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ARTICLE

Science and Technology-based Video Content Regulation on OTT Platforms

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ABSTRACT

India is a diverse country with different religions, castes, cultures, languages, levels of knowledge, and economic conditions, and it is highly dependent on the media for getting first-hand information. Earlier, it was newspapers and television; now, with the advancements in mobile and internet technologies, the smart phone has become a first-hand source for content dissemination. With the evolution of newer technology and processes that are leveraged by the media ecosystem, the government is liberal enough to help it breathe and grow in an open playground. Once it achieves a considerable level of traction and reach starts impacting social practices and influences socio-political realities, the government acts as a guardian and brings in new regulations, laws, and policies, which help balance freedom of speech, citizens' rights to privacy, etc., so that everyone can get true, unbiased information on any issues and subjects; in a very decent manner without harming the sentiments of others.

The content regulation journey in India from the Indian Cinematograph Act 1918 for films to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2023 and proposed Digital India Act 2023, for all online content, including Over-the-Top (OTT) platforms, has been very interesting. The paper highlights the need to impart self-regulation in science communication strategies in the changing media land scape. It also suggests self-regulatory guidelines for both — those who produce science and technology-based video content and run OTT platforms, within the scope of the new regulations to issues like- fake, misinformation, myths and superstitions, rumours,

grievance, copyright, content sharing, credits, particularly in dissemination Science and Technology related content in India.

Keywords: Audio-Visual Content Regulation Policies, OTT platforms, Science Communication through videos

Introduction

Audio-Video technology has grown very fast in the last century. When it comes to sharing motion pictures with the public, in the amazing journey from terrestrial telecasts on Black and White CRT televisions, to colour televisions through satellites, then 4K TVs - which have four times more pixels than traditional full HD television. While this evolution was happening, the internet crept into our lives and increased furiously into a mass phenomenon, first as an encrypted IPTV which did not find a mass base and then exploded and evolved into Over-the-top (OTT), which broke the monopoly of internet service providers (ISPs) and created a new regime where content creators could gainfully monetise their intellectual properties. International Telecom Union defined OTT as: "An application accessed and delivered over the public Internet that may be a direct technical/functional substitute for traditional international telecommunication services" (ITU, 2019). Esselaar & Stork (2019c), introduce a framework defining four distinct categories of OTTs: OTT-ECS, OTT-Com, OTT-Content, and OTT-Others. Possibly categorized as electronic communication services (OTT-ECS) are platforms facilitating voice and text communications, including the ability to make calls to fixed or mobile telephone networks. Examples include Skype and Viber etc. Platforms potentially competing with electronic communication services (OTT-Com) are applications offering voice calls and instant messaging via the public Internet, such as WhatsApp and Telegram etc. Those potential broadcasting services (OTT-Content) deliver content to end users via the public Internet, exemplified by Netflix, Amazon, YouTube and others. Finally, there are services that neither competing with electronic communication services nor broadcasting services (OTT-Other), such as e-commerce platforms, search portals etc. In this paper, the content platforms which come under the preview of broadcast regulators are discussed.

Cinema has been the most powerful media, with the capacity to entertain and educate people. It often catalyses behavioural changes by highlighting issues of social relevance. Such was the impact of cinema on the audience that the colonial British regime instituted film censorship to control the display of Indian films under the pretext of maintaining law and order and stopping aspirational messages of nationalism. Even foreign films (especially Hollywood) were censored to stop revolutionist thoughts from seeping in, considering that these films promoted democracy (Sharma, 2009). Under the Indian Cinematograph Act of 1918, the need for an independent institution was suggested to regulate cinema (Indian Cinematograph Committee, 1928). As per the Cambridge English Dictionary regulation means "an official rule or the act of controlling something". After Independence, the Indian Cinematography Act of 1952 was introduced to control film immorality. Most of the ideas were taken from the previous act. The states got more power to control cinema as a medium (Bhowmik, 2002). Television started in India, in 1959 through an education initiative supported by UNESCO, which later in the last decade of the twentieth century, with the advancements of satellite technology, reached almost all Indian houses and became the most popular media platform for entertainment, news, sports, education, science and technology, etc. It transpires from the earlier reports that in the beginning, the government had decided to spread the reach of television to promote developmental programmes related to awareness of agriculture and farming; health and hygiene; population control and others, and also showed the need for control, with the apprehension that showing visuals depicting violence and character degradation could affect young minds (Kumar, 2003). After that, the government started controlling both radio and television until the sector was thrown open to the private sector. The private sector's entry into broadcast media sparked competition, although licensing continues to be with the government, which has enough powers under certain laws to control content.

