a week – including YouTube, social media, general browsing, shopping and search.[1]

2. We see emerging technology affecting broadcasting in two main ways in coming years. Firstly, in the distribution of content and services. The move to IP distribution technologies brings many advantages and consumers now have unprecedented choice in audio-visual content. However the real risk for consumers is that global tech companies gain influence across the whole distribution value chain, coming to control entire media ecosystems and eventually driving out UK players. The BBC and the whole PSB system can work with these companies so audiences benefit from great UK services sitting alongside the best the rest of the world has to offer – but we require the right regulatory conditions.

3. Regulators and industry should be focused on allowing as much innovation and tech creation as possible, whilst also ensuring that the dominance of a small number of players does not prevent a plural and thriving media ecosystem. Major shifts are occurring in audio and in-car distribution, where online platforms are already leveraging their positions of market power. They pose a threat to the distribution of PSB content, particularly in voice where there is a 'winner takes all' scenario and concerns around dominance and self-preferencing by big tech.

4. We see many opportunities to use IP to better deliver content and services, including in 5G, where the BBC is working with others on how the 5G various modes are likely to evolve.

5. Secondly, emerging technology is allowing broadcasters and others to open up new methods of content creation. For example, the BBC's work on 'object-based media' allows the content of programmes to change according to the requirements of each individual audience member. There are real opportunities to use augmented and synthetic media of various types to create exciting new propositions for audiences.

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[1] http://downloads.bbc.co.uk/aboutthebbc/reports/annualplan/annual-plan-2020-21.pdf

However, these new technologies also pose threats and can be used to mislead audiences and in some cases can be used to cast doubt on legitimate news providers. As they develop they will increase the regulatory challenges associated with misinformation and disinformation – and raise the issue of how to ensure that legitimate information is not inadvertently censored.

Section 1: Distribution of content and services

6. As television and radio consumption moves from broadcast to IP networks, major change will be driven by technological developments and evolution in audience behaviour. IP brings many advantages, and offers benefits such as increased scalability and flexibility operations and services. In addition, audiences will sometimes be able to access different forms of content and have bold new experiences (our section on augmented and synthetic media discusses some of these use cases).

7. We already see the emergence of low latency video transfer across the internet that has led to new opportunities for interactive and remote experiences, of high quality and framerates. Developments in these areas have allowed social benefits such an increased ability for people to work from home during the Covid-19 pandemic. They will likely develop further over time to spread the computation across the network and enhance the capability in people's homes, enabling games technology to be applied to other forms of media creation using distributed and edge computing technology. This will create benefits for audiences and content creators, in consumption and storytelling.

8. Further, a move to IP also requires careful thought to ensure that the current emergency systems which depend on the existing broadcast infrastructure can be provided in the future over IP networks. For example, we would encourage Ofcom and Government to consider how provision of critical communications systems in the absence of power might be provided via IP. As more and more people move away from owning TV and radio sets, and broadcasters themselves consider the possibility of an all-IP future, it will be essential to ensure emergency systems can be accommodated in any future IP-only world.

The impact of big tech on audiovisual

9. Consumers now have unprecedented choice in audiovisual content. We are concerned that platforms controlled by global tech companies do not gain the

position where they will have the ability to reduce that choice, creating entire media eco-systems that exclude UK players.

10. For instance, platforms controlled by global tech companies are already leveraging their positions of market power into VOD services, IPTV services, in-car audio and into voice services. If the global online platforms were to be allowed to continue leveraging their market power in this way, it is likely to have adverse impacts for audiences in the UK, including in fundamentally important areas such as news, and it could result in less choice for UK audiences across the full range of content. For example, audiences might be directed to a smaller number of services owned by the platform operator or (from which the platform operator gains financially) which are not focussed on UK audiences or covered by Ofcom's regulatory framework on content, and editorial standards.

11. The main issues stemming from the influence of big tech platforms which impact the BBC's ability to serve our audiences in the UK are threefold.

