Prospects and Challenges with Legal Informatics and Legal Metrology Framework in the Context of Industry 6.0

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Abstract: Industry 6.0 is viewed as a futuristic industrial evolution. It aims to set the synergy between man and robot by providing the wealth affluence away from the trade, and customers solutions that would provide progress to the world in every field across all planetary boundaries. Industry 6.0 comprises numerous promising technology such as quantum computing, artificial intelligence, machine learning, cloud computing, and quantum artificial computing. These technologies have the massive capabilities to help the legal industry, metrology industry and many other organizations attain their goals by delivering excellent and best-suited insights. In the future, these technologies will assist the lawmaker and jurisprudence in improving the old law justice system into the advanced one. In this article, we first introduce a glimpse of industry 6.0 from the outlook of legal information, digital transformation in metrology, and strength, limitation, opportunities, and threat analysis in brief. Then we discuss key technologies of industry 6.0, framework of legal informative, a futuristic model for a legal informatics system based on quantum-based AI, machine learning, and digital legal metrology and its challenges in adoption in regard's Industry 6.0. In subsequent sections, we discussed requirements, challenges, and progress in developed countries, preparedness of academia and industry in India. Then, we brief challenges for legal metrology in the future, opportunities for legal metrology in future legal challenges faced by lawyers and legal metrology, limitations of the study, research implication, and conclusion. Finally, the finding shows that industry 6.0 technologies have enormous capabilities to bring a revolutionary change in the legal industry but are present in the new born growth stage.

1. Introduction

During the last many years, manufacturing industries and business organizations have willingly moved toward the adoption of new technologies for improving their production system efficiency, data transparency, sustainable production, and real-time monitoring. In the present scenario, the digital transformation, the unification of new technologies and information technology, such as electronic communication, electronic sensors, IoT, cloud computing, artificial intelligence, quantum computing, and anti-fragile

concepts in metrology are at their peak stage and it resulted to the birth of industry 6.0 and gave birth of Atma Nirbhar (Self-reliant Bharat) Bharat of GOI (Government of India) missions [1, 2]. For instance, the sensors, distinguish methodologies and other digital technologies would play a significant role in the evolution of industry 6.0 for setting the connection between the real world to the virtual world. As an entire summary, the efficacious implementation of industry 6.0 needs the use of present-day digital technologies such as quantum computing, AI, cloud computing, data storage, and security. For example, the EM (European metrology) department is using metrology clouds for checking the accuracy of the process, its valuation as well as the market observation that would help them in developing the base of a digital solitary arcade from the European viewpoint [3]. That is why, the need for industry 6.0

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and digital technologies in metrological amenities are required for achieving the digital quality structure for speeding the industrial development, growth, conventionality assessment, innovation, market checking, and standardization of the product [4]. Industry 6.0 is defined as the futuristic idea where every individual's thought would be commanded through engaging the human brain and work performed with the help of automatic robots by enwrapping all the cosmopolitan boundaries [5]. As a result, business organizations, and manufacturing industries are rapidly exploring industry 6.0 to meet the worldwide challenges of inconsistency, optimization of processes, and environment-friendly technology with low economic cost [6]. Industry 6.0 is the assortment of human intelligence [7], quantum computing [8], the co-working culture of humans and robots, artificial intelligence, and anti-fragile sustainable goals [5]. It is capable of connecting the physical system to the digital world [6] outside the planetary boundaries. According to Chourasia [5], industry 6.0 gathers various ideas from industrialists, business people, leaders, scientists, and researchers. It works on the exclusive concept of customer-driven, customer-oriented, effervescent supply chain management, robotic flexibility, magnificent interconnected industries, and business-to-appropriate interactions among the intensive and extensive across the world and managerial areas. On the next side, a radical change occurs in digital transformation in production, business model, and value creation which creates new challenging environments for enterprises in day-to-day business life [9]. With the intention of this, organizations have to develop new strategies in an adequate frame of time under the government law, statutory provisions, and judicial bodies to reduce the risk of accountabilities under criminal and civil law for the organization and their bodies [9]. In the present scenario, the inducement of technologies is spreading its wings with the speed of light, because of which government policies, laws, and judiciary systems are changing abruptly and creating lots of complexities for the adoption of legal castigations and use of technology in LM (legal metrology). Metrology is the study of measurements that introduces the units and distinguishes techniques for weighing and measuring, based on laws and regulations globally. But due to progression in science and technology as well continuous enhancement in digital technologies push the metrology toward the legality. Therefore, to measure the weight for profitable drive and trading business purpose there is used of legal metrology, where it retracted the standards of weight and measurement Act 1985. In simple words, legal metrology is the claim of legal requirements to measuring and measurements the instruments [10]. Technological change triggered the

development of distinguish variety of nobel measuring instruments and processes that expands the opportunity of metrology [11]. The technology's predictable challenges includes introduction of digital weighing equipment's, fast flow of equipment in market, cost of maintenance of metrology devices, calibrations for various weighing equipment's cost in metrology and criminal law, civil law, legal liability, data security, trade boundaries, data rights [12], and data mismanagement [13]. Additionally, it is vigorous to explain the right interaction of digital technology of industry 6.0 with legal constitution. But alliances of digital technologies with legal trials must have enhanced the probabilities of data threat, legal liability, data security and hacking of data information system. To address all these current issues, the concept of a legal information system has been addressed in industry 6.0 and would also play a crucial role in developing a legal information system. Legal information system came into the existence in 1995 and illustrates the relationship between jurisprudence and computer [14]. Legal informatics is the synergy between man and machines in statutory processes to solve their problems, about all the laws, data protection, right to seclusion, and data security [15]. Legal information system has a tremendous ability of legal conscripting to accomplish several law activities and a tendency to create new legal cognitive models. Moreover, legal information is an area that is growing in the field of technologies too such as artificial intelligence, cloud computing, cyber security, big data, additive manufacturing, smart factories, and virtual reality [7, 8, 16]. The application of industry 6.0 would also show an imperative part of the legal informative system as a reinforcement of jurisprudence activities. In industry 6.0, all the technologies such as data science, quantum computing, cloud computing, artificial intelligence, cyber physical system, automated robots would have work together to create a legal paradigm that make the work easier and substantiate. The computational and data science-driven legal innovative populations models would be made for improvement of existing legal models. The new models will be developed with the use of industry 6.0 tools such as artificial intelligence, quantum computing, cloud computing, cyber physical system, and automated robots. Implementation of legal informatics in industry 6.0 would guide the industrialist, businessmen and clients on the several matters related to data privacy, management information system, litigations, compliance, and security-related issues and efficiently manage all the legal tranquil in internal and external processes of the organization in cutting throat competitive environment [17]. Further, quantum computing [8], AI, cloud computing, Internet of Things, cyber security and system integration [18] have all