Rapid growth in mobile, internet and media player technologies has paved the way for OTTs. The power of OTT has been such that it has also considerably eclipsed satellite television and dented

the big-screen cinema industry. The popularity of OTT platforms has started challenging traditional media (Banerjee et al., 2014). After the COVID-19 pandemic, social media viewing patterns have changed dramatically. Social media has profoundly influenced the people of India. It helped us exercise our right to free expression, get our message out to more people, and encourage others to do the same (Saini, 2020). In India, around 40 popular OTT platforms provide their services largely for the entertainment genre. Content regulation is being made initially under the Information Technology Act, 2000 for online platforms. AI-based tools, Chat GPT, are making the OTT platform more engaging. It is now becoming challenging to regulate online content, media, and news because several videos are being uploaded that are accessible globally.

Being hybrid, OTT media services transmit content simultaneously suitable for television and cinema too. Broadcasters follow the regulation strictly for television but not for OTT platforms. Some argue that the internet allows everyone the freedom to produce content. Excessive regulation, in their opinion, can harm the creation of diverse and pluralistic content. Currently, many instances are reported where misuse poses fresh challenges for law enforcement agencies. Users cannot raise their concerns without a robust complaint and redressal mechanism. Keeping this in mind, Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021 was introduced to regulate social media, including OTT platforms. The rule was further amended as the Information Technology Amendment Rule, 2023. The new amendment rule has provisions related to online gaming and gives authority to the government to establish a fact check for the removal of any information from the internet considered false.

In India, science communication is being done through television and OTT platforms. Few commercial films have also attracted an audience. Several OTT platforms which include YouTube are being run by the government, private, and individuals to create awareness and inculcate scientific temper among the common masses. Several instances were recently noticed where communication was defeated due to the spread of misinformation, superstition, disbelief, and unscientific facts. In

the wake of the 2018 floods in Kerala, a fabricated video depicting a purported leak in the Mullaperiyar Dam sparked unwarranted panic among the populace, hampering rescue efforts (Pierpoint, G. 2018). During COVID-19, there was a huge surge of misinformation about the disease and treatment. For example- a video claiming that the omicron variant can be cured through garlic juice and fenugreek seed, similarly videos explaining variants of the coronavirus a myth and rumours on the efficacy of vaccines and their side effects. Hundreds of videos that promote pseudoscience, and regularly interview people who claim himself godman and say they can drive out evil from houses, in another incident where a twin educated young women were murdered by well-educated parents who killed their daughters and expected them to come back to life within hours at Madanapalle-a city in Andhra Pradesh (Teja Charan, 2020). These unscientific videos are creating harm in society. To counter such misinformation and unscientific arguments some regulations are needed.

The present study focuses on three theoretical frameworks i.e. (i) Contextual or Public engagement model of science communication (ii) User gratification theory– a concept which is discussed often in the context of media studies (iii)Technology determinism theory to understand the regulatory mechanism. The aim of integrating these frameworks is to guide the delivery of science and technology video content effectively on OTT platforms.

The objectives of the study are-

- To explore the existing content regulation policies for Cinema films, Television programmes, and emerging OTT media platforms in India and how they shaped over time with the emergence and advancement of the technologies.
- To analyse the bills for Over-the-Top (OTT) platforms (Information Technology (Intermediary Guidelines and Digital Media Ethics Code 2021, Amendment Rules, 2023 and proposed Digital India Act, 2023).
- To highlight the important concerns in producing science and technology-based content for OTT platforms and suggest self-regulation guidelines for producing Science and Technology Content.

Review of Literature

Sir Mark Walport (2013), said"Science is not finished until it is communicated". As per UNESCO's perspective, science communication to the public means to make complex scientific ideas and concepts simpler and to create tools to develop the interest of the public without modifying the scientific truth. Bucchi and Trench (2008), explored how the general public perceives, engages with, and understands science. The study emphasises the role of communication in bridging the gap between scientific knowledge and public understanding. Brossard and Lewenstein (2010), explored science communication models and found that the contextual model or public engagement model considers social, cultural, and psychological factors that influence how scientific information is received and interpreted for effective communication. Science Communication through videos is the latest trend. Online video platforms like YouTube have changed how people find and learn about science. Because YouTube reaches so many people, it's become a popular way to share scientific knowledge. Science and technology videos make up about 4% of all uploads and are among the top categories(Hutchinson, 2017). The popularity of a video is often measured by user engagement such as likes, shares, comments etc. Welbourne and Grant (2016), found that user-generated content is more popular than professionally generated. The channel has a consistent Science communicator delivering the content. Channels that present information quickly tend to get more views than slower ones. Science communicators must engage with the community to produce popular videos. Yang S et al., (2022), in their study, examined that engagement depends upon how online users evaluate the content.