   - Access to data – On digital platforms access to data is essential for all services competing for audiences there. It is essential in order to develop digital content and to supply personalised services to users. In short, the lack of quality data provision from big tech platforms to the BBC and other service providers who use these platforms inhibits our ability to develop valued content and useful services for our audiences.
   - Attribution – the aggregation of content by digital platforms, including by news aggregators, has led to a lower brand attribution being provided to original UK content providers, including the BBC. This damages our relationship with audiences and undermines support for the BBC as people do not understand the value they are getting from their licence fee. Put simply, it is news aggregators rather than the BBC and others who invest in journalism who gain 'attribution' from users.
   - Self-preferencing – big tech platforms offering preferential treatment to their own downstream services creates significant anti-competitive effects, which have negatively impacted our ability to serve our audiences.

12. In summary, the ongoing change in distribution technologies is accompanied by a move by global companies to seek interests across the whole distribution value chain to the detriment of smaller national players who cannot compete at scale. Indeed, global tech companies are increasingly using insights gained in one technological market to gain advantage in another market.

13. This is, of course, a key aspect of the ongoing Competition and Markets Authority activity on online platforms. We are pleased to see Government proposals that engage Ofcom as key to the Digital Markets Unit, and believe that regulation can support aims such as media plurality and prominence in the context of these developing digital markets issues.

14. When considering the impact of technological developments in one area of distribution, we would ask Ofcom to be mindful of the impact across the whole supply chain. And pay particular attention to value capture by players at different levels of the supply chain– an area where we see an imbalance of power emerging in favour of platform owners.

5G for Content Distribution

15. Consumption of audiovisual services via mobile devices is growing and the BBC currently delivers curated linear broadcast, on-demand non-linear services and enhanced media services to mobile devices. The current release of 5G includes broadcast-specific additions, including free-to-air reception, downlink-only carriers and the support for greater inter-cell distances. There are a number of limiting factors with current technologies including bandwidth, the quality of service and network capacity.

16. The 5G standardisation process is continuing, with industry development underway for both a 5G broadcast mode (which could require a dedicated network), as well as a mixed-mode (which would be integrated with networks also used for other purposes). The BBC is working with others on how the various modes within 5G (including broadcast and mixed-mode) could influence and change how we distribute our content.

17. As industry development continues, we note that questions may arise about how capabilities are made available, as mobile network operators (MNO) and/or device manufacturers chose to deploy particular 5G features according to narrow commercial concerns. In future, some MNOs and manufacturers may adopt capabilities that enable full functionality for the broadcast of content such as PSB content, while others do not. For example, in a scenario where mixed-mode becomes the industry norm for 5G broadcasting, but is not taken on by one particular MNO, then access to BBC services for customers of that MNO could be more limited (either because of lack of coverage, capacity, higher cost or lower quality). Ofcom may wish to understand the effects of 5G developments in these areas as industry development continues at pace.

Audio

In-car radio

18. The development of fully-internet connected vehicles is likely to have a major impact on the way people discover, search for and consume media content as they travel. Increasingly, new cars - whether they are conventionally-powered or electric vehicles - are connected to the internet. This allows manufacturers to control and remotely update many aspects of the car's operation from fuel management, to safety features, to navigation and to infotainment.

19. The last of these has major implications for broadcasters in the UK, Europe and beyond. Listening in cars makes up a significant proportion of all radio listening (in the case of the BBC it represents around 10-15% of all time spent by UK audiences). In the past, broadcasters had a direct relationship with drivers and passengers through branded channels on the car radio. In connected cars, this will change as manufacturers adopt operating systems which control how consumers find and select audio content. Many are likely to move to app-based environments which include on-demand music, news and other audio products alongside live radio.

20. There will be benefits for consumers who may have a wider choice of content and enjoy the greater personalisation of signed-in, connected services. But there could also be disadvantages for consumers and for industry if, for example, it becomes harder to find public service radio and on-demand content (including up-to-date, reliable news), if the associated metadata is low-quality or radio is de-prioritised in the dashboard altogether. Voice control is likely to be an increasingly important feature of connected cars and this also has the potential to bring benefits (easier, safer searching and switching while driving) as well as disadvantages (narrower results returned, limiting discovery and reducing data-flow back to content-providers).