the possible abilities to bring the changes in the era of legal informative and metrology sector. For instance, in metrology quantum lies measurement technologies would simplify the accuracy and precision of the measurements that is keep concern with SI (International Sytem of Units) for several applications [19]. Industry 6.0 is the futuristic concept where technologies would provide system integration, simulation support, real-time data information and big data that support to recognize the system fault, miscalculation, optimizing the production flow and also mending the legal informative services in perspective of industry 6.0 [20]. AI is the powerful tool of industry 6.0 where lawyers, can easily fetch the all past and existing information regarding to judicial cases and make work smoother. Industry 6.0 has tendency to develop unique insight into the legal circle in seconds using the technology of AI [21]. The industry 6.0 works on the various pillars of digital technologies such as IoT, quantum computing, antifragility, digital twins, transparency in data, and dynamic supply chain 22]. While a usage of quantum computing technology, lawyer to streamline their study and paper work. Quantum computing would provide enough advancements in field of law through which system would be able to generate automated legal advice to lawyer. This is one of the powerful tool of industry 6.0, it would provide predictive analytics that could help law practices to understand outcomes of cases and refined results. It would also assist the lawyer to understand client behavior and selection of right prosecutor for national and international cases [23]. The incorporation of industry 6.0 digital technologies with legal system would definitely come out with the outstanding results in operational efficiencies, cost-effective solutions, precise law decisions practices, real-time status of cases and revamp the eminence of legal services in entire the globe without debilitating the human rights [23, 24]. The central objective of this research paper is to study the role of industry 6.0 technologies in legal informative field, to find out legal potential challenges and legal risks factors to implementation of legal informative system with industry 6.0 and also to prosper the connection between them. On account of all, the legal informative system should able to embrace the digital transformations of industry 6.0 so that rapid transfer of right information, data security, AI-based solutions, legal analytics using quantum computing, document automation [25], electronic contract generation, legal mechanism [26], smart legal contracts in license data and right to personal information [27], robot attorney's [28] can affirms. It has been seen that few extent research has done over industry 6.0 which keep concern with the sustainable legal informative domain. Thus, the following research questions are to be addressed in present research work:

Question 1: To study the need for industry 6.0 in the legal informative system and digital transformation in the metrology system.

Question 2: To find out the techniques which could support a legal informative system in the context of industry 6.0

Question 3: To develop a hypothesis framework and futuristic model for a legal informatics system based on quantum-based AI, machine learning concepts, and a framework of digital metrology based on cloud computing and its adoption challenges.

Question 4: To study the requirement, challenges, and progress in developed countries and the preparedness of academia and industries in India in the context of digital metrology.

Question 5: To study legal challenges and opportunities in legal informative and legal metrology in industry 6.0.

2. Need for Industry 6.0 in Legal Informative

The need for digital technologies in law/jurisprudence has been a growing trend in the last few years. In developing countries like India, the legal system is negligibly touched with IT support and industry 6.0 technologies such as quantum computing, the Internet of Things, cloud computing, artificial intelligence, machine learning, and other IT-enabled advancements. The law system is still working with its traditional style, demanding lots of resources and hard work. These hard-core law conditions can be improvised with the futuristic concept of Industry 6.0 technologies. These technologies can provide outstanding support to the present judicial system instead of enormous, complex work. Indian legal system has infinite possibilities for improvement that can be accomplished with collaboration with industry 6.0 technologies. In of present scenario, the Indian law jurisprudence system of developing countries is very sluggish and disorganized where maximum cases are still pending due to the fewer numbers of the ratio of judges per case and time-consuming court proceedings. Regardless, the above-said condition is still not improved over the last many years because of many constraints such as political, financial, technological, and many more. Thus, now it is time to take a wake-up call for legal communities to reconnoiter themselves and explore a new perspective of innovative processes and computational methods that can enhance their existing worse condition of the justice system. The art of the state of industry 6.0 can give a new look to the jurisprudence system with the assistance of enabling artificial intelligence, quantum computing, IoT, and machine learning in a more effective, efficient, and optimized way. That is why there is a need for industry 6.0 in

legal information so that tremendous change could be brought in the area of the legal province with the assistance of digital transformation.

2.1. Need for Digital Transformation in a Metrology System

Each country possesses its own individual vigorous measurement system that consists of a chain of laboratories, standardized facilities, and accreditation governing bodies as per the need for national quality infrastructure. The legal metrology department of any country makes the rules and regulations and imposes on the metrology trade and BIS (Bureau of Indian standard) that deals with written standards of products and services [29]. Now digital metrology is a need of the metrological department. Digital metrology would bring a good understanding that would be beyond the measure. It would help to develop, interpret, and apply the measurement outcomes to detailed situations. By using enabling technologies of industry 6.0, the VL (virtual links) of distinguish calibration laboratories or testing laboratory can perform their jobs remotely or online through the transfer of data despite the physical transport of instruments. By using enabling technologies of industry 6.0 in the future data can be transferred from the testing laboratories to client scenes electronically. The digital transformations in legal metrology can only be established by implementing, cloud metrology, IoT-based digital framework, big data, AI and digital twins would be adopted in the future that is why there is a need for industry 6.0 in legal metrology so that tremendous change could be brought in the area of the metrology province with the assistance of digital transformation. Table 1 shows strengths, limitations, opportunities, and threats during the adoption of digital transformation in metrology [29].