Science communication in India through films and television started long back, and OTT media is now gaining popularity; the Department of Science and Technology, Government of India, started the India Science OTT platform (www.indiascience.in) in 2019 (Biju Dharmapalan and Kapil K Tripathi,2021). Science in film or science on the screen refers to the cinematographic representation of scientific information, processes and history (Vidal, 2018). Science-based films, shows and documentaries are essential for communicating science. Indian Films like Kalai Arasi (1963), Mr India (1987), Aditya 369 (1991), Koi Mil

Gaya (2003), Krrish (2006), 3 Idiot (2009), Robot (2010), The man who knows infinity (2015), Parmanu (2018), Super 30 (2019), Mission Mangal (2019), Sakuntala Devi (2020), Rocket Boys (2022) were very popular among viewers, but some of them fall prey to various controversies which results in the manipulation of facts. Similarly, several popular science shows were telecast through television including *Turning Point* —a weekly science magazine programme (1991) of Doordarshan National, a *Science show by Samar Bagchi* and the team, which was telecast through the Doordarshan channel, Khudbud produced by Vigyan Prasar and telecast by Doordarshan (2014-15), *Building Blocks of Bharat* (2017) produced by Vigyan Prasar and telecast by various channel Including RSTV brought several young minds to be interested into Science and technology. The first dedicated weekly Science news-based programme, *Science Monitor* (in English) and *Gyan Vigyan* (in Hindi) was started at RSTV in 2010 and continues at India Science OTT channel. Ineffective science communication endeavours, whether due to insufficiency, inadequacy, or poor execution, impede the dissemination, implementation, and sustainability of scientific knowledge (Burns et al., 2003). Misinformation refers to false or misleading information that spreads unintentionally (Wu Liang et al*., 2019).*

United Nations document, Impact of Digital Technologies (2020), says that all societies, cultures, and economics arise from the development of technology and innovation. Media gives power to the people to express their views. Recent advancements in digital technologies enabled people to make their voices heard and talk to people worldwide in real-time. The user and gratification is a communication theory that emphasises the active role of individuals in selecting media content based on their motivation and preferences to satisfy various needs or desires, such as entertainment, information, social interaction, and relaxation. Katz (1959) and Menon (2022), mentioned that in the electronic information age, people have more options for media use. Bucchi and Tranch (2014), highlight that screens serve the purpose of informing, entertaining and communicating. The public is assessing information about science from various TV channels, the internet and digital resources. Vorbau et al.,

(2007), discovered that video consumption represents the most rapidly expanding domain within mass communication. Finkler and Leon(2019), pointed out that science communicators need to be where there is an audience eye. Increasing demand for online video rises to create opportunities to connect audiences through science stories. Social media has become a primary source for accessing and learning about scientific information and YouTube is an increasingly popular source on different science-related topics (Brossard and Scheufele, 2013). Kal, G. (2016), investigated the increasing prevalence of OTT platforms and their influence on the youth. The research revealed that OTT platforms have become integral to the entertainment and media consumption patterns of the younger demographic.

Content regulation refers to the rules, laws, policies, and standards put in place by governments, institutions, or organisations to control the content that is produced, distributed, or accessed through various media platforms to control behaviour. Content regulation can cover a wide range of issues, including censorship, obscenity, hate speech, advertising standards, data privacy, algorithmic bias and media ownership. The content-regulating process started with the emergence of technologies to protect the masses from harmful content. The concept of censorship evolves during the Roman accessing the morals of the people (Abbasi and Al-Sharqi, 2015). Pranesh Prakash et al., (2016), define content regulation follows three approaches, i.e., the government or state prescribes the rules for displaying the content, the content provider puts self-imposed rules on their content, and societal norms decide the nature of the content. Technology determinism theory can have implications for content regulation, particularly in the context of digital media and the internet. As per theory technological developments primarily drive social, cultural and behavioural changes in society and these changes often prompt regulatory responses to manage the impact of technology on society. Hauer (2017), describes that as per technological determinism belief, societal transformations are controlled by technological development, communication technologies and media.