Voice-enabled devices

21. In addition to the use of voice in cars, a similar challenge is to be found in voice-enabled devices. Voice assistants on connected devices, such as Google Assistant, Amazon's Alexa and Apple's Siri, create a new level of intermediation. Discovery of content on such devices is more limited than those with a visual interface. Rather than returning multiple results in a graphic user interface, a Voice Search will typically return a single result, resulting in a 'winner takes all' in terms of search results. We consider that defaults will be 'stickier', encouraging users to interact and stay there longer. Furthermore, voice assistants provide platforms with the scope to make selections for consumers,

without necessarily providing them with a choice about content or where it is played back. The owners of the voice assistant operating systems (primarily Google, Amazon, Apple) may be incentivised to direct listeners to their own content, played on their own services (or those they favour for commercial reasons). This will limit the range of content and quality of experience for consumers and could remove control from content providers by giving them little understanding about how and why the user is consuming their content. Gaining insight into consumer behaviour on such products will be key for those seeking to develop content and services for this new technology.

22. This is a particular case of 'winner takes all' in terms of search results – as there is no search ranking or menu, content is either top, or not returned. There is a concern that big tech-manufactured smart speakers will give preference to their own content and apps, including news apps. The BBC is working with the industry to ensure BBC News is available on these devices, but there is a risk that trusted news providers are not prominent, or trusted news content easily found, on these platforms.

Regulation for audio

23. Updates to the prominence regime for TV should encompass voice navigation. In addition, we would encourage Ofcom to investigate the role of voice in content discovery more generally going beyond TV. We would suggest that device manufactures should not be able to self-preference their own services – and that selling prominent slots (e.g. for top news provider) would not lead to good outcomes for citizens. We also believe that this is an appropriate area for the Digital Markets Unit to consider, in particular examining the impact of audio upon media plurality.

Environmental sustainability engineering

24. In the BBC's sustainability strategy, we commit to making a positive environmental impact. Changing technology, particularly the move to IP represents an opportunity for us to innovate and reduce the environmental impact of our services.

25. Over the last decade, we have seen significant improvements in the environmental performance of our industry. We've switched from analogue to digital television, new display technologies have made old-style cathode ray

tube (CRT) televisions obsolete, and TV sets now use much less power when in standby mode.

26. As part of our environmental sustainability work,[2] we are measuring and modelling the environmental effects of the BBC's current television, radio and online output. We have published a white paper that sets out the first assessment of electricity used for distribution and viewing of television over different distribution platforms - terrestrial, satellite, cable and online streaming. We use a novel methodology that combines life cycle assessment techniques with models of the diversity of actual user behaviour, derived from detailed audience monitoring and online behaviour analytics data.[3]

27. We want to know the impacts across all our distribution platforms and the full range of consumer devices used to receive them, looking at these systems' impacts now, and also which factors could affect them in future.

Section 2: New methods of content creation

28. The BBC is exploring innovative new approaches to content creation including developing object-based media, which allows the content of programmes to change according to the requirements of each individual audience member. In addition, we are also exploring how 5G can be used in content creation. These will enable the delivery of new services, personalised in new and innovative ways and, we believe, will be valued highly by our audiences.

Object Based Media

29. Object-based media[4] allows the content of programmes to change according to the requirements of each individual audience member. The 'objects' refer to the different assets that are used to make a piece of content. These could be large objects: the audio and video used for a scene in a drama – or small objects, like an individual frame of video, a caption, or a signer. By breaking down a piece of media into separate objects, attaching meaning to them, and describing how

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[2] https://www.bbc.co.uk/rd/projects/sustainable-engineering

[3]
https://www.bbc.co.uk/rd/publications/whp372_behavioural_data_environment_impact_electricity_consumption_tv_platforms

[4] https://www.bbc.co.uk/rd/object-based-media

they can be rearranged, a programme can change to reflect the context of an individual viewer. The objects are assembled at the consumer's device depending upon their preferences so there is only one set of components delivered along with the "recipes" for assembling the content to make the required programme. These could be large objects: the audio and video used for a scene in a drama – or small objects, like an individual frame of video, a caption, or a signer.

30. By breaking down a piece of media into separate objects, attaching meaning to them, and describing how they can be rearranged, a programme can change to reflect the context of an individual viewer.

31. Examples of how this could be used include replacing an audio track with a signer, providing a shortened catch-up summary or changing the relative levels of the dialogue track and the music and effects track. There have been experiments with both television and radio programmes.