Contrasting the Internet, cloud computing is in its initial state in the field of legal metrology. From the literature, it has been studied that in 2012, the European Commission estimated that 250 euro billion in GDP can be generated in an upcoming year, i.e., 2020 by the implementation of cloud approachable policies in contradiction of 88 billion euros in the environment of "NO INTERVENTION" environment and bringing to more collective controls from 2015 to 2020 of 600 euro billion with the generation of 2.5 million more jobs [30]. Cloud will work effectively when countries have good IT infrastructure for their consumers and stakeholders. Now cloud technology is not un-touch with the legal metrology field. No doubt, cloud computing would bring new prospects in the field of measuring systems that are bare to legal control. Cloud computing offers servals aspects to manufacturers of measuring the world and they are utilizing it by use of virtualized infrastructure in developed countries. For instance, legally relevant

measuring data are stored remotely or complete data is transferred to clouds, i.e., on external servers. In the cloud, all data of individual measurement is stored easily for all the instruments and make experts surveillance work easier, when they wish to test the instrument from a remote area. Hence, the native instruments can reduce physical sensor that is combined with minimum communication unit that are providing admittances to open network. For instance, sensors, that assist technologies as proposed by Europe in the digital agenda in 2020 [31].

3. Literature Review

The present paperwork has been categorized into 10 phases. In the very beginning phase, the basic introduction of legal informatics, legal metrology, and industry 6.0 is explained. In the second phase, the need for industry 6.0 in legal Informative and legal metrology is illustrated. Iin the third phase, the literature review and the transformation journey from industry 4.0 to industry 6.0 are addressed. In contrast, in the fourth phase, key technologies of industry 6.0 have been illustrated. The fifth phase of the paper covers the framework of industry 6.0 in the legal Informatics system with its challenges in the adoption of the framework. In the seventh phase, a futuristic model for a legal informatics system based on quantum-based AI and machine learning in Industry 6.0, is explained in brief. Further, in the eighth phase, the framework of digital legal metrology in context with cloud metrology is explained as its challenges in the adoption of the framework. In the ninth phase of the paper, we discussed requirements, challenges, and progress in developed countries. In the tenth phase, we discussed the preparedness of academia and industry in India in the context of digital metrology. And at the end of the paper, the limitations of the study research implications, and conclusions in the future were addressed.

3.1. Revolution Voyage from I.4.0 to Industry I.6.0

We, humans, have been encroaching toward the up-gradation of industrial revolutions to chase effective and efficient production throughout history. The IR-1 started in late 1784–1800 and was lied on the concept of the mechanical production system, the introduction of the steam engine, and water power usage [28]. IR-2 (1870-1914) has one step ahead of the previous one; mass production use of electricity for production and assembly lines was the core theory of IR-1. The IR-2 is extended further and turned into the IR-3, and computer-based knowledge and automation come into the picture or the transformation of hard analog systems into the digital system [12]. As time

Table 1 Shows strengths, limitations, opportunities, and threats during the adoption of digital transformation in metrology

S. no	Strength	Limitations	Opportunities	Threat
1	Capability to develop the economy of the country and society	Required highly skilled and qualified workforce to understand digital technologies	Coordination of conformity valuation and market observation	Required strict security system and protocols for sharing and coordinating measurement information
2	Make strong legal metrology standardization process, accreditation, market lookup, and confirm the assessment	Quantum-based digital technology is expensive and required a huge infrastructure setup	Online checking of faults, condition monitoring, and self-decision-making	Requires excellent metrological traceability and self-identify intelligent system
3	Fix the link between the non-virtual and virtual worlds	Remote maintenance is the biggest challenge in digital communications	Synchronization in legal metrology standards, documentation, and market observation. and service standards	Chances of arguments may be created between legal people and technological people
4	Employing the development of a smart metrology system, a single digital market for metrologists	Remote diagnostics and calibration are the challenges in front of the metrology department while using digital technologies	Chance for developing 5G communication channel	Required cloud services for storing the real-time data of measurement
5	Generate new job chances and innovations in the field of legal metrology	High-budget infrastructure with 5G enabling Internet connectivity	Finding new ways to lessen	Semantic methods or technologies are required for fixing the link between virtual and physical systems

passed, IR-3 entered into the new paradigm of revolution, i.e., IR-4. Currently, industries are working on the impression of industry 4.0, which is based on mass customization rather than mass production, the conceptualization of modularity, cyber physical system, 3D printing, real-time data capability, and robotization. IR-4 concept came to light in 2011 and pushed the entire world to digital automation [5]. As we move further, IR-5 comes into the frame with supporting high-tech technologies such as artificial intelligence, machine learning, deep learning, and the Internet of Things., strengthening the IR-5 [32]. According to Demir et al. [33] co-working culture of humans and robots, the growth of smart societies, artificial intelligence-enabled robots, data unification, mobilization, sustainability, and bio-economy led to starting of IR-5. The core idea of IR 5 is moving from mass customization to personal customization. IR-6 is the futuristic vision of researchers that believes in anti-fragile manufacturing, mind control machines, cloud renewable energy, human co-robot-centric, homogeneous assets, hyper-connected industries, quantum computing, etc. Figure 1 shows the transformation journey from industry 1.0 to industry 6.0. Moreover, industry 6.0 is based on quantum computing and real-time information transfer to several systems and their sub-components to bring transparency to work and enhance digitalization in the whole service chain. Quantum computing is a new technology that works 158 million times faster than any supercomputer globally. It comprises a high-performance capacity that easily gauges the millions

of data through qubits, can run millions of algorithms, and performs predictive analysis and data analytics in seconds [34]. In today's time, QC works as a powerful weapon where clients' data privacy is a topmost priority, especially in the time of excellent cloud and distributed computing. Quantum computing has the inherent supremacy to expand AI-based systems in forthcoming years. Such quantum computing can develop digital subordinates which would be AI-enabled with actual circumstantial responsiveness and can easily coordinate, interact and make the people understand [23]. Here researchers hope that QC has high computational supremacy that would meet the exponential singularities of AI. It has been found that AI can work excellently flourishes when a huge amount of data is given to the AI system to analyze, store, recognize, classify, and more accurately, precisely organize and categorize huge data as per specific requirements [35]. Quantum computing systems have excellent memory to save enormous data that can be processed at a very high speed and are easier to cater to as artificial intelligence. AI analyzes the set to remove several irregularities from data and produce authenticated ones [36]. However, these irregularities in the data create lots of trouble and yield huge challenges in front of professionals to get accurate data on an internal working system. Quantum computing is the backbone of AI because it is observed that without quantum computing and no artificial intelligence and machine learning can work [34]. Because AI and ML require millions of data for generating algorithms and to achieve precise results. And