Methodology

To understand the existing regulations for audio-visual content and their evolution in India, several documents, gazette notifications, research papers, media reports, and newspapers available online were explored. To know the current practices for the production of science and technology-based audio-visual content, particularly for the OTT platforms, a discussion with several stakeholders (30 in number), including science filmmakers, science producers, science communicators, scientists, researchers and representatives from science and technology-based OTT platforms and YouTube channels was made. Based on their opinions, recommendations were drawn under existing content regulations for OTT platforms.

Evolution of content regulations—Cinema Films to OTT platforms

Content Regulation Related to Cinema Films in India

The film's first screening in India was in 1896, and 22 years later, The Indian Cinematograph Act came into existence in 1918. During this period, the Indian audience was exposed to foreign and indigenous films. The Indian film industry was growing very fast and started impacting the masses—the act aimed to regulate content by the socially accepted norms prevailing at that time. In 1928, the committee constituted by the Governor General of India also pointed out in the report that censorship was required to control sexually explicit content in films and propaganda by other countries (Rangachari, 1928). The report also highlighted the concern that the judgement on the appropriateness of the content could not be left to the public. The committee suggested having a centralised body to replace provincial censors. During that time, the government did not want to show anything against its policies. After India's Independence, a new Indian Cinematography Act of 1952 was introduced (Mitra, 2019). The act was introduced to protect the audience from immorality in films. During that period, films in India attracted an audience of approximately 1.6 million viewers on average (Patil, 1951). Given the significance of films as a medium of expression, the central government needs to possess the authority to regulate and authorise films at the national level.

This act included legal provisions reaffirming the State's control over the film as a medium. It introduced four different categories along with the rating U (universal exhibition), A (adult exhibition), UA (with permission after 12 years of age) and S (for professionals). A statutory body under the preview of the Ministry of Information and Broadcasting was given the responsibility to regulate the public exhibition of films under this act (Mitra, 2019). The Cinematograph Act of 1952 encompasses the provisions of Article 19(2), granting the authority to impose reasonable restrictions on freedom of speech and expression to uphold India's sovereignty and integrity. Following its enactment, numerous cases have arisen wherein cinema film producers have sought legal recourse, citing concerns regarding certification and alleged infringements upon freedom of expression. Observing these trends, the Government of India established the Khosla committee in 1968 to investigate the prevailing procedures for certifying cinematograph films intended for public exhibition in the country.

The committee highlighted India's stringent censorship frameworks, advocating for more liberal standards in content regulation. It was also stated that there should be a policy so that minimum standards for filmmakers may be decided and colonial rules should be removed, which paved the way for the amendment of the Indian Cinematograph Act of 1952. Owing to swift digitisation and technological progress, the Government of India has put forward amendments to the Cinematograph Act of 1952 in 2010, 2018, 2019, and 2021. These proposals stem from recommendations provided by various committees, including the Mukul Mudgal Committee (2013), the Shyam Benegal Committee (2016), and the Standing Committee on Information Technology (2019-2020). The latest Cinematograph (Amendment) Bill 2021, proposed by the government, addresses various issues like the procedure of examining movies more efficiently and curbing piracy. The proposed bill also suggests the amendment of the existing UA category into age-based categories like U/A 7+, U/A 13+ and U/A 16+. On the one end, the Indian film industry agreed upon regulatory control of the government over content as films are powerful media that can influence society; on the other end, demands for a more liberal, independent board of certification.

Content Regulation and Policies for Television in India

Evaluation of content regulation started in India with the emergence of television. The popularity of cinema promoted the government as a content regulator in 1959. The Government of India tasked a committee with drafting guidelines for the broadcast sector. A report released in 1965 mentioned that television is to entertain an elite class of society and has the potential as an educational medium to disseminate information to the common man. The report also emphasised the need for control over the content of television with the understating that violent and indecent visuals may impact the viewers, mainly young minds. The committee advocated leveraging television as a platform for promoting development programs encompassing health, agriculture, family planning, and other pertinent areas. In 1975, the first television programme was telecast to educate the masses about health and related issues. Doordarshan, a government agency, controlled India's broadcast agenda. The same year, when an emergency was imposed, the Government of India used the media to control the people in its way. A few years later, the Prasar Bharati bill was presented in the parliament in 1979 to ensure autonomy in content evaluation, but it could not be passed. When India hosted the Asian Games in Delhi in 1982, it also coincided with the introduction of colour television in India, which resulted in major growth in the television audience in the country. In subsequent years, this evolved and further grew the audience with the introduction of newer genres of programmes, including soap serials, mythological dramas, and other attractive content forms. This sparked a call for the enhancement of television as a platform capable of serving educational, public awareness, and developmental purposes. In 1990, the government of India passed the Prasar Bharati Bill. After liberalisation, the number of television channels and their reach increased. By 1996, around 14.2 million households had cable television (Daya Kishan Thussu, 1999). Subsequently, the government enacted the Cable Television Networks (Regulation) Act of 1995, designed to mitigate the influx of foreign content via satellite channels, thus addressing concerns regarding cultural intrusion. The act was inspired by the Indian Cinematograph Act of 1952 and its guidelines for prohibited content (Ministry of Information and Broadcasting, 1995).