5G Benefits for Content Creation

32. The use of the 5G network for content creation can enable a well deployed technology to be used in some cases, and can sometimes have the ability to reduce the cost. Some are a natural evolution of existing 4G applications, some will enhance or replace other forms of contribution (ISDN, for example) and some will be completely new ways of creating content. We are working to ensure that 5G is brought into play in relevant content creation areas, while ensuring that the right methods of content creation are used in the right ways.

33. As a key enabler of connectivity services alongside wifi6 and fiber rollouts, 5G improves on existing technologies by adding in more reliability, flexibility and mobility. In production there will be a variety of different models that will be used dependent on the type and scale of production.

34. The standards enabling this are being finalised in 3GPP and are aiming at inclusion in Release 17 (currently aimed at December 2021). In parallel there are a number of trials being undertaken in UK and Europe.

35. Use cases for 5G vary and some newsgathering and productions can rely on the coverage of public networks for single cameras, as currently on existing 4G networks. More complex multi-camera events and other types of productions will require more robust networks and a different quality of service for content creation. Non-public 5G networks in dedicated spectrum can provide sufficiently reliable connection to data centers and also to support local programme-making and special events (PMSE) applications including wireless cameras and wireless microphones.

Augmented media, synthetic media and veracity of information

36. Augmented and synthetic media of various types will bring consumer benefits, make storytelling more compelling. The public service potential for use of technologies such as augmented reality is significant and BBC R&D is exploring it.

37. Below we set out five examples of augmented or synthetic media where we are aware of industry development – augmented reality, natural language generation from human-authored templates; deep fakes; virtual worlds; and virtual humans. We note that these media increase the complexity and regulatory challenges associated with misinformation, disinformation and fake news, and other potential for misrepresentation of manipulated images.

38. Disinformation, in particular, can have an extremely serious impact on democracy and society. Online platforms can be manipulated by foreign governments using either automation or human-led efforts to create or amplify narratives and support. Over the pandemic period, we have seen a notable increase in the number of accounts on social media platforms, in particular Twitter, that impersonate the BBC as well as standalone content in the form of tweets or posts that likewise falsely purport to come from the BBC, the most serious of which was a Twitter account impersonating BBC Breaking News that tweeted that the Prime Minister had died whilst in hospital with Covid-19.

39. However the risks of regulating disinformation badly are also serious– the introduction of new obligations on platforms must not lead to the censorship of important public service and public interest journalism in Europe or elsewhere, including through the mis-application of European precedents. Internationally, we have seen questions about whether national regulation of disinformation leads to silencing of political dissent or important voices.[5]

40. One area where Ofcom is likely to engage with this is in new online harms rule, and we welcome Ofcom's positive engagement with PSBs in areas including online harms and the implementation of the Audiovisual Media Services Directives. We note that significant safeguards are required in both areas for PSBs. As Ofcom knows well, PSB content is recognised as meeting higher standards than AVMSD standards – regulated and made according to high editorial values. Therefore video sharing platforms can be confident that if content is PSB content, they will not need to filter it, demote it, or take it down for content regulation reasons. Both online harms and AVMSD bring dangers of censorship of content, if platforms consider themselves to be under heavy-

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[5] https://www.bbc.co.uk/news/world-asia-50613341

handed duties to censor. We will continue to engage with Ofcom about these risks.

Augmented reality

41. As the technology rapidly matures and becomes commoditised through mobile OS capabilities, augmented reality (AR) will allow contextually-aware content. For example, content that is tailored to a person's geolocation or using computer vision to understand and augment the image of the real world seen by a person.

42. This immersion may make storytelling more compelling, for example creating immersive theatre-like experiences. It may also support 'appearance augmentation' through applied filters and lenses or via new software or hardware. That can lead to automatic 'correction', adjusting and filtering images and content that users are seeing automatically. It is currently used in areas such as 3D design, manufacturing support, games, hardware platforms (such as phone-based and headset-based AR).

43. Style transfer, filters and lenses (related to, but somewhat separate from, AR lenses and overlaid motion-captured style application) are used extensively in many camera-based apps. They are machine learning-driven changes to an image shared by a user and it is increasingly possible to apply very complex algorithms across entire videos and in real time. Importantly this is done at the user's discretion.