these data can only be provided through quantum computing. In quantum computing, computers work with countless numbers at an implausible rate and super speed of data searches [36]. It is observed that AI can work excellently flourishes when a huge amount of data is provided to the AI system and AI analyses, store, recognize, classify and accurately, organize and categorize huge data as per specific requirements, and provide excellent results. The collaborative work of quantum computing with AI would enhance the operational efficiency of the legal system. It can also help them make the right decisions in the law industry and maintain authentic records of important information. Quantum computing is the high-tech technology that would make computers faster, about 50-quilt in the future, and smarter through factors prime, statics, algorithms, complex coding, maths, and simulation [37]. These technologies are used to solve unbelievably complex processes and calculations with a huge amount of data. Most researchers believe that quantum computers will take artificial intelligence at a great pace forward. And it would prove highly safe and reliable for data evaluation and forecasting over tasks in the future [38]. Industry 6.0 focuses on quantum AI computing, where quantum computing and AI will work together to compute ML (machine learning) algorithms. Because of the advantages of QC, AI would be able to achieve these results that were not thinkable to attain from classical computers [39]. Although AI is a problem-solving technique that enhances the efficiency of collected data in several ways over the past periods, it has still not yet come out from many technological constraints, such as artificial general intelligence (AGI). AGI is the depiction of broad human intellectual/cerebral abilities in software so that the developed software can face all the unfamiliar tasks. It can perform every task that human is competent in [39]. These constraints can be eliminated in the future with the assistance of quantum computing, where QC can be used for creating optimized algorithms by providing rapid training to machine learning models. A secure and optimized artificial intelligence offered by QC could utter years of data analysis in a minimal period [40]. Further, cloud computing uses remote servers for storing data, managing, and processing the data to achieve better and improved services that would be most cost-effective, reliable, and possess good quality [41]. Currently, quantum-based cloud computing is in its initial phases of development. It would open the door for all the possibilities to enter the era of automation of composite legal reasoning which is called computational law. The progress in the infrastructure of cloud quantum computing would have the ability to create the CLA (computational law applications), would be highly proficient in computing and analyzing several compound patterns at less power consumption to provide as per the demand of the client or

on-demand legal assistance. If a legal firm can use quantum cloud computing models, the firm can make maximum profit in terms of money, services, client satisfaction, etc. Big data is the technology that helps an organization make critical and complex decisions by using millions of data, whereas quantum computing can boost the value of big data. In the instance of big data, quantum computing has numerous promising capabilities to deal with various decisions and predicting factors and form more accessible predictable prototypes that can deal with loads of big data and add more feasible variables in the equations without slow downing the process with effective use of data [42].

3.2. Legal Informatics

The term coined legal informatics consist of two separate words. The first one is legal, which refers to the law. And second denotes informatics, defined as an area of information science that belongs to information processing and computer technology [43]. In my own simple words, legal informatics is the science that involves the several applications of legal rules and principles to the dispensation of information and confirming its submission with the law that pertains to obligations, right, data protection, and individual privacy rights. Many individuals and
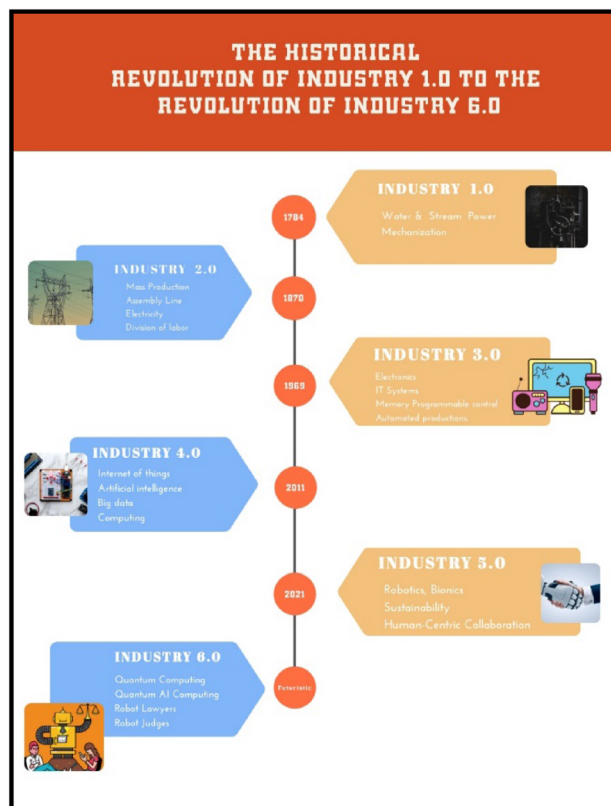

Fig. 1 Transformation journey from industry 1.0 to industry 6.0

associations have different points of view toward the legal informatics system. According to the American library association, legal informatics combines information structure and technology that provides access to the organization for storing, retrieving, and distributing information in the legal environment [14]. As per the view of Professor Peter Seipel, legal informatics is Jurimetrics. The jurimetrics keep province with the quantitative analysis rather than qualitative, where all the information, computational, and communication theory in the legal system uses mathematical formulas, logic, and calculus for predicting the solutions to legal problems [9]. In the current scenario, legal informatics is widely contributing to society in various fields such as case management, law office automation, legal administration [44, 45], and E-governance [46]. Due to increasing trends of ease of digital technology and computerization, all the administrative governance, E-governance, and legal system is heading toward digitalization. According to Don Tap Scott, an E-government is a government that connects new technologies to the central legal system; it turns everyone, such as taxpayers, business people, lawyers, judiciary system, and connects everything digitally [46]. According to Hinson [47], the main aim of the legal system is to keep the focus on the information technology field and its advanced technologies that can be used in the legal system. Daksh [48] has developed a regulatory framework for justice authorities. At the same time, the E-legal platform was developed by Sharma et al. [49] to stir the current Indian justice system. Sharma et al. [24] described the involvement of AI (artificial intelligence), ML (machine learning), NPL (natural language processing), DP (deep learning), and IT (information technology) in the legal system. These technologies would help people file their complaints and queries from any place to the police station with a secure line and eliminate individual visits to the police station. According to Saarenpaa et al. [50], LI deals with legal information, information law, legal information processing, and ICT law. Legal informatics does not only keep concerned with the information and computer law which provides information but also closely emphasizes the application of information technology in law.