The parliament also introduced a Broadcasting Bill in 1997. The previously passed Prasar Bharati Bill was also revised. Since the media landscape has been liberalised, television's popularity has skyrocketed, yet the government has shown a growing propensity to censor content. Cultural sensitivity became more noticeable as television viewing rose. Due to technological advancements and liberalisation policies, the television landscape has transitioned from a government-controlled monopoly to a competitive broadcasting market. This shift has made it progressively challenging for the government to retain control over television as its exclusive platform for disseminating information and viewpoints. Through a programme code and the imposition of public order and morality based on past film laws, the Indian government regulates what may and cannot be shown on television.

Content regulation for OTT platforms in India

OTT services allow users to watch content on the web. The content telecast through television can also be watched through the web. BigFlix started its first OTT service in 2008. Many traditional broadcasters also started their OTT platforms later. As per the MICA Report 2019, more than 400 OTT platforms are operational in India (MICA, 2019). Censorship rules related to online content apply to the company which provides the content over the internet. User-generated content cannot be subjected to censorship. The Information Technology Act of 2000, equipped with provisions empowering the government to regulate intermediaries, was applied to all online publishers, including OTT platforms (Basu& Jones, 2003). In 2019, public litigation against OTT services, including Amazon and Netflix, spurred a call for legislation to govern sexually explicit and vulgar content. India requires a policy that strikes a balance between regulation and freedom. Consequently, self-regulation emerges as the most suitable approach (Heda Shubhangi, 2019).

A committee was formed by the Ministry of Information and Broadcasting to create the framework for the regulation of online material. To implement its authority under Sections 69A(2), 79(2)(c), and 87 of the Information Technology Act, the Ministry of Electronics and Information Technology (MeITY) in 2021 enacted the Information Technology (Intermediary

Guidelines and Digital Media Ethics Code) Rules 2021 to govern OTT services, social media platforms, and digital media in India (Sharma and Pendyal, 2021). There are three distinct sections of rules. Part I covers definitions; Part II details the due diligence that social media intermediaries must observe; Part III covers the code of ethics and procedure for digital media; Part IV covers the administrative part.

The Rules' Section II addresses the intermediary's duty of care and any other conditions the important intermediary on social media must meet. Web hosting service providers, online marketplaces, messaging platforms, and OTT platforms are all examples of intermediaries (major and significant both) because they participate in the acquisition, collection, or transfer of or provide services related to the records. The Rules mandate that all news and current events coverage must adhere to the Norms outlined in the Press Council Act and the Cable Television Act. It also lays down specific guidelines applicable to streaming services such as Netflix and Amazon Prime.

Online content curators must be sensitive to the fact that India is home to people of many different races and religions. Publishers of online curated content must categorise their content according to many criteria, including appropriateness for various age groups, ease of use, and the ability to restrict a child's access to the material. As part of his legislation, Bill requested that each intermediary disclose its rules, privacy, and policy online, specify what kinds of information are prohibited, and retain records for at least 180 days in case of an investigation. To facilitate the lodging of complaints by users or victims, intermediaries are required to establish a Grievance Redressal Mechanism. The designated Grievance Officer must acknowledge a complaint within 24 hours and try to resolve it within 15 days. Publishers of news, and online curated content are mandated to adhere to the regulations delineated in Part III. As stated in the Rules' Code of Ethics, all news and current events coverage must adhere to the guidelines laid down in the Press Council Act's Norms of Journalistic Conduct and the Cable Television Act's Programme Code. It stipulates that OTT services like Netflix and Amazon Prime must adhere to a set of guidelines.

The internet content curators must be sensitive to the content's ethnic and religious diversity and ensure that it does not undermine India's sovereignty and integrity. Publishers of curated online material are responsible for categorising it according to appropriateness for different age groups, including restrictions on access for children and measures to make content more accessible for people with impairments. At the start of each show, publishers must either display the classification rating "U" (Universal) for children, "U/A 7+" for children aged 7 years and above, "U/A 13+" for persons aged 13 years and above, "A" (Adult), or both, depending on the intended audience. The Rules also specify criteria for identifying the intended audience for every piece of curated material and determining its overall context, subject, tone, and impact (Sharma & Pendyal, 2021). Information Technology Amendment Rule 2023 was notified by the government in April 2023. The rule extensively covers the provision on online gaming and also gives the authority to the government to remove false, fake and misleading content from the internet through fact-checking under the control of the government. The amendment also includes the provision of revoking the legal protection given to OTT and other social media platforms under the Information Technology Act 2000 (Singh Hamendra, 2023). These new rules violate the fundamental right of freedom of speech by granting complete authority to the government. Each OTT platform whether it is YouTube, WhatsApp and X (formally Twitter) operates differently and different business models so uniform rules cannot be applied to all platforms. This may be the reason for proposing the Digital India Act 2023, which is set to replace the Information Technology (Amendment) Act of 2008. As per the initial reports, the new act will classify intermediaries into nine groups. There will be separate guidelines for each group. The purpose is to holistically regulate the different online content by forming specific rules. (Chatterjee, et.al 2024) .

Seeing the popularity of OTT platforms worldwide, several countries have framed their regulations for online content. Content regulation is an evolving process. In the United States, there is no specific regulation for OTT platforms. Federal communications commission has some standalone rules. The platforms are largely

self regulated. UK has recently proposed new legislations to regulate the content available on OTT platforms. Freedom of speech and expression is protected under various laws. As a consequence of the legal framework, creative freedom in the UK is valued and protected by allowing individuals to express themselves through various artistic mediums and without undue interference or rigid censorship. The British Board of Film Classification have an authority for content classification and age ratings. In Singapore, it is a combination of licensing requirements, content standards, age rating, advisory and industry collaboration to promote responsible content practices and enhance self-regulation efforts. Non-compliance may result in penalties, warning and suspension of license. Regulation in South Korea may be subject to content censorship and regulations, particularly concerning content that may be deemed harmful to minors or socially disruptive. Australia does not have specific regulations solely dedicated to OTT services and is governed by the Broadcast Service Act 1992. Instead, OTT platforms are generally regulated through a complaint-based mechanism started in the year 2000. In China government has direct and strict control over media content.

Why does Science Communication through the OTT platform need regulation?

In India, a large-scale anti-science or pseudoscience discourse is often floated just to attract the media's attention and gain public acceptance. This anti-science campaign is spearheaded by certain private television channels, which has now become a routine affair in OTT and social media. Some YouTube channels have also become a vehicle for propagating outdated ideas. Misinformation on 5G technology that it is killing the living world and spreading virus were circulated in media and spread on social networks. The Kudankulam Nuclear Power Plant controversy was also an example of failed science communication (2011). The project suffered due to anti-nuclear protests by various groups. The media could not convey the truth to the people despite the intervention of eminent Indian scientists. During the Total Solar Eclipse in 1980, 1995 and 2009, age-old superstitions related to the ill effects of the eclipse. Similarly, in 1995 news of Lord Ganesha started drinking milk spread in the

country, and television channels spread the news so fast without knowing its scientific basis (Ramachandran,2013). The public concerns related to GM crops, Climate change, Deforestation, Environment, Energy etc. can only be addressed if the producers, filmmakers, new channels, and content aggregators, produce unbiased, authentic content and telecast or stream through various platforms. It is a filmmaker's responsibility to design content so that users can learn about the pros and cons of the subject and could take a informed decision. Users should also be sensitive and careful before forwarding any video that can harm society. During the COVID-19 pandemic, India has witnessed a surge in fake videos related to vaccines for coronavirus, medication, face masks sanitiser etc., which increases mass anxiety and distrust against the Government's efforts to fight the pandemic. As per the study, 47.2 % of fake videos were reported (Al-Zaman,2021). At times, our era seems contradictory. People are witnessing incredible advancements like artificial Intelligence, nanotechnology, robotics, and stem cell therapy, even nearing victory over cancer and exploring the depths of atoms and distant stars. Yet, alongside this progress, there's a rise in irrationality. Producing scientifically accurate content is essential for enabling better-informed decision-making among the general public. This calls for a broader community of science communicators and an expansion of science programming that embraces new formats, techniques, and regulations as per the requirement of the OTT platforms to present scientific discoveries, innovations, and experiments.

Recommendations for Science and Technology Based content production and its dissemination through OTT platforms

When participants were asked about the necessity of regulations on scientific content via OTT platforms, 83.33% agreed that it is required, while 13.33% were not in favour. Additionally, 3.34% responded with 'can’t say.' Similarly, when participants in favour of regulations were asked about the adequacy of self-regulatory guidelines outlined in the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2021, 92% indicated that it is sufficient and should be adopted by all OTT platforms. 4% advocated for regulations akin to those

governing cinema and television, while the remaining 4% responded with 'can't say.' All participants concurred common minimum points may be considered while framing self-regulatory guidelines for science and technology-based content-OTT platforms including YouTube Channel. Content creators in the science and technology space have an ethical responsibility to provide accurate and responsible information to their audience. Self-regulatory guidelines can serve as a framework for upholding these ethical standards.

- Self-regulatory guidelines should consider factors such as accuracy, credibility, community trust, and compliance with legal and ethical standards.
- Identify the specific areas of content creation and distribution that require regulation. This may include fact-checking procedures, editorial standards, disclosure policies, community guidelines, and compliance with relevant laws and regulations.
- Create clear and comprehensive guidelines that outline the standards and expectations for content creators and moderators. These guidelines should cover topics such as accuracy, sourcing, citation, copyrights, avoiding plagiarism, disclosing conflicts of interest, respectful engagement with the audience, and handling sensitive topics. Video producers must prioritize accuracy and validation by consulting subject matter experts before online dissemination. Crediting these experts is imperative, underscoring the commitment to factual integrity.
- A science video should encompass scientific methodology, technical intricacies, and the contextual background of inventions, ensuring a comprehensive exploration of the subject matter for inculcating scientific temper among the people.
- Content touching upon technologies and infrastructures pertinent to national security, such as those related to Space, Atomic Energy, and Defence, demands meticulous handling to avoid compromising sensitive information or national interests.
- Depictions of animal cruelty are strictly prohibited. Laboratory experiments involving animals may be depicted for educational purposes, provided they are sensitively

portrayed to minimize viewer distress. Similarly, smoking scenes are strictly prohibited.

- Utilization of animations and graphics is encouraged to augment audience engagement and comprehension without compromising the complexity of the content. However, simplification should not dilute the accuracy or integrity of the subject matter.
- The filmmaker, producer, and media person at large has a strong prejudice against any indigenously developed technologies. They generally consider it doubtful and therefore do not give it due publicity. This prejudice has its origin in their lack of background in science. It should be mandatory for the media to consult a scientist in the concerned field to judge whether a particular indigenous technology is worth reporting.
- The science film producer should avoid content which promotes violence, sexuality, communal disharmony, gender discrimination, racism, casteism, disrespect to any community etc.
- The producer should be careful about depicting national flags, maps, and geographical boundaries of the nation.
- The OTT service provider or content aggregator should compulsively mention which group the content is suitable for and mention it according to the category as per the general OTT guidelines.
- The science-based platform must implement a grievance redressal mechanism to address users' complaints. Content flagged as false or fake, with the potential to harm society, shall be promptly removed from the platform upon verification within the specified time frame. By demonstrating a commitment to responsible content creation and distribution, platforms can build trust with their audience and the broader scientific community. This trust is essential for fostering engagement and long-term success.
- OTT platforms which use content produced by others should have a policy to review the content before uploading the content.

Discussion

The necessity of content regulation for OTT platforms in India is a topic of ongoing debate. Like other fields, regulation can ensure that science and technology content presented on OTT platforms is accurate, reliable, and accessible to all to promote scientific temper, scientific literacy and informed decision-making. Science and Technology deal with complex concepts that can be easily misunderstood and misrepresented. Without proper oversight, there is a risk of spreading misinformation and rumours that could have serious consequences, particularly in areas of health, environment, agriculture, technology and disaster. Science and Technology content often raises ethical dilemmas, such as the use of emerging technologies like AI, biotechnology, genetics, nanotechnology and others. Regulations can ensure that content creators address these issues responsibly and ethically fostering informed discussions rather than sensationalism or fearmongering. As per the opinion of the science communicators regulation can help combat the spread of pseudoscience and misinformation by setting standards for accuracy and fact-checking. Countries' cultural and religious diversity often intersects with scientific and technological discourse. Regulation can help ensure that content creators handle sensitive topics with cultural competence and respect, avoiding potential conflicts or offences. Regulations can protect vulnerable viewers from exposure to inappropriate or harmful Science and Technology content, ensuring that age-appropriate content ratings and parental controls are enforced.

India has a vibrant media landscape with a rich tradition of free speech and expression. Overregulation of Science and Technology content on OTT platforms could potentially infringe upon these freedoms, creativity, innovation, and open discourse. Science and Technology content often explores cutting-edge research, emerging technologies, and speculative ideas. Overregulation could discourage content creators from tackling complex or controversial topics, limiting the diversity and richness of content available to viewers. Implementing and enforcing content regulations for OTT platforms is resource-intensive and difficult to manage effectively. The fields of Science and Technology are constantly evolving, with discoveries and breakthroughs emerging regularly. Static

regulations may struggle to keep pace with these rapid changes, potentially becoming outdated or irrelevant over time. Excessive regulation poses a risk to the business model of emerging OTT platforms. The rise in user-generated content significantly boosts content popularity. However, in an environment of excessive regulation, users may hesitate to share content, leading to a decline in channel popularity and adversely impacting advertisement revenue. The advent of OTT platforms has empowered the scientific community to engage directly with the public, particularly evident during the COVID-19 pandemic amidst the proliferation of misinformation by certain media channels. However, stringent regulations risk dampening their motivation.

By establishing clear self-regulating guidelines as proposed in Information Technology (Intermediary Guidelines and Digital Media Ethics Code) 2021 science and technology-based OTT platforms can help build trust among the public. Viewers are more likely to engage with content they perceive as reliable and accurate, which ultimately benefits both viewers and content creators. The government should make it compulsory for all OTT platform owners to form an in-house fact-checking unit rather than at the central government level as proposed in Information Technology (Intermediary Guidelines and Digital Media Ethics Code) 2023. If someone approaches the OTT platform with the request to review the content, then the fact-checking unit should actively address the matter and be ready to remove the content if found to be fake and misleading. By adhering to self-imposed regulations, service providers fulfil their social responsibility. Many OTT platforms are following the self-regulation guidelines for example YouTube removed 58.2 lakh channels and 56 lakh videos (30% of which are from India) during July -Sept 2022 the messaging platform WhatsApp banned 97.2 lakh Indian accounts during October -December 2022 (Proposed Digital India Act, 2023). When OTT platforms are following the self-regulation guidelines then what is the need for fact-checking units at the central government level as proposed in New Amendment Rule, 2023? This may be due to the fact the efforts made by the OTT platforms are not enough. New Information Technology Amendments rule, 2023 does not give protection to the intermediaries from responsibilities of

third-party information and data hosted by their platform if the intermediary neglects to expeditiously remove the post or content even after the government flagged it fake, false and misleading. One single rule can not be applied to all. For example- YouTube follows the algorithm and restricts users from uploading harmful content, WhatsApp is not concerned with the content circulating from its platform due to its end-to-end encryption feature, X (earlier Twitter) has a policy for fake and misleading content, but enforcement is not restricted to users/content. For this reason, the government of India is planning to introduce a Digital India Act that will have separate rules for each intermediary group.

However, it is also essential to consider the potential drawbacks of regulation. Overregulation could stifle creativity, innovation, and freedom of expression, hindering the development of diverse and thought-provoking Science and Technology content. Achieving the delicate equilibrium between regulation and freedom is imperative to uphold the role of OTT platforms as essential sources of information and entertainment.

Conclusion

The guidelines suggested in the paper for the science and technology-based video content are just for indication. Content producers may form their self-regulatory guidelines for content and evolve them from time to time based on their experience aligned to the current existing act. Scientists and researchers should come forward to establish a dialogue with the public on the different scientific issues using OTT platforms or help video producers/ science communicators in preparing the content under their social scientific responsibility. By incorporating these components into a cohesive theoretical framework, policymakers, regulators, and industry stakeholders can effectively navigate the intricate landscape of science communication on OTT platforms This approach allows for a balanced consideration of regulatory oversight while upholding principles of freedom of expression and ensuring access to information.

Limitations

The study draws upon published literature and discussions with the small group of domain experts directly engaged in scientific content production and managing their OTT platforms and YouTube channels. However, it does not incorporate perspectives from regulators or legal experts.

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