44. Software- or hardware-driven automatic correction is a "black box" change to the captured data, applied by the software or hardware driving the experience. This is driven by the software or hardware vendor and could be, for example, "face smoothing" by some cameras to improve appearance and track faces. Manipulation of the imagery can happen without users being able to understand or know about the effect. More broadly, AR may lead to the ability for the changing of expressions and additional filtering. Where imagery is manipulated, it is important that audiences should understand that this is the case. This may be an area that is relevant as online harms rules develop – in areas such as those set out the section above and on deep fakes.

Natural Language Generation from Generative Language Models

45. Generative language models[6] and trained on a very large corpus or set of natural language texts. They are beginning to display characteristics that are difficult to distinguish from general human intelligence in some circumstances. They can result in high-quality synthetic voices that can read artificially-

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[6] These are built using transformer machine learning approaches to deep learning

generated text, and sometimes accompany character-driven synthetic video, at a quality that is difficult to distinguish from an actual person speaking in an actual video.

46. There are creative positive use cases for the technology, as well as disruptive potential that comes from the ability to mimic human responses at very believable, high quality levels. This model-generated text is probabilistic, not deterministic - in other words it is not based on a coherent, internally-consistent worldview or point-of-view but is instead is generated by sequentially predicting the most likely words that a human would produce, based on its training data. The text therefore reads and sounds like the coherent and specific communication of a particular human being, but is actually the incoherent, generalised combination of thousands or millions of separate human communications.

47. Generative language models should be distinguished from template-based natural language generation - a very different technology. The latter is essentially a new form of writing, with journalists and others able to author accurate, edited, factual text at the level of story patterns rather than at the level of the individual story. Although both technologies automatically generate text, generative language models create their text probabilistically, with no expectation of accuracy or factualness.

48. The disruptive potential of Generative Language Models comes from their ability to mimic human responses at high fidelity across domains, and that are nearly indistinguishable from text generated by humans. We encourage Ofcom to consider such uses as part of work on misinformation or disinformation online.

Deep Fakes

49. As technology advances, new techniques for producing disinformation will arise, and we will see deep and shallow fakes of increased sophistication, in coordinated campaigns across platforms. It is important to give audiences the skills to spot falsehoods and understand trusted sources.

50. Three main categories of technologies relate to "Deep Fakes" - the use of neural networks to manipulate video content either in real-time or offline to augment, replace and change the content. These techniques can be used to create virtual assistants and presenters, to create characters and agents in interactive experiences such as games as well as to manipulate and create misinformation and propaganda.

    - Firstly, face-swapping - manipulating a video to replace the face of a filmed subject with another subject. Similarly, body swapping is done too,

in a comparable way, and 'pupetting' (using technology for the misleading uses of online identities).

- Secondly, voice-cloning - taking a voice imprint and applying it to written text to generate convincing audio.

- Finally, synthesis - taking the above approaches but using wholly generated faces or voices from other Machine Learning projects.

51. As we set out above, an ill-defined ban on platforms hosting disinformation could raise very serious concerns about freedom of expression, and incentivise platforms to take down legitimate content. However insofar as deep fakes are found in the news ecosystem, there are targeted interventions that would improve the way that audiences are able to access and assess information, improve media literacy, and reduce the potential for disinformation including in relation to deep fakes:

- **News prominence** –Ofcom found that the TV prominence afforded to BBC One as the UK's most used news source,[7] and to the main commercial PSB channels, plays an important role in ensuring easy access to news and journalism.[8] However, there is no similar regulation regarding the prominence of trusted news online, from a range of sources. This is an area where platforms and the news industry, in the first instance, might join together to consider appropriate approaches to ensuring audiences can easily access relevant news and diverse viewpoints that they can trust. There may be a role for regulation should platforms fail to achieve good outcomes voluntarily.

- **Attribution** – the distribution and aggregation of content by online platforms, including by news aggregators, has led to lower brand attribution being provided to content providers, including the BBC. Ofcom's Media Use and Attitudes found that 'When deciding whether or not to trust online content, participants cited a number of factors including awareness, knowledge or (ideally) previous experience of the site or source. The latter was perhaps the most important factor in determining the level of trust accorded to it.' When attribution is lower and there is less awareness of where content has come from, it lessens the ability of audiences to judge these factors – and it as an impact on the value audiences think they are getting from news producers. Please see below on Project Origin for further discussion of the problems that audiences have in assessing whether the purported

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[7] https://www.ipsos.com/ipsos-mori/en-uk/bbc-most-trusted-news-source-2020

[8] The BBC defines fake news as false information deliberately circulated by hoax news sites to misinform, usually for political or commercial purposes.

publisher of content is, in fact, the actual publisher. There may be a role for further regulation should platforms fail to deliver good outcomes, including in relation to news content.

- **Algorithmic transparency.** Platforms should be able to explain what general effect algorithms have and what they are designed to do. It may be the case that misinformation and disinformation should form part of the transparency standards.[9]

- **News literacy**. The BBC currently provides media literacy – for example the Beyond Fake News season launched by the World Service aims to fight back with a focus on global media literacy. Work done in schools to explain disinformation and how to recognise it is effective in helping young people to critically assess what they are seeing and to make good decisions about it.[10] Literacy work around disinformation could, helpfully, become an essential part of citizenship work in schools. It has also become clear that co-operation across the widest possible landscape is the only way that action against disinformation can be effective – academics, tech companies, publishers, fact checkers, civil society organisations and regulators need to work together for effective results. We are also contributing to emerging work around how best to describe the way content has been manipulated so that the information lands as effectively as possible.

- **Improving flagging, moderation and takedown**. Platforms have become more proactive, taking down false or harmful posts including by politicians. However, social media platforms often have lower levels of transparency, clarity and human moderation than other sites such as PSB sites. Social media organisations should be urged to do more to proactively police their own platforms for illegal and harmful activities online. We would encourage close understanding and communication between platforms and Ofcom as part of online harms rules.

Virtual worlds and virtual humans

52. An online virtual world – also known as a "metaverse", creates a persistent virtual spaces in which users inhabit, interact, socialise, make, sell and

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[9] We note that BBC Research & Development is working with colleagues across the BBC, as well as academic and expert institutions, to develop Machine Learning - and data-enabled technologies more generally - in ways that reflect and uphold core BBC values and support the BBC in delivering its remit. https://www.bbc.co.uk/rd/projects/responsible-machine-learning

[10] https://www.bbc.co.uk/mediacentre/latestnews/2018/beyond-fake-news

experience media content. These are typically used in online games. Within these virtual platforms, there may be scope for media content creation – a concert held within a game, for example.

53. In contrast to the synthetic media approach of manipulating images, video and audio with machine learning, virtual humans rely on 3D rendering and volumetric capture to provide 3D models that can be animated and rendered with increasingly realistic appearance (sometimes referred to as 'CGI'). These techniques may be used to create virtual assistants, people and presenters, to create characters and agents in television, cinematic and interactive experiences such as games as well as to manipulate and create misinformation and propaganda. An important issue will be how these virtual presences might be signalled to audiences as such.

Project Origin

54. Project Origin - from the BBC, Microsoft, New York Times and CBC Canada - is developing a trial system using cryptographic techniques combined with distributed ledger technology to provide a signature for content which can be compared to confirm media's integrity. It aims to combat disinformation by detecting the manipulation of content and authenticating the content source.

55. Whilst brand marks, styles, and other traditional indicators of trust continue to be critical, they are no longer enough to ensure content legitimacy. Altered or synthetic material can at times appear to come from reputable journalistic sources and this can make false or misleading material look credible.

56. Project Origin attaches a digital watermark to media originating from an authentic content creator, a watermark that degrades when content has been manipulated. When fielded, audiences will see an indicator of authenticity, along with a message on the content or in the browser. This is to ensure audiences know the content, such as video, was actually produced by its purported source, and has not been manipulated for other purposes. The prototype is under development - distributed ledger technology is maturing but its use for countering disinformation is in the experimental stages, and a paper is being published at IBC 2020.

57. Distributed ledger is a type of database that is shared, replicated, and synchronized among the members of a decentralized network. The distributed ledger records the transactions, such as the exchange of assets or data, among the participants in the network. In the media sector it is being investigated for contract management. But is also being used for establishing the provenance of media in order to not only prevent its misuse but to enable the user to have confidence that they are seeing the media as the originator intended it. This is one part of the jigsaw in combatting disinformation and the misuse of content.

58. Distributed ledger technology is maturing but its use for countering disinformation is in the experimental stages.