Scherer [51] discussed AI and legal informatics, where the author concluded that AI could help law practitioners resolve legal clashes with their patrons by using AI algorithms to provide many solutions to single problems. Currently, digitization in legal communities is not so easy because of global corruption, lack of understating, financial barriers, swift changes in technologies, cyber risk, IT advancements, and polyglot information management. Usually, these challenges are faced by the law system due to rapid transformation in information technologies that require enough skill [9]. As per the author's knowledge, the legal system should have learned the depth of technologies to employ and get better and more effective results. They have to come out from the fear that the growing association with digital technology and law will tend to unemployability in the law industry [52].

Further, it has been observed from many law-based studies that if the legal system keeps focusing on its managerial actions, formal documentation of legal requirements [53], good governance, and correct decision-making processes, then it would become easy for the legal system to reduce the gap between the client and legal law with a peak of client satisfaction. Moreover, the application of industry 6.0 would have the ability to bring the dynamic explosion in the legal firm to providing quantum decision-making solutions to the judiciary system within seconds, easy retrieval and solve of colossal algorithms [5], ease the law practice between the advocates and legal profession [52], ease the client's legal justice system automatic generation of receipts, text mining [53], and robot assistance lawyers (AI Bot) to legal advisory institutions. The robot assistance lawyers (AI Bot) will elucidate the advice and dependability and correlate several factors in real judiciary case issues [54].

3.3. Role of Industry 6.0 in Legal Informatics

Industry 6.0 is defined as the futuristic idea where every individual's thought would be commanded by engaging the human brain, and work would be performed with the help of automatic robots by enwrapping all the cosmopolitan boundaries [5]. Industry 6.0 would develop the link between the lawyers, the judiciary system, clients, and robots. The researcher, academician, and lawyers have started to work together to develop a high-technology robot lawyer; if it succeeds in the future so it will open a new horizon for the legal system and will make legal advice ease for all the immigrant people from multilingual backgrounds and also transforms the face of legal informatics area. With the arrival of robots in the legal judiciary system, the law would sense an immense change in its system, and that would make lawyers' and judges' work more accessible by reducing the cost as well as constraints which are ingress to legal services for a person due to high cost that can be only afforded by rich people [55]. Industry 6.0 will focus on robot judges and robot lawyers. It seems to be a real-life science-fiction concept, but this would come true in industry 6.0.

4. Industry 6.0 Key Technologies and its Challenges

With the tremendous growth of digital technologies, the world insanity is moving toward digital transformation

where tonnes of data are continuously obtained from IoT, nearly transforming the whole world toward the concept of industry 6.0. Quantum computing, AI computing, AI, IoT, machine learning, and other industry 6.0 technologies can assist law developers in supporting the legal judicial system. The implementation of industry 6.0 technologies in legal informatics can help the clients, lawyers, government, and judiciary system keep proper documentation of records, monitoring and analyzing the judiciary cases and their impacts on the legislation system [56]. Implementation of industry 6.0 will motivate the law people and citizens to participate and understand the new methods of the legislative process. Table 2 presents the key digital technologies of Industry 6.0

5. Framework of Industry 6.0 in LI System

Developing a legal informatics framework for the legal system will provide the stage and authority to the legal system that can provide legal assistance to the legal industry in the future. The primary profit of developing the LI framework for the legal industry is to assist the legal judiciary system, justice-ability to legal process, and accountability to stage authority. After an inclusive literature review, the present study proposes a framework for legal informatics that could help the legal system in a future perspective. Figure 2 illustrates the framework of the legal informatics system. The theoretical framework of a legal informatics system consists of seven components such as first industry 6.0 technologies, legal education and documentation, cyber legal law, operating parameters, regulatory bodies, legal challenges, and LI system implementation. In the first component of the LI framework, digital technologies of industries 6.0 will be introduced into the legal system. A brief description of the following is addressed below:

5.1. Introduction of Industry 6.0 Technologies in Legal System

The primary purpose of introducing these technologies in the legal system is to provide the ease of accessibility of legal services to every client. At present, the law system of India is very complex and steady; the proceedings in court take a much longer time to reach the final judgment or a few years. This is due to less awareness of digital technologies and their implantation in the legal industry they are still working with an inefficient, traditional approach

that demands enormous numbers of human resources, energy, more time, and enough financial support. The ultimate focus of these technologies is to use the supremacy of digital technologies of industry 6.0 such as quantum computing, artificial intelligence, machine learning, and artificial cloud computing to transform traditional legal informatics systems into digital legal informatics systems. Industry 6.0 technologies tend to revise, renovate, reshape, and modernize the present legal system to make it more efficient and easy to use for all people. Industry 6.0 would be proved a boon to manufacturing industries by connecting them through a dynamic supply chain, transparency in information flow, and increased industries' profit in every aspect [5]. From the literature review, it has been found that the UK government has started to use AI-based services to deal with civil legal cases that arise from road casualties by virtual modes. This kind of AI assisting virtual hearing can help clients with casualties and improve customer services with minimal costs [69].

By using AI, customers need not go outside the city where they are working or live; they can avail of the AI services. Industry 6.0 is also moving forward with the future vision for establishing a legal and ethical framework for quantum computing. This would ease the work of legal informatics systems such as solving the case pendency, judicial decision on numerous cases, time-consuming tasks, and the poor ratio of cases over judge's calculations. It can easily be solved by using a legal and ethical framework for quantum computing where several components of QC are armed with artificial intelligence, so the binary codes, neural network technology, and quantum software will provide outstanding results to all the above-said problems [35]. Further application of quantum computing to quantum analysis, sense, quantum simulation the millions of legal documents in seconds with the help of a quantum algorithm and would provide outstanding results [42]. In the upcoming days, a collaboration between AI and auantum will bring a new skyline to the whole legal system of the world.

Moreover, suppose quantum computing AI technology implementation has started in a legal firm. In that case, it will accelerate the entire legal profession's practice and bring a revolutionary change in the legal paradigm, and will teach lawyers new technologies that make their work easy. The sole target of introducing quantum computing and quantum computing AI is to fill the gap between the legal system and technology so that the legal activities of lawyers, judges, and judiciary system can be sped up and clients and society can be benefitted. Nowadays, cloud

Table 2 Key digital technologies of Industry 6.0

| S. no	Industry 6.0 technologies	Explanations	Advantages	Barriers	Applications
A	Quantum computing	• It is a sort of computation that binds the several properties of quantum phases like interference, entanglement, and the concept of superposition for solving quantum computations [57] • It works on qubits which is the basic unit of computing and useful for the security of data stored in a quantum field [58]	• This technology makes the calculation much faster than the traditional system [38] • It helps law firms with data analytics by providing sufficient advancement in technology • This technology will provide automated legal advice to lawyers and judges by interpreting laws freely [23] • It tends to solve any calculation in 200 s • It tends to transform cybersecurity before 2030 or may be beyond [59] • This technology can solve complex problems with extraordinary speed [59]	• It is costly technology and is still on under development • It performs calculations errors up to 10 to 100 times more than classical computers • It provides noise and interference of qubits because of which errors are produced	• Cryptography • Banking Sector • Automobiles • Health sector • Travel and Transport
B	Quantum artificial intelligence computing	• It is the combination of quantum computing and artificial intelligence, where they work together and would provide insignificant results to the law system • Quantum AI employs a machine learning algorithm for computation purposes [60] • Quantum artificial intelligence is the sort of computing in which AI algorithms are specially designed for quantum computing to perform a task. Both work simultaneously and contribute to fast calculation in minimum time with numerous benefits [60]	• This technology provides a less mistake-prone and more powerful system • It can be used as an open-source model and for training purposes • Persuasive applications of artificial intelligence help quantum computing to perform unbeatable results [39]	• One of the highly vigorous challenges in implementing QAI computing is the scarcity of resources for design • Lack of organization/system interest in embracing new technologies • The design of the algorithm structure and its verifications is one more challenge [61] • The organization required a huge-scale quantum computing circuit system for efficient execution which required architecture support [62]	• Climate Change predictions [61] • Quantum Property Testing [62] • Automobile • Health care system [61] • Space exploration [41]
C	Artificial intelligence	• It is the technology that refers to the imitation of man's intelligence to machines through proper programming by using AI algorithms [63] • It is a part of information technology where it comprises probability, data mining, statistics, problem-solving models, decision models, and maths [63] • AI reconnoiter several data by using various open data sources by coalescing ANN (artificial neural networks), the Internet of Things, Mathematical models, genetic algorithms, etc. [41]	• It reduces the time to perform the job • It helps to take fast and accurate decision-making during the judgment time • It helps to reduce human error. Because AI uses all previously gathered data and a group of algorithms before giving any decisions • It provides digital assistance to customers. eg chat-bot • It helps the medical system to solve intricate problems. Eg Recently AI-based technologies were used to predict the starting phase of breast cancer in women	• Its implementation in legal informatics systems requires high costs • It will have increased unemployment because AI-based lawyers would replace human lawyers [64] • AI does not contain ethics and moral values like humans and that can be very difficult to integrate into an AI. So there would be more chances that AI will wipe out all of humanity [64] • Neuromorphic cognitive models, adaptive machine learning, or reasoning under vagueness are approximately fundamental challenges of AI	• Banking Sector • Automobiles • Health sector • Legal system • E-commerce • Gaming • Finance • Education • Surveillance • Agriculture [13]

Table 2 continued

S. no	Industry 6.0 technologies	Explanations	Advantages	Barriers	Applications
D	Cloud computing	• Cloud computing is a technology that relies on the Internet • It uses an outskirts server to store the data, manage the data, and effectively processed the data economically [65]	• Cloud-based technologies enhance the reliability of the system by lowering the fear of losing the data of clients • It helps the legal system to store a large amount of data in clouds and save human and IT and machine resources • It reduces the attorney's time that is consumed during arranging appointments, managing legal documents, billings, voicing, etc. [66]	• One of the biggest challenges in cloud computing is the safety of personal/confidential customers' or clients' data • Data privacy • The anxiety of handing over control of data [71] • Data Hacking • Third-party admittance issues [66]	• Education Sector • Entertainment Industry • Health care Sector
E	Robot judges and robot lawyers	• Robot judges and lawyers reduce the workload of human judges and lawyers by using their programming abilities that are enabled by AI, ML, QC, and deep learning • This technology will be designed in such a way that it will understand all the multilingual languages, able to articulate hypotheses and monitor the changes that occur in the legal system [67]	• Robot judges will edify the legal reasoning of human judges [68] • Better decision-making by using algorithms [68]	• Increase rate of unemployment • Lack of emotions • Robots could develop their communication language as occurred in the Facebook project. That could be proof very dangerous to humans [67]	• Judiciary system • Legal Informatics • Courts
F	Big Data	• This is the technology that extracts data from large and complex database and analyzes it, process it, and extract the information as per the requirement of users which is an impossible task for old data processing software system [68] • This technology helps the legal firm as well as other organizations also to take complex decisions [67]	• Big data would bring transparency to legal operations and tell the Clients about the fees means should have to know how much money they are paying for which services • This technology would develop building a client strong base	• Access of control • Data privacy • Data integrity • Rules and regulations • Data breach [14]	• Faster courtroom process • Believe in maintaining a client base • Health sector

computing keeps transforming the face of the legal industry by offering cost-effective services and profit to time-strapped attorneys. Cloud-based technology provides data protection and backup services to lawyers [70] and allows clients to take follow-ups of their cases from any place through real-time data monitoring [71]. Machine learning technology uses algorithms capable of developing empirical models by gathering information by pattern followed by received data. If these empirical models are correct, ML develops automated several decisions related to the case for a future perspective that helps the judiciary system a lot. From the perspective of big data, it would help the government administrations and judiciary system understand the ML and deep learning process to identify the several possibilities of illegal, criminal activities and cybercrime for mitigating actions [72].

5.2. Role of Legal Education and Documentation in Legal Informative System

The ultimate aim of legal education in legal informatics is to develop multi-purpose and inter-discipline purpose learnings that strengthen the entire legal structure. According to S.P. Sathe, a successful product of the education system is a lawyer that should be capable in the future of contributing toward the growth of the nation and
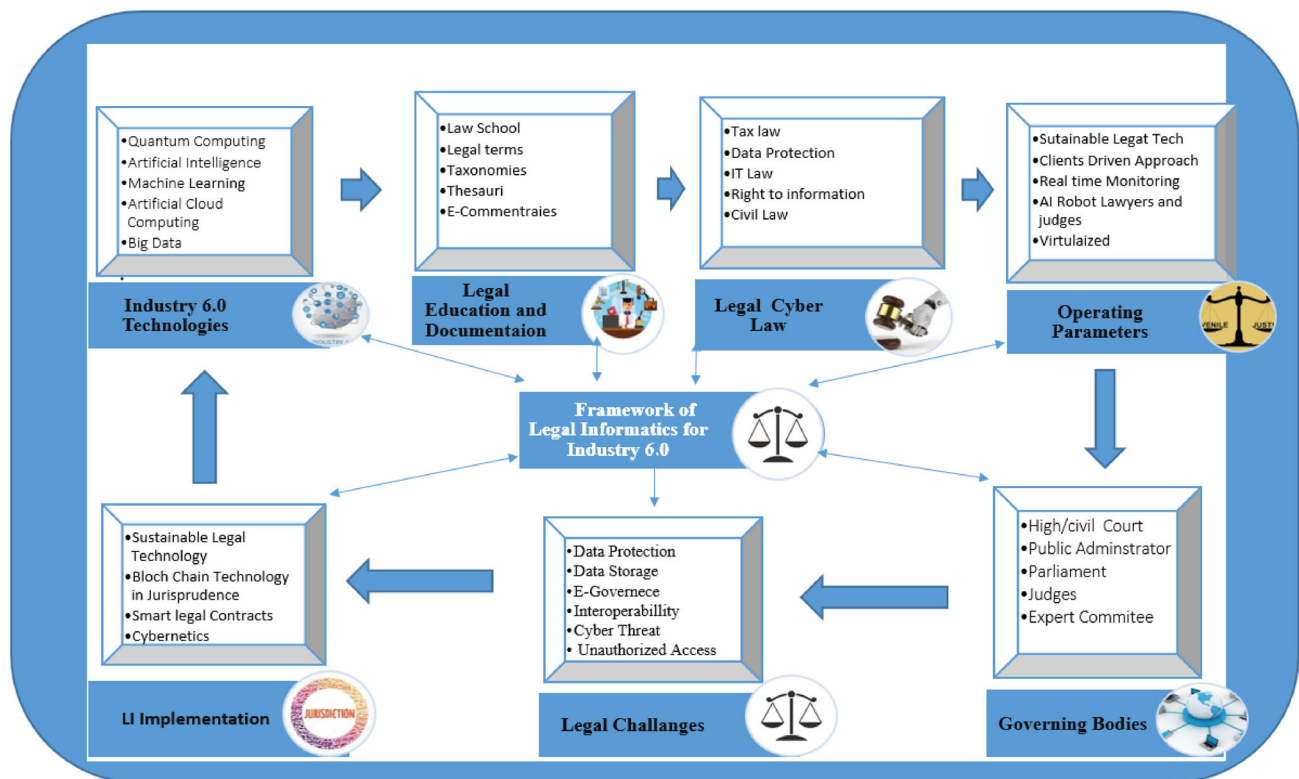
Fig. 2 Framework of legal informatics system

society and bringing substantial social change in a positive manner [73]. Industry 6.0 can transform the era of legal education and will produce exciting opportunities through which the future of law graduates and postgraduate law students can be transformed constructively. Industry 6.0 gives the massive propagation of digital technologies of auantum computing, simulation, AI, ML, deep learning, and cloud computing, high technology enables mobiles and 5G and 6G Internet connectivity which would offer a new paradigm and set a new path for educating students. This innovative education approach in law will reform the old trend of legal education. Law students are no longer required to study on university/college campuses to study the law; they would be able to take their bar lectures/classes from any part of the country [74].

The futuristic student of industry 6.0 will be the students who will emerge with the amalgamation of digital technologies and novelties. These students are the ones who would be incarnate in an atmosphere where everything would be automated and more organized. The legal system is highly affected by lots of paperwork used during the time of herrings of the cases and judicial judging. So, to solve this problem, the concept of E-review could be introduced in case management. So that judges and lawyers can manage the case comfortably from their homes or where

are they. On the other hand, lawyers are not required not to worry about supervising the files, documents, and affidavits of pending case judgments in several cases. Because the industry 6.0 cloud-based monitoring system will ring the automatic alert alarm to remind the date for them. Further, all the files and documents would be virtual in the CMS (case management system); lawyers are only supposed to bring their laptops/tablets to court.

5.3. Legal Cyber Law

Legal cyber law or IT law is the paperless law in the paperless ecosphere, which relates to the law of the Internet, where the legal system is sketched in such a way that it should be proficient in dealing with computers, the Internet, cyberspace, and more legal issues [87]. It is also in accord with the legal informatics that handles data flow, software commerce, and data security. According to the Ministry of Electronics and Information Technology of the Government of India, the identification of cyber law is to work with electronic documents and provide support to electronic-filling and electronic commerce and also decrease cybercrimes [88]. The critical areas of cybercrimes covered by the Indian IT act are illustrated in Fig. 3 [57]:

The birth of the cyber law or IT act came into existence after establishing the constitution, i.e., in the year 2000 on 17th October, to furnish with E-commerce and crimes attacks/cybercrimes in India. There are some IT Act guidelines published by Indian legislation in Table 3.

The main governing body of cyber law is the central government of India. Under this IT act, people can register their complaint or FIR to any police station by online mode without physically visiting that place. In addition, industry 6.0 technologies provide a wide range of access by using digital tools to effectively deal with complex crime cases. Additionally, lawyers should have adequate knowledge of these budding technologies of industry 6.0 to understand their consequences on law and its risks and have a tendency to develop a safeguard against them. In India, ITA (Information Technology Act) is the prime regulator of the legal justice system and was applied in the year 2000 [24, 77]. The main goal of ITA is to provide significant legal shielding and make E-commerce flexible services by providing actual information to the government at every period. Quantum computing and law would be proved cognate to each other, but presently, there are no particular regulations and laws in India that keep concerned with quantum computing. Hoever, MEITY (Ministry of Electronics and Information Technology) is answerable for all the policies regarding matters to IT and ADIT (Administration of the Information Technology), Act 2000 [78]. One more study in the USA reveals that Australia, China, and other European countries are moving faster to lead in quantum technologies. Now, India has also commenced nearly legal reforms in quantum computing, and these reforms are broadly associated with the laws adopted by developed countries [79]. Similarly, India has implemented the export of some information security systems by using quantum cryptography under the Foreign Trade Act, of 1992 but still working on quantum computing.
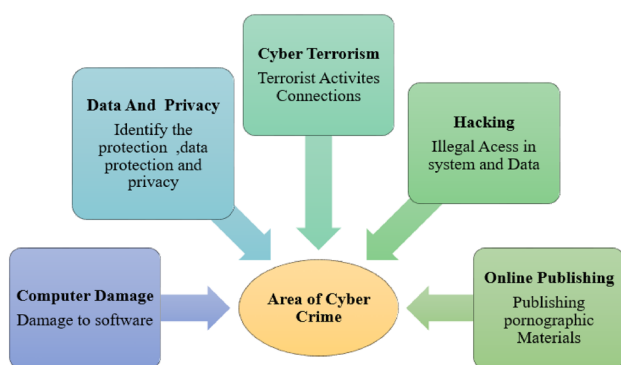
Fig. 3 Critical areas of cybercrimes are covered beneath the Indian IT act

5.4. Operating Parameters in Legal Informatics

Currently, sustainable legal tech is the new primacy of an informative legal system where law firms are continuously expanding their feet toward adopting new technologies for improving efficiency and law values. Sustainable legal tech intends to develop a judicial system that can make solid operational functions for the judiciary system so that members of the law industry could easily access it [80]. In sustainable legal tech, lawyers not only to adapt the changing economy and part of society but also work as a leader who would bring positive change to a law firm on a magnificent scale [81]. Innovation in the legal system is often driven by customer/client demands. So it is the responsibility of lawyers to employ their knowledge, experience, and expertise for goodwill to their clients and identify their needs and preferences to defend them [82].

To make healthy relationships with clients, lawyers must embrace the innovative skillset in the legal profession to be able to meet the requirements of their clients. This indicates that for achieving a sustainable legal tech firm or informative legal system, legal administration, lawyers, and judiciary system are required to set a sustainable legal mind in the law profession and to understand clients, their human rights, social challenges, and the digitalized world in the more economical way [81]. On the other hand, Industry 6.0 would focus on lawyer robots, which would be proved a boon for tomorrow's attorneys, and also be capable of providing prodigious legal assistance to every client. Robot lawyers and judges will assist human lawyers and judges in researching the cases, and the history of clients, drafting briefs and complicated paperwork, and also providing counseling to clients in the legal profession [83]. The dream of a robot lawyer can be accomplished by using industry 6.0-enabled digital technologies such as quantum computing, artificial intelligence, and machine learning and also make lawyer work more accessible and safe than ever thought.

5.5. Regulatory Bodies in Legal Informatics

The constitution of India provides guarantees lifetime protection, defense of fundamental rights, and personal liberty to everyone. The regulatory bodies in legal informatics have bonds with government administration, the supreme court, the high court, subordinate courts, legal aid, public prosecuting attorneys, experts, etc. [84]. The governing regulatory bodies are the backbone of the legal system. It becomes highly subtle when forming sustainable laws and policies for the legal system. Law-making governing bodies need to consider the emerging technologies of industry 6.0. This industry 6.0 revolution would bring a new revolution in the era of the legal system by providing

Table 3 Guidelines of Indian Legislation under the IT Act

S. no	Sections	Explanations	Penalty	References
1	43	This section refers to aggravation or attack on a computer system deprived of owner permission will be liable to this punishment	In such cases, lifetime imprisonment	[71]
2	65	This section refers to Snooping with the source code documents The source codes document is the collection of codes written so that humans can read	In such cases, imprisonment of up to 3 years and an Rs. 2 Lakh fine will be applied	[75]
3	66	This section refers to computer systems and cybercrime hacking, which involves computers and networks	In such cases, imprisonment of up to 3 years and an Rs. 5 Lakh fine will be applied	[75, 76]
4	66B	This section refers to imposing a fine for getting a stolen computer, communication device, and digital device	In such cases, imprisonment of up to 3 years and an Rs. 1 Lakh fine will be applied	[75, 76]
5	66C	This section refers to cheating, breaching the password	In such cases, imprisonment of up to 3 years and an Rs.1 Lakh fine will be applied	[75, 76]
6	66D	This section refers to Internet fraud or cheating using computer resources. or These sections miens into the matter related to Internet fraud or providing wrong information to the victim for taking money, property, and inheritance	In such cases, imprisonment of up to 3 years and an Rs. 1 Lakh fine will be applied	[75, 76]
7	66F	This section refers to the act of cyberterrorism	In such cases, lifetime imprisonment	[75, 76]
8	70	This section refers to attempting to open secure access to a password-protected system	In such cases, as much as possible fine and 3 years of imprisonment	[75, 76]
9	72	Fissure/Breach of confidentiality and privacy	In such cases, imprisonment of up to 2 years and an Rs. 1 Lakh fine will be applied	[75, 76]

accurate monitoring data information, transparency in the legal system and public administration, and promoting responsibility.

5.6. Legal Technology Challenges

Legal technology is changing the face of the legal firm with the velocity of light incredibly. This technology has an enormous capacity to change the map of the whole practice of the law system. But cyber threats, data protection, unauthorized access, extensive investment in technology, and global fraud are significant challenges to legal informatics systems. Data protection is the arranged application of official, technical and physical protection that saves personal data and privacy [85]. Legal firms are continuously working to maintain their clients' privacy and sensitive information. With emerging technology, interoperability is another challenge, where lawyers get various solutions to their case-related problems with the help of AI, IoT, etc. Still, it is difficult to decide which solution will connect and fit with the existing problem in the future [86].

5.7. Legal Informatics Implementation

It has been seen that lawyers are complaining about their workload and that they are overloaded. So to reduