LEGAL FRONTIERS OF DIGITAL TWINS: PRIVACY, OWNERSHIP, AND RESPONSIBILITY

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ABSTRACT

This research paper talks about digital twins, which are online copies of people made using data and technology. These twins raise many new questions for law and society. For example, who really owns the information of a person's digital twin? Should twins have the same kind of privacy as real people? What if a digital twin works on its own, like signing a contract or causing harm, then who should be responsible for that? The study also asks whether people should have special rights over their digital versions and whether, in some cases, even digital twins should be given legal responsibilities or rights. To explore this, the paper looks at existing laws on data protection, intellectual property, torts, and human rights, and compares them to see where they fall short. The conclusion is that a new law system is needed. It should protect people's personal rights and also ensure there is responsibility in using such advanced technology. This will help balance human rights with future technological growth.

Keywords: Digital Twins, Privacy, Responsibility, Human Rights.

INTRODUCTION

Digital twins are sort of a duplicate of an individual on the computer. They are created because so much of our data just continues to come in, and then it creates something that behaves like us. Sometimes these duplicates can even have their own decisions, which is sort of clean and intimidating. It leads us to question simple things such as who actually owns this information, is my privacy secure, and if the digital twin does something bad, then who will be blamed? The greatest question is, if there is an online copy of me, then what does that say about the actual "me"? These are difficult things people need to consider as technology is going so fast. Legal

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systems in India and other parts of the world are incapable of adequately controlling such emerging entities that have eroded conventional distinctions on personhood and technology.[1]

One of the major issues is the question of data ownership and control of the data that forms a digital twin. Although current intellectual property laws partially address the use of data, the collaborative aspect of digital twin development makes the ownership more complex in cases when various users provide data or a set of algorithms. Moreover, the laws and regulations on privacy that include the Information Technology Act, 2000, and new regulations like the Digital Personal Data Protection Bill, 2023, have to be reviewed and enhanced to guarantee that sensitive personal information in digital twins is reasonably safe.[2]

A different urgent question is how to establish liability in case one of the digital twins behaves independently, i.e., contracts or causes harm. Indian law currently offers limited guidance, with debates ongoing on how liability should be apportioned among the human, the creators, and the platform providers. Comparative insights from international jurisdictions reveal a need for tailored liability frameworks to address these nuances.[3]

Other researchers propose a discussion of the limited legal personhood of digital twins to control their autonomous operations in a more adequate way and use the legal personality of a corporation as an analogy.

However, the ethical issues in assigning rights and liabilities to the non-human appear to be an unethical matter, which should be analysed in terms of legal moderation to ensure the advancement of innovation within constitutional rights upholding.

It uses a doctrinal approach in which statutes, case law, and scientific literature are examined to give a proposal of a comprehensive legal framework aimed at dealing with the new issues of problems of digital twins on privacy, ownership, and liabilities of data.

[1] Bhoda F, 'Understanding Data Privacy Laws in the Age of Digital Twins in India' (LinkedIn, 12 July 2024) https://www.linkedin.com/pulse/understanding-data-privacy-laws-age-digital-twins-india-bhoda-fzpac accessed 11 September 2025

[2] 'Digital Personal Data Protection Bill, 2023' (India); Information Technology Act 2000 (India).

[3] Fenwick Elliott, 'The Challenges and Legal Implications of Digital Twins' (Fenwick Elliott, 25 November 2020) https://www.fenwickelliott.com/research-insight/annual-review/2020/challenges-legal-implications-digital-twins accessed 11 September 2025

DEFINING DIGITAL TWINS AND THEIR TECHNOLOGY

The Digital 'Twin Consortium defines a digital twin as "a realistic digital representation of an individual or physical system that continuously incorporates data from its real-world counterpart to enable enhanced monitoring, analysis, and decision-making." This technology bridges the physical and digital worlds, allowing for simulations that optimise performance and predict outcomes in real time.[4]

According to Tao and his team, a digital twin is like a computer model that copies a real thing or process. It keeps getting updated with real-time information, so it can show what's happening throughout the whole life of that thing. This means digital twins don't just copy how something looks, but also how it works and changes over time. Because of this, they help manage systems better, but they also raise new legal questions about how to deal with these digital copies.

