ISSN :2582-6433

INTERNATIONAL JOURNAL FOR LEGAL RESEARCH AND ANALYSIS

Open Access, Refereed JournalMulti Disciplinary
Peer Reviewed6th Edition

VOLUME 2 ISSUE 6

www.ijlra.com

 ISSN: 2582-6433

DISCLAIMER

EDITORIAL TEAM

EDITORS

Megha Middha

Megha Middha, Assistant Professor of Law in Mody University of Science and Technology, Lakshmangarh, Sikar

Megha Middha, is working as an Assistant Professor of Law in Mody University of Science and Technology, Lakshmangarh, Sikar (Rajasthan). She has an experience in the teaching of almost 3 years. She has completed her graduation in BBA LL.B (H) from Amity University, Rajasthan (Gold Medalist) and did her post-graduation (LL.M in Business Laws) from NLSIU, Bengaluru. Currently, she is enrolled in a Ph.D. course in the Department of Law at Mohanlal Sukhadia University, Udaipur (Rajasthan). She wishes to excel in academics and research and contribute as much as she can to society. Through her interactions with the students, she tries to inculcate a sense of deep thinking power in her students and enlighten and guide them to the fact how they can bring a change to the society

Dr. Samrat Datta

Dr. Samrat Datta Seedling School of Law and Governance, Jaipur National University, Jaipur. Dr. Samrat Datta is currently associated with Seedling School of Law and Governance, Jaipur National University, Jaipur. Dr. Datta has completed his graduation i.e., B.A.LL.B. from Law College Dehradun, Hemvati Nandan Bahuguna Garhwal University, Srinagar, Uttarakhand. He is an alumnus of KIIT University, Bhubaneswar where he pursued his post-graduation (LL.M.) in Criminal Law and subsequently completed his Ph.D. in Police Law and Information Technology from the Pacific Academy of Higher Education and Research University, Udaipur in 2020. His area of interest and research is Criminal and Police Law. Dr. Datta has a teaching experience of 7 years in various law schools across North India and has held administrative positions like Academic Coordinator, Centre Superintendent for Examinations, Deputy Controller of Examinations, Member of the Proctorial Board

.

Dr. Namita Jain

Head & Associate Professor

School of Law, JECRC University, Jaipur Ph.D. (Commercial Law) LL.M., UGC -NET Post Graduation Diploma in Taxation law and Practice, Bachelor of Commerce.

Teaching Experience: 12 years, AWARDS AND RECOGNITION of Dr. Namita Jain are - ICF Global Excellence Award 2020 in the category of educationalist by I Can Foundation, India.India Women Empowerment Award in the category of "Emerging Excellence in Academics by Prime Time & Utkrisht Bharat Foundation, New Delhi.(2020). Conferred in FL Book of Top 21 Record Holders in the category of education by Fashion Lifestyle Magazine, New Delhi. (2020).Certificate of Appreciation for organizing and managing the Professional Development Training Program on IPR in Collaboration with Trade Innovations Services, Jaipur on March 14th, 2019

Mrs.S.Kalpana

Assistant professor of Law

Mrs.S.Kalpana, presently Assistant professor of Law, VelTech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology, Avadi.Formerly Assistant professor of Law,Vels University in the year 2019 to 2020, Worked as Guest Faculty, Chennai Dr.Ambedkar Law College, Pudupakkam. Published one book. Published 8Articles in various reputed Law Journals. Conducted 1Moot court competition and participated in nearly 80 National and International seminars and webinars conducted on various subjects of Law. Did ML in Criminal Law and Criminal Justice Administration.10 paper presentations in various National and International seminars. Attended more than 10 FDP programs. Ph.D. in Law pursuing.

Avinash Kumar

Avinash Kumar has completed his Ph.D. in International Investment Law from the Dept. of Law & Governance, Central University of South Bihar. His research work is on "International Investment Agreement and State's right to regulate Foreign Investment." He qualified UGC-NET and has been selected for the prestigious ICSSR Doctoral Fellowship.He is an alumnus of the Faculty of Law, University of Delhi. Formerly he has been elected as Students Union President of Law Centre-1, University of Delhi.Moreover, he completed his LL.M. from the University of Delhi (2014-16), dissertation on "Cross-border Merger & Acquisition"; LL.B. from the University of Delhi (2011-14), and B.A. (Hons.) from Maharaja Agrasen College, University of Delhi. He has also obtained P.G. Diploma in IPR from the Indian Society of International Law, New Delhi.He has qualified UGC – NET examination and has been awarded ICSSR – Doctoral Fellowship. He has published six-plus articles and presented 9 plus papers in national and international seminars/conferences. He participated in several workshops on research methodology and teaching and learning.

ABOUT US

INTERNATIONAL JOURNAL FOR LEGAL RESEARCH & ANLAYSIS ISSN 2582-6433 is an Online Journal is Monthly, Peer Review, Academic Journal, Published online, that seeks to provide an interactive platform for the publication of Short Articles, Long Articles, Book Review, Case Comments, Research Papers, Essay in the field of Law & Multidisciplinary issue. Our aim is to upgrade the level of interaction and discourse about contemporary issues of law. We are eager to become a highly cited academic publication, through quality contributions from students, academics, professionals from the industry, the bar and the bench. INTERNATIONAL JOURNAL FOR LEGAL RESEARCH & ANALYSIS ISSN 2582-6433 welcomes contributions from all legal branches, as long as the work is original, unpublished and is in consonance with the submission guidelines.

COPYRIGHT PROTECTION ON3D AND 4D PRINTING IN INDIA– A CRITICAL LEGAL ANALYSIS

Authored By- Kavitha Christo Nelson[1]& Dr. Upankar Chutia[2]

Abstract

Intellectual Property Rights is always a tug-of-war between the emerging technological innovations and inventions with the existing national laws and regulations, whereby 3D and 4D Printing technology is no exception. 3D and 4D printing- a technology that can reprint or produce a replica of any objects or prototypes with one of the printing machines with the aid of an available CAD file or in absence of such file the technology is so advanced that a 3D Scanner can scan such an object that converts to CAD file to reprint the replica objects or prototypes where such objects pose threat to the original inventor of the patented objects or any other new artistic works. As 3D and 4D printing are advanced in technology that is currently used in all the fields from constructing unique and unimaginable designs of architectural buildings,food, and pharmaceutical drug printing, to the most advanced 3D bioprinting of replicas of metal implants, and artificial human organs to hearing aid in the medical industry, environmental concerned objects, to the world's largest rocket engine, etc., thereby protecting the intellectual property of the same is the need of the hour.The research will analyzethe lacunae in the existing IP law, evaluate the concerns as well suggest probable amendments to the existing Copyright regime protecting the authors or creators in India.

Keywords: *Intellectual Property Rights, IPR, 3D and 4D printing, Technology, CAD file Copyright*

Introduction:

A carte blanche work of authors and artists, and any emerging new technology in any industry would be a tribute to Intellectual Property Rights in return always pose a challenging task and debates the existing Intellectual Property Rights Laws in India.

The concept of transformation of 2D or two-dimensional to 3D or three-dimensional printing or "additive manufacturing" dates back to an invention of 1986 by Engineer Chuck Hull[3]. The 3D printer transforms the computerized 2D blueprint files called the computer-Aided-Design file (CAD file) a software that deconstructs the 2D to 3D model or object in layers termed additive

[1]*Kavitha Christo Nelson*. FSN.PGD-IB.LLB. - LL.M student of Alliance University, Bangalore, India.
[2]*Dr.UpankarChutia*, Assistant Professor, Alliance School of Law, Alliance University, Bangalore, India.
3Engineer Chuck Hull, "Chuck Hull Invents Stereolithography or 3D Printing and Produces the First Commercial 3D Printer
https://www.historyofinformation.com/detail.php?id=3864 (accessed on 1st May 2022)

manufacturing or 3D printing. In such circumstances where such a CAD file to produce or print a 3D object isn't available, there comes the support of the 3D Scanner that scans the object and creates a CAD file to support the replication of the desired object. The present 3D printing has given its technological advancement to emerging 4D or four-dimensional printing which holds up more advanced applications, increased capabilities, and efficiency.[4]

The 3D printing technology had remarked its next-gen revolution where its applicability and usage extend to the creation of printing replica objects in almost all the industries fromthe agro-food industry, pharmaceutical industry to print 3D drugs, prosthetics, fashion industry, jewellery making to meet the global requirement where such 3D printing technology caters to produce cost-effective and accommodate the customized requirements of an individual.

The concept of 3D printing and 4D printing through an Intellectual Property Right acquires the Patent protection for the invention of 3D or the 4D printing machine and its subsidiary 3D Scanner to support producing the CAD file to produce a replica object or prototypes. The design of the 3D printer is protected under the Designs Act,2000, The Trademarks Act,1999, and the blueprint CAD file is protected under the Copyrights Act 1957 in India. Irrespective of existing IP laws in India demands a challenging IP law that handles the 3D printing technologies and their exploitationfroman ethical and economic perspective. 3D printing infringement and remedies are not covered under the Indian Penal Code,1860 and not nor in the Copyright Act 1957.

When considering the pros of the 3D or 4D printing technology in the medical industry is advanced and supports in productionof a replica of human organs, artificial limbs, and tissues for transplantation in humans, especially in emergency cases of the non-availability of organs/donors.

Another consideration towards the environmental aspect would help in recyclability of the plastic or polymers to create another artistic object or prototype using the 3D or 4 Printing technology.

Emerging technology in any new invention would always be protected under the Intellectual Property Rights but another critical scenario always demands a debate and challenge towards the up-gradation of the existing laws to protect the intellectual aspect of one person and restrict its usage from infringement by another person.

Fostering 3D or 4D printing technology in India ensures adequate protection in the existing Copyright Law where the question arises concerning section 2(c) which specifically doesn't mention the copyright protection for 3D or 4D printed objects or prototypes.

The use of 3D printing in the unauthorized reproduction, duplication, and distribution of

[4] 3D printing industry, https://3dprintingindustry.com/3d-printing-basics-free-beginners-guide/

copyrighted material would amount to copyright infringement in India under *section 52(1) (w)*[5]and needs to be justified as such would be a dilution of creative works of another person. This lacuna holds a negative impact on the original or genuine copyright owners and the Indian economy as such would result in huge loss.

When a 3D object is created who holds the exclusive copyright ownership is a debate as to whether it is the CAD file owner or the person who printed the 3D object, the copyright law holds lacunae in specifying the 3D prototypes which the copyright law demands to justify.

3D printing and 4D printing support and cater to all requirements in industries and household prototypes don't hold stringent regulations to control their unauthorized production. This loophole may impact the national security as well when on leakage of such CAD files or genuinely obtaining such blueprint of making machine guns or other negative circumstances. This posits the question of whether hobbyists would be charged as infringers in such a scenario.

Even though the *TRIPS Agreement under Article 13* provides the limitations and exceptions, "members shall confine limitations or exceptions to exclusive rights to certain special cases that *do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the right holder."* [6]In India, we lagged in strict IP laws when there are emerging new technologies, unlike in the USA. There is a grave need for an exclusive addition towards 3D printing or 4D printing in copyright law in the perspective of economic growth, to protect the monopoly rights of the original owner, and to avoid and regulate such illegal sale and use of 3D printing CAD file to produce unauthorized objects that are patent protected usually sold through online or other modes.

The objectives of this paper are:

1. To analyze the protection regime of 3D and 4D printed objects or prototypes in India.
2. To evaluate the liabilities on infringement on CAD files, 3D and 4D printed objects or prototypes in the Copyright Law in India.

The paper hypothesis that "*The regulatory mechanism that prevails in India in relation to 3D and 4D printing is insufficient thereby we need separate provisions to regulate the sections in Copyright Law".*

The scope of the study extends to the copyright protection of artistic 3D and 4D printing objects or prototypes under section 2(c) and limits the infringement under section 52(1)(w) of the Copyright

[5]*Section 52(1)(w) of the Copyright Act,*
https://indiankanoon.org/doc/257434/#:~:text=(za)%20the%20performance%20of%20a,Explanation.
[6]*Article 31, TRIPS Agreement,*
https://www.wto.org/english/res_e/publications_e/ai17_e/trips_art13_jur.pdf

Act,1957.

3d And 4d Revolution In Technology And Industry:

WIPO on, "3D printing and IP Law"[7] *an article on the current 3D* advantages, the gap between the laws and emerging technology, and how the existing IP laws try to handle 3D printing in their respective nations. This article also refers to the TRIPS agreement and the WIPO Copyright Treaty to curb unauthorized use and extend its limitation and exceptions to copyright protection in the legitimate interest of the right holder.

3D and 4D printing have gone ahead in developing unimaginable products in the technologically advanced world's largest 3D rocket engine by the UK-basedOrbex[8] *a single piecemanufactured with the perfect temperature and to handle the power fluctuations a much advanced and better rocket engine than the other space engines.*

From an educational point of view, supports that the 3D printing technology attempts to be an alternative to traditional learning which incorporates more 3D printed student projects for a better understanding and learning process.[9] The developments in 3D printing along with the Intellectual Property concerns highlight that the Copyright law protects only the objects created through the expression of ideas. Whereas the US copyright law extensively protects the author's creative work whilst protecting exploitation of the copyright information in the education and research field and with the digital revolution it becomes readily accessible to anyone. The article highlights the challenges for the 3D printed objects regarding the copyright protection and its infringement as at times in circumstantial cases such transformative uses claimed as legal as in cases for the academic purpose or project, especially would be an advantage for those visually impaired.[10]

Food is an essential part of every human life, and the same if served with an unimaginable designer product adds not just aesthetic creativity but also the innovator's creativity towards delivering the intricate shapes and geometric designs on the plater. Such 3D and 4D printing ways of printing the

[7]WIPO MAGAZINE, 3D PRINTING AND IP LAW,2017,
https://www.wipo.int/wipo_magazine/en/2017/01/article_0006.html
[8]MADDY WHITE,UK SPACE BLASTS OUT OF ORBIT WITH WORLD'S LARGEST 3D-PRINTED ROCKET ENGINE, https://www.themanufacturer.com/articles/uk-space-blasts-out-of-orbit-with-worlds-largest-3d-printed-rocket-engine/ (accessed on 1st May 2022).
[9]PATRICIA MCGAHERN, FRANCES BOSCH, &DOROTHYBELLE POLI. (2015). ENHANCING LEARNING USING 3D PRINTING: AN ALTERNATIVE TO TRADITIONAL STUDENT PROJECT METHODS. THE AMERICAN BIOLOGY TEACHER, 77(5), 376–377. https://doi.org/10.1525/abt.2015.77.5.9
[10]AAGAARD, P., &KOLITSKY, M. (2014). 3-D PRINTING, COPYRIGHT, AND FAIR USE: WHAT SHOULD WE KNOW? IN B. R. BERNHARDT, L. H. HINDS, & K. P. STRAUCH (EDS.),*Too Much is Not Enough: Charleston Conference Proceedings, 2013* (pp. 470–473). Purdue University Press.
http://www.jstor.org/stable/j.ctt6wq772.87

food product and end-product have become a trend in the Food industry.[11]

Owning a designer house is everyone's dream, and 3D and 4D printed house is just another amazing concept of building aesthetically beautiful and intricate designer houses with minimal construction costs compared to traditional manual constructions. The pros are the architecture of the house is just as per the CAD blueprint and the designer's creations without any flaws which normally doesn't happen in any architectural construction as promised by the architecture.[12] 3D printing is a concept of robotic construction where high-rise buildings are constructed using concrete 3D printing methods. Also highlights the advancements and challenges of 3D printing in the architectural industry with three cases addressing the eco-friendly construction requiring minimal human labor or effort as in traditional architectural construction[13].

Whenever there is an advancement in the medical industry, that would always benefit the public at large, especially when 3D and 4D printing can create customized hearing aids, 3D printed metal implants, and another prospect of the creation of artificial human organs using 3D- bioprinting.[14] The use of 3D printing in the healthcare industry and its demanding need for regulations, especially in 3D bioprinting where such involves the medical devices that mandate quality, medical technology for better clinical practice in ethical and moral in the demanding technological[15].

Everyone is bound to save the environment as a part of sustainable development, and 3D and 4D printing have gone ahead to print the replicas of coral reefs with fine intricates and structures to protect the environment[16]. *Another scientific approach* towards the printing of micro-organisms that attracts over to the research is the field that is using 3D micro printing and 3D cellular printing to produce micro-organisms and bacteria. Also proves the technological advancements in 3D printing

---

[11]LUCAS CAROLO, 3D PRINTED FOOD: ALL YOU NEED TO KNOW IN 2022, https://all3dp.com/2/3d-printed-food-3d-printing-food/, accessed on 1st May 2022.

[12]MADDY WHITE,WOULD YOU BUY A 3D PRINTED HOUSE?,https://www.themanufacturer.com/articles/would-you-buy-a-3d-printed-house/, accessed on 1st May 2022.

[13]GAUDILLIÈRE, N., DIRRENBERGER, J., DUBALLET, R., BOUYSSOU, C., MALLET, A., ROUX, P., & ZAKERI, M. (2020). INDUSTRIALISING CONCRETE 3D PRINTING: THREE CASE STUDIES. IN B. SHEIL, M. R. THOMSEN, M. TAMKE, & S. HANNA (EDS.),*Design Transactions: Rethinking Information Modelling for a New Material Age* (pp. 158–165). UCL Press. https://doi.org/10.2307/j.ctv13xprf6.31

[14]SEVEN INNOVATIVE REAL-WORLD CASE STUDIES OF 3D PRINTING, https://www.themanufacturer.com/articles/seven-innovative-real-world-case-studies-of-3d-printing/

[15]MARUTHAPPU, M., & KEOGH, B. (2014). HOW MIGHT 3D PRINTING AFFECT CLINICAL PRACTICE? BMJ: BRITISH MEDICAL JOURNAL, 349. https://www.jstor.org/stable/26517730

[16]MADDY WHITE, COULD ADDITIVE MANUFACTURING FIX CORAL REEFS?,https://www.themanufacturer.com/articles/could-additive-manufacturing-fix-coral-reefs/

which mandates adapting legal regulatory methods for the next-generation technology and sustainability.[17]

3D printing concept has become an added advantage in the manufacturing and automobile industry as the most intricate spare parts are printed at ease to perfection that would help any machine work perfectly. The technological potential growth in additive manufacturing or 3D printing technology is a revolutionary method and a transformative technology to the traditional approach. Such advancements though hold to increase the GDP of any nation hence suggesting the policymakers look into predicting the future aspect of technological challenges that would arise and make regulations holding a better disruptive technology of additive manufacturing.[18]

*The Do-It-Yourself (DIY) trend has been increasing day-by-day where each one would like to create new or imitate the other either for hobbies and passion or for the commercial benefits, where the 3D / 4D printers and scanners have supported them enormously letting the public opt for CAD files where at times are misused to make of replicas of counterfeit goods and illegal metal gun-making which would be a threat to the national security of any nation.*A classic example of the 'Makers Movement' and how any small-scale industry can make replicas of unauthorized, replication and duplication of any prototypes or objects by DIY communities (Do-It-Yourself) which also highlights the making of 3D printing guns and gun parts that exclusively doesn't hold any statutory restrictions over the DIY maker and the threats associated with such a technology where for production of prototypes blueprint CAD file is readily available in the online market that can be accessed or obtained either ethically or unethically by any ordinary person or hackers.[19]

Such 3D and 4D printing deserve protection not just on the national level since the 3D CAD files are easily accessible the international organizations are trying to find regulations to protect such under the Copyright Law.

[17]CONNELL, J. L., RITSCHDORFF, E. T., WHITELEY, M., & SHEAR, J. B. (2013). 3D PRINTING OF MICROSCOPIC BACTERIAL COMMUNITIES. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(46), 18380–18385.
http://www.jstor.org/stable/23757552

[18]CAMPBELL, T., WILLIAMS, C., IVANOVA, O., & GARRETT, B. (2011). COULD 3D PRINTING CHANGE THE WORLD? TECHNOLOGIES, POTENTIAL, AND IMPLICATIONS OF ADDITIVE MANUFACTURING. ATLANTIC COUNCIL. http://www.jstor.org/stable/resrep03564

[19]SHAW, R., DALNOKI-VERESS, F., COTTON, S., POLLACK, J., TOKI, M., RUSSELL, R., VASSALOTTI, O., & ALTAF, S. G. (2017). DIY COMMUNITIES, MANUFACTURING, AND 3D PRINTING. IN EVALUATING WMD PROLIFERATION RISKS AT THE NEXUS OF 3D PRINTING AND DO-IT-YOURSELF (DIY) COMMUNITIES (p. A-83-A-95). James Martin Center for Nonproliferation Studies (CNS).
http://www.jstor.org/stable/resrep17539.16

International Regimes On Copyrights Law On 3d/4d Printing:

WIPO magazine on 3D printing or additive manufacturingposits that different strategies have been considered by different countries towards the economic and technological ecosystems favouring the development of 3D printing and also the drawback in technology that affects the Intellectual Property in regard to the Copyright, Design Law, Patent Law and to some extent the Geographical Indications.*3D Scanning software can make wonders in the replication of the museum and cultural heritage applications which concludes the impossible to possible. Whilst technological advancement is inevitable in any industry instead of justifying with the Wait-and-Watch approach it's high time to the control application of 3D printing technology*[20].

The *Berne Convention for the Protection of Literary and Artistic Works*[21], whilst it supports the 'unity of art principle[22]' and honorsthe protection of copyrighted work across the contracting States to the Berne Convention for a minimal duration until 50 years after the death of the author or 50 years in pseudonymous works, also denies the protection if such copyright protection is ceased or denied in the country of origin.

The *Trade-Related Aspects of Intellectual Property Rights Agreement* (TRIPs Agreement) with the *World Trade Organization* (WTO) binds to automatic protection and independent protection of those members who are not a party to the Berne Convention subject to limitations and exceptions. This provision under Article 13 of the TRIPS Agreement has given way for some countries to adopt the levy of minimal fee towards compensation for unauthorized copying of protected material in 3D printing.[23]

Some countries like France holdprovisions under the *Intellectual Property Code of France (Article L 613-4)*[24] that 3D printed objects can be protected under the Patent which would support the patent holders to seek redress towards the unauthorized use of their 3D printing by the third parties and to honour the copyrighted work.

---

[20]WACHOWIAK, M. J., & KARAS, B. V. (2009). 3D SCANNING AND REPLICATION FOR MUSEUM AND CULTURAL HERITAGE APPLICATIONS. *Journal of the American Institute for Conservation*, *48*(2), 141–158. http://www.jstor.org/stable/27784660

[21]BERNE CONVENTION FOR THE PROTECTION OF LITERARY AND ARTISTIC WORKS https://www.wipo.int/treaties/en/ip/berne/

[22]MASIYAKURIMA, P. (2016). COPYRIGHT IN WORKS OF ARTISTIC CRAFTSMANSHIP: AN ANALYSIS. OXFORD JOURNAL OF LEGAL STUDIES, 36(3), 505–534. http://www.jstor.org/stable/26363506

[23]3D PRINTING AND IP LAW, https://www.wipo.int/wipo_magazine/en/2017/01/article_0006.html

[24]INTELLECTUAL PROPERTY CODE OF FRANCE (ARTICLE L 613-4) https://www.jpo.go.jp/e/system/laws/gaikoku/document/index/france-e_chiteki_zaisan.pdf

3D printing technology from the international perspective addresses the key issues and challenges and also highlights the national strategies promoting the technology for instance the 'Made-In-China' movement or 'America Makes'. Whenever there is technology there are attached threats associated with it.[25]

3d Printing And Product Liability:

3D printing is a revolution in the technology industry and also posits legal upshots in the Intellectual Property towards the 3D CAD data protection and end-product liability. The availability of 3D CAD files onlineencourages private individuals to opt for 3D printers at affordable costs that are capable of printing the product that is protected under patent leading to counterfeit products in the market. Such 3D pirated software demands legal protection towards their infringement of IP as well as the misappropriation of software, and 3D printed products and devices associated with the copyright claim.

Inanotherscenario, on the non-availability of the CAD file, the 3D Scanner is capable of scanning the product to convey the CAD file or digital software and then reprinting the unauthorized product without any legal obstructions to their infringement under the Copyright Law even though such software is ethically protected under the artistic works of the Act.3D and 4D printing could be interpreted with reference to New Zealand's case of *Wham-O-Manufacturing Co vs Lincoln Industries Ltd*[26]where the wooden models are produced from preliminary drawings that fall under the definition of sculptures or engravings under artistic works subject to copyright protection.

On analysing the possible liability issues on the person towards copyright infringement debates on whom, whether the manufacturer or supplier of 3D printer or printing material, or the owner of the printer or CAD blueprint right owner, or the person who printed the object, as the existing copyright law remains silent in that[27].

The challenges of 3D printing technology and Intellectual property law give a predominance focus on copyright law. This remains a threat to the creative minds and infringement that demands a Copyright law to protect the rights of the copyright owners. *T*he artistic work of craftmanship and the Art and Craft Movement lies a controversial riddle of whether the machine-created or mass-produced objects fall under the ambit of artistic craftsmanship was substantiated in the precedents and judicial

[2525]FEY, M. (2017). ADDITIVE MANUFACTURING. IN 3D PRINTING AND INTERNATIONAL SECURITY: RISKS AND CHALLENGES OF AN EMERGING TECHNOLOGY (pp. 3–18). Peace Research Institute Frankfurt. http://www.jstor.org/stable/resrep14453.4

[26]*Wham-O-Manufacturing Co vs Lincoln Industries Ltd*,*Reports of Patent, Design and Trade Mark Cases*, Volume 102, Issue 7, 1985, Pages 127–186, https://doi.org/10.1093/rpc/1985rpc127

[27]EMERGING LEGAL ISSUES IN 3D PRINTING AND PRODUCT LIABILITY, https://www.lawjournalnewsletters.com/sites/lawjournalnewsletters/2016/09/01/emerging-legal-issues-in-3d-printing-and-product-liability-2/?slreturn=20220407141125

interpretations.[28]

Conclusion:

The world has witnessed the unveiled world's largest 3D printed rocket engine[29], 3D printed house, 3D printed bone implants, 3D jewellery, automobile spare parts, and 3D printed guns. The pros of the 3D and 4D printing, and prototypes would be the future educational mode as an alternative to the traditional teaching and such posits the advantage of fair use purpose. The possibilities of future 3D printing prototypes are endless as the technology and public interaction with the end product of 3D prototypes are increasing empowering the consumer's influence on 3D printing.

When 3D printing is a threat to the unauthorized copying of prototypes across the world, for some developing countries like Africa such technology can really play a vital role in their economic upliftment in the future[30].

The research paper proves the hypothesis by justifying "*The regulatory mechanism that prevails in India in relation to 3D and 4D printing is insufficient thereby we need separate provisions to regulate the sections in Copyright Act".*

The paper concludes that any creation deserves an incentive for the creator's investment in Research and Development and unique designs of CAD blueprints and 3D and 4D printing prototypes. Emerging digitalization and fostering creative content going forward would pressure the IP Policymakers a demanding regulatory challenge on Intellectual Property Rights and their protection worldwide combating the 3D and 4D printing piracy.

Suggestions:

Since the 3D and 4D print market covers the largest commercial application technology from revolutionary applications, regenerative medicine to prosthetics, complex airplane components, the food industry, fashion, and other technology that are deeply embedded in the future, towards which the paper suggests

1. 3D Printing in Africa Can Boost Manufacturing Sector,

[28]MANYIKA, J., MCRAVEN, W. H., & SEGAL, A. (2019). FINDINGS. IN INNOVATION AND NATIONAL SECURITY: KEEPING OUR EDGE (pp. 13–52). Council on Foreign Relations. http://www.jstor.org/stable/resrep29894.7

[29]SEVEN INNOVATIVE REAL-WORLD CASE STUDIES OF 3D PRINTING, https://www.themanufacturer.com/articles/seven-innovative-real-world-case-studies-of-3d-printing/

[30]3D PRINTING IN AFRICA CAN BOOST MANUFACTURING SECTOR, https://www.borgenmagazine.com/3d-printing-in-africa/, accessed on 6th May 2022

https://www.borgenmagazine.com/3d-printing-in-africa/, (accessed on 6th May 2022)

2. Campbell, T., Williams, C., Ivanova, O., & Garrett, B. (2011). Could 3D Printing Change the WORLD? Technologies, Potential, and Implications of Additive Manufacturing. Atlantic Council.

3. http://www.jstor.org/stable/resrep03564(accessed on 4thMay 2022)

4. Connell, J. L., Ritschdorff, E. T., Whiteley, M., & Shear, J. B. (2013). 3D printing of microscopic bacterial communities. Proceedings of the National Academy of Sciences of the United States of America, 110(46), 18380–18385. (accessed on 4thMay 2022)

5. http://www.jstor.org/stable/23757552(accessed on 4thMay 2022)

6. GADZALA, A. (2018). 3D Printing: Shaping Africa's Future. Atlantic Council. http://www.jstor.org/stable/resrep17104 (accessed on 4thMay 2022)

7. Gaudillière, N., Dirrenberger, J., Duballet, R., Bouyssou, C., Mallet, A., Roux, P., & Zakeri, M. (2020). Industrialising Concrete 3D Printing: Three Case Studies. In B. Sheil, M. R. Thomsen, M. Tamke, & S. Hanna (Eds.), Design Transactions: Rethinking Information Modelling for a New Material Age (pp. 158–165). UCL Press.
https://doi.org/10.2307/j.ctv13xprf6.31(accessed on 4thMay 2022)

8. https://www.wto.org/english/res_e/publications_e/ai17_e/trips_art13_jur.pdf(accessed on 4thMay 2022)

9. Lucas Carolo, 3D Printed Food: All You Need to Know in 2022,
https://all3dp.com/2/3d-printed-food-3d-printing-food/ (accessed on 1st May 2022)

10. MADDY WHITE, COULD ADDITIVE MANUFACTURING FIX CORAL REEFS?,https://www.themanufacturer.com/articles/could-additive-manufacturing-fix-coral-reefS/(accessed on 4thMay 2022)

11. Maddy white, Would you buy a 3D printed house?,
https://www.themanufacturer.com/articles/would-you-buy-a-3d-printed-house/, (accessed on 1st May 2022)

12. Manyika, J., McRaven, W. H., & Segal, A. (2019). FINDINGS. In Innovation and National Security: Keeping Our Edge (pp. 13–52). Council on Foreign Relations. http://www.jstor.org/stable/resrep29894.7(accessed on 4thMay 2022)

13. Masiyakurima, P. (2016). Copyright in Works of Artistic Craftsmanship: An Analysis. Oxford Journal of Legal Studies, 36(3), 505–534.
http://www.jstor.org/stable/26363506(accessed on 4thMay 2022)

14. Masiyakurima, P. (2016). Copyright in Works of Artistic Craftsmanship: An Analysis. Oxford Journal of Legal Studies, 36(3), 505–534.
http://www.jstor.org/stable/26363506(accessed on 3rdMay 2022)
15. Patricia McGahern, Frances Bosch, &DorothyBelle Poli. (2015). Enhancing Learning Using 3D Printing: An Alternative to Traditional Student Project Methods. The American Biology Teacher, 77(5), 376–377. (accessed on 4thMay 2022)
https://doi.org/10.1525/abt.2015.77.5.9
16. Sarah Craig, Protection for Printing: An Analysis of Copyright Protection for 3D Printing, 2017 U. ILL. L. REV. 307 (2017)(accessed on 3rdMay 2022)
17. ShardhaRajam&Adya Jha, 3D Printing - An Analysis of Liabilities and Potential Benefits within the Indian Legal Framework, 11 NUJS L. REV. 361 (2018)(accessed on 3rdMay 2022)
18. Shaw, R., Dalnoki-Veress, F., Cotton, S., Pollack, J., Toki, M., Russell, R., Vassalotti, O., & Altaf, S. G. (2017). DIY COMMUNITIES, MANUFACTURING, AND 3D PRINTING. In Evaluating WMD Proliferation Risks at the Nexus of 3D Printing and Do-It-Yourself (DIY) Communities (p. A-83-A-95). James Martin Center for Nonproliferation Studies (CNS).
http://www.jstor.org/stable/resrep17539.16(accessed on 3rdMay 2022)
19. Véronneau, S., Torrington, G., & Hlávka, J. P. (2017). 3D Printing: Downstream Production Transforming the Supply Chain. RAND Corporation.
http://www.jstor.org/stable/resrep17635(accessed on 3rdMay 2022)
20. WACHOWIAK, M. J., & KARAS, B. V. (2009). 3D SCANNING AND REPLICATION FOR MUSEUM AND CULTURAL HERITAGE APPLICATIONS. Journal of the American Institute for Conservation, 48(2), 141–158.
http://www.jstor.org/stable/27784660(accessed on 3rdMay 2022)
21. Wham-O-Manufacturing Co vs Lincoln Industries Ltd, Reports of Patent, Design and Trade Mark Cases, Volume 102, Issue 7, 1985, Pages 127–186,
https://doi.org/10.1093/rpc/1985rpc127(accessed on 3rdMay 2022)
22. WIPO MAGAZINE, 3D PRINTING AND IP LAW,2017,
https://www.wipo.int/wipo_magazine/en/2017/01/article_0006.html(accessed on 3rdMay 2022)
23. Berne Convention for the Protection of Literary and Artistic Works
https://www.wipo.int/treaties/en/ip/berne/ (accessed on 3rdMay 2022)
24. Intellectual Property Code of France (Article L 613-4)
https://www.jpo.go.jp/e/system/laws/gaikoku/document/index/france-e_chiteki_zaisan.pdf(accessed on 2nd May 2022)
25. Seven innovative real-world case studies of 3D printing,

https://www.themanufacturer.com/articles/seven-innovative-real-world-case-studies-of-3d-printing/(accessed on 2ndMay 2022)

26. Seven innovative real-world case studies of 3D printing, https://www.themanufacturer.com/articles/seven-innovative-real-world-case-studies-of-3d-printing/(accessed on 2ndMay 2022)

27. 3D PRINTING AND IP LAW, https://www.wipo.int/wipo_magazine/en/2017/01/article_0006.html(accessed on 2ndMay 2022)

28. Aagaard, P., &Kolitsky, M. (2014). 3-D Printing, Copyright, and Fair Use: What Should We Know? In B. R. Bernhardt, L. H. Hinds, & K. P. Strauch (Eds.), Too Much is Not Enough: Charleston Conference Proceedings, 2013 (pp. 470–473). Purdue University Press. http://www.jstor.org/stable/j.ctt6wq772.87 (accessed on 2ndMay 2022)

29. EMERGING LEGAL ISSUES IN 3D PRINTING AND PRODUCT LIABILITY, https://www.lawjournalnewsletters.com/sites/lawjournalnewsletters/2016/09/01/emerging-legal-issues-in-3d-printing-and-product-liability-2/?slreturn=20220407141125 (accessed on 2nd May 2022)

30. Fey, M. (2017). Additive Manufacturing. In 3D Printing and International Security: Risks and Challenges of an Emerging Technology (pp. 3–18). Peace Research Institute Frankfurt. http://www.jstor.org/stable/resrep14453.4(accessed on 1st May 2022)

31. MADDY WHITE, UK SPACE BLASTS OUT OF ORBIT WITH WORLD'S LARGEST 3D-PRINTED ROCKET ENGINE, https://www.themanufacturer.com/articles/uk-space-blasts-out-of-orbit-with-worlds-largest-3d-printed-rocket-engine/ (accessed on 1st May 2022)

32. Maruthappu, M., & Keogh, B. (2014). How might 3D printing affect clinical practice? BMJ: British Medical Journal, 349. https://www.jstor.org/stable/26517730 (accessed on 1st May 2022)

33. Shaw, R., Dalnoki-Veress, F., Cotton, S., Pollack, J., Toki, M., Russell, R., Vassalotti, O., & Altaf, S. G. (2017). DIY COMMUNITIES, MANUFACTURING, AND 3D PRINTING. In Evaluating WMD Proliferation Risks at the Nexus of 3D Printing and Do-It-Yourself (DIY) Communities (p. A-83-A-95). James Martin Center for Nonproliferation Studies (CNS). http://www.jstor.org/stable/resrep17539.16 (accessed on 1st May 2022)

34. 3D printing industry, https://3dprintingindustry.com/3d-printing-basics-free-beginners-guide