INTELLECTUAL PROPERTY RIGHTS CONCERNING DIGITAL TWINS

Digital twins are kind of like a copy of a real thing, but made on a computer. They run using a lot of data and smart programs. It looks very cool and useful, but when we think more, we see many problems behind it. The biggest problem everybody talks about is: who owns the digital twin? It is not one simple thing because a twin is made of many pieces, like software, systems, brands, and all the data that feeds into it. For software, there are copyrights, for systems, there are patents, and for brand names, there are trademarks. But data is different, and nobody can clearly say who really owns it. That makes everything messy. The codes and programs inside a digital twin are usually safe under copyright or patent. So, you cannot just copy them without permission. But when the twin is made from real human information, like personal details or body-related data, that doesn't come under intellectual property at all. It gets linked more to privacy and data protection laws. So now two sets of laws get mixed up together, and that is where confusion starts. Another thing is, most digital twins are not built by just one person or company. Usually, different people add different parts. Someone gives data, another brings the technology, and others may do the actual designing and work. With so many people involved, it's not easy to say who owns the final product. So, contracts and agreements become important; otherwise, fights about ownership can happen. Experts today are saying the IP rules

[4] Digital Twin Consortium, 'What is a Digital Twin?' (Digital Twin Consortium) https://www.digitaltwinconsortium.org accessed 12 September 2025.

we have are not enough to deal with digital twins.[5] They believe new kinds of laws are needed. Some think there should be special protection for data and for the digital models separately. They also say we must clearly draw the line between what it means to own data and what it means to just have the right to use it.[6]

To sum up, the issue of intellectual property protection in digital twins requires a complex solution that will tackle the software innovation, data rights, and collaborative contributions supported by the transparent regulation framework, to encourage innovation without harming the rightful ownership rights.

LEGAL LIABILITY AND ACCOUNTABILITY ISSUES

The rise of digital twins questions the established concept of legal responsibility and accountability because they are autonomous in making decisions and are complicated in their creation procedures. The main challenge is who is liable when the actions of a digital twin lead to harm, contract breach, or law breach. As opposed to traditional entities, digital twins work on algorithms and data input, and in some cases, not under the direct control of their human counterparts or creators, making it difficult to assign liability.

According to the current legal practices, one of the main issues is that the responsibility of a wrongdoer is usually placed on natural persons or legal entities that were directly involved in the wrongdoing. But in the case of digital twins, three key stakeholders can be held accountable, with the individual whom the twin is based on having an interest in the twin; the developers or operators who create, maintain, or control the twin; and the platforms on which the twin operates. The scope of liability of each party needs scrutiny in terms of control, foreseeability, as well as the nature of the harm done.

In one example, the Indian case State of Maharashtra v. The Supreme Court, led by Praful B. Desai,[7] highlighted liability on fault-based negligence and foreseeability in medical negligence, which could be used to determine liability in the case of harm by digital twins in medical applications. Similarly, the UK case Smith v. The case of Littlewoods Organisation Ltd[8]

[5] R. Brown, 'Legal Challenges and Intellectual Property Protections for Digital Twins' (2023) 12 Journal of Intellectual Property Law 45
[6] S. Kumar, 'Data Rights and Intellectual Property in the Era of Digital Twins' (2024) 29 Computer Law Review International
[7] *State of Maharashtra v Praful B Desai* (2003) 4 SCC 601.
[8] *Smith v Littlewoods Organisation Ltd* AC 241 (HL).

highlights the restrictions of liability in the case of harm as a result of third-party autonomous actions, which creates analogous issues with the digital twin case, where autonomy and control are decentralised.

Moreover, vicarious liability can be used when the developer or platform has adequate control over the functions of the digital twin. However, this entails expansion and modification in the view of the unique working autonomy of digital twins.

The absence of judicial cases with digital twins explicitly indicates that legislation is needed to create specific liability frameworks, balancing the stimulation of innovation and its responsibility.

Some legal experts have said that we might need a new kind of mixed legal system to deal with digital twins, because the old rules don't fully cover them. This system could bring together parts of product liability, cyber law, and agency law to match the complex problems digital twins create. One idea is to make developers strictly responsible, just like how manufacturers are held responsible for the products they make. Another idea is a shared responsibility model, where liability is divided based on who has control or what agreements are made in contracts. The point of these ideas is to close the gaps in the current rules and give better protection to everyone involved. When it comes to legal responsibility for digital twins, the old way of looking at fault doesn't fully work anymore. The issues with control and autonomy need to be thought about in a new way. So, researchers say we should build on existing laws and cases but add new rules that make it clear who will be responsible if something goes wrong. This will make things more transparent and help guide the future without confusion.

THE QUESTION OF LEGAL PERSONHOOD FOR DIGITAL TWINS

The law of legal personhood, which has long been known by natural persons and well-established collective entities such as corporations, is being challenged like never before with the rise of digital twins. Legal personhood is the possession of the ability to bear rights and responsibilities, to sue and to be sued, to enter into binding contracts. As digital twins are becoming more and more functional and autonomous in making certain decisions, a question arises as to whether digital twins should be given some interim status in order to deal with practical and normative issues.

According to the Indian law, natural persons are inherently given a legal personality because they are born with it, whereas juridical persons, i.e., companies, are granted one, in particular, the Companies Act, 2013.[9] The concept of legal personhood in societies which assign non-human entities as persons is generally backed by their use in legal and business dealings. Applying this to digital twins requires a strict analysis of the possibility that they can have legal rights or duties worthwhile.

The digital twins are not yet envisioned by the statutory law as legal persons, which leaves a regulatory gap. Nonetheless, researchers posit that the establishment of limited or functional personhood may help to resolve the issue of liability, allow digital twins to make a contract on their own, and safeguard the rights of data. That status would not be that of full legal personhood like the novice field of artificial intelligence personalities, but a personalised form of legal treatment based on their abilities and shortcomings.

In comparison, the European Parliament resolution on a framework of artificial intelligence in 2020 has some recommendations to consider the legal personhood of autonomous systems and suggests that they might require sui generis regulation.[10] In the same manner, some jurisdictions have initiated the possibility of having middle levels of legal personality of AI systems to bridge the gap between humans and machines.

Critics warn that early assigning of personhood can erode accountability and human responsibility.[11] In this way, it is necessary to have a balanced solution where legislative creativity and judicial discretion are required to support the special character of digital twins.

Finally, even though the current legal framework does not include digital twins as legal personalities, changing realities in the field of technology make a complex system of law with certain limited person-like rights reinforced in autonomy, contractual capacity, and liability, in line with constitutional and business traditions.

[9] Companies Act 2013 (India).
[10] European Parliament, 'Resolution with recommendations to the Commission on a civil liability regime for artificial intelligence' (2020).
[11] RS Rahman, 'Legal Personhood for AI: A Comparative Analysis' (2024) 15 Journal of Law and Technology 67.

REGULATORY LANDSCAPE AND GAPS

The fast pace of the creation of digital twin technology has gone ahead of the transformation that exists in the current regulatory systems, leaving major loopholes in the way the legal frameworks will deal with the peculiarities of such advanced digital duplicates. The regulatory landscape in India is still disjointed, and no particular legislation directly regulates digital twins.

Although the significant aspect of data protection is widely touched upon in the Information Technology (IT) Act, 2000, and is expected to be enhanced further in the Digital Personal Data Protection Bill, 2023, these legal frameworks were not created considering the multidimensionality of the digital twins. It confuses who owns data, its privacy, and liability, which should result in specific regulatory strategies.

Regulation globally in regard to digital twins is immature but developing. The European Union (EU) has been quite progressive. The GDPR offers an effective protection framework for personal data that can be applied to information used to generate and manage digital twins.[12] Besides, the harmonised regulations concerning autonomous entities and digital replicas are clearly identified in the coordinated plan of the European Commission on artificial intelligence.[13] It encompasses transparency, accountability, and data governance principles that are likely to be used as a guide to regulating digital twins on a global scale.

Other countries, including Singapore and South Korea, began to use digital twin technologies as part of the smart city programs and simultaneously created sector-specific regulatory proposals to address the risks.[14] In contrast to India, such jurisdictions have already taken some first steps towards embedding regulatory control with innovation, but an extensive, explicit infrastructure of digital twins is missing. The Indian regulatory void is also a challenge and an opportunity. On the one hand, there is a lack of explicit regulations, which brings legal uncertainty to the developers, users, and people who are impacted.

Digital twins give India a chance to make new kinds of rules. These rules shouldn't just be about one thing, but should mix data protection, intellectual property, negligence, and

[12] Regulation (EU) 2016/679 (General Data Protection Regulation).
[13] European Commission, 'Coordinated Plan on Artificial Intelligence' (2021).
[14] K. Lee, 'Smart Cities and Digital Twin Adoption: Regulatory Approaches in Asia' (2024) 18 Journal of Technology Policy 210

government controls. We need a multi-level system—a general set of data rules plus some special ones just for digital twins. Regulatory sandboxes are helpful. They let people try out new tech in a safe way, but still keep some rules. This helps innovation but also makes it clear what's allowed and what's not. For this to work, the government, companies, and colleges need to work together. They should make standards for things like consent, being open about what's happening, who's responsible, and making sure different systems can connect and work together. In short, to fix the gaps in today's laws, India and others need smart, flexible rules. These rules should understand the problems digital twins bring and help innovation grow, not stop it. This way, technology can be used well and safely.

RECOMMENDATIONS FOR LEGAL FRAMEWORK DEVELOPMENT

We really need a clear and flexible set of laws to deal with digital twins and all the legal problems they bring. The ideas below are meant to support new technology while protecting people's rights, making sure everyone involved knows their roles, and keeping things fair and safe.

Make special laws just for digital twins: Because digital twins are different from other things, we need specific laws or rules for how they should be managed and who is responsible if something goes wrong. This law should cover things like data privacy, intellectual property, and contracts, and put all these rules together in one clear way for digital twins.

Create strong rules for data protection and who owns what: The information used to make digital twins is very sensitive, especially since it includes personal and biometric data. So, laws need to protect this data well. People should have rights over their digital twin's information, like being able to say who can see it, change it, or delete it. These rights should follow the guidelines from India's Digital Personal Data Protection Bill, 2023, and also follow good examples from international laws like the GDPR.

Develop Liability and Accountability Paradigms: The framework has to ensure there are clear rules about liability involving the developers, operators, users, and third parties. To address the risks, a more hybrid approach of blending the strict liability of the creators and the liability of operators (fault-based) can be applied. When it comes to digital twins, it's really important to make sure they are held accountable. This means there should be clear rules about how they make decisions and how much freedom they actually have.

One idea is to give digital twins a kind of limited legal status, but only for certain actions like signing contracts or licenses. They wouldn't have full human rights, but this would help them work better without taking away human responsibility.

Another way is to create special spaces called "regulatory sandboxes" where digital twin technology can be tested safely. These sandboxes help us learn from real situations, avoid big risks, and keep making better rules as we go. They also support innovation while keeping security tight.

It's also important that the people making the rules in the industry and universities work together to create common standards. These standards would be about how data is handled, how systems talk to each other, and how to keep everything safe and ethical.

To get good regulations, lots of different people need to join in and help make the policies. This means involving regular people, tech experts, and legal scholars. Plus, users should be taught about their rights and what using a digital twin means for them.

Finally, these rules can't stay the same forever. There should be regular check-ups and updates to keep up with new technology and changes in society. In short, we need smart and flexible laws that respect people's basic rights but also fit the special nature of digital twins. India can learn from what other countries are doing, but it needs to make sure the rules fit India's own culture and legal system. This way, India can have technological progress that is responsible and fair.

CONCLUSION

There are many problems with new digital technologies like digital twins, especially where technology and law meet. Since digital twins are becoming smarter and more independent, the old laws about who is a person and who owns data don't work well. This study shows we need careful changes in the law that cover data protection, intellectual property, who is responsible for problems, and even some limited legal rights for digital twins themselves. If laws don't keep up, technology could either get stuck or suddenly spread without any control, which would hurt human rights and responsibilities. So, it's important to find a balance that lets technology grow while protecting people. Lawmakers and judges should make flexible rules that can change as technology changes. A famous judge, Oliver Wendell Holmes Jr.,[15] once

[15] Oliver Wendell Holmes Jr, 'The Path of the Law' (1897) 10 Harvard Law Review 457, 469.

said, "The life of the law has not been logic; it has been experience." That means laws change as society and technology change. Following this way of thinking will help make sure that the amazing chances and new problems digital twins bring are handled wisely, fairly, and for the good of everyone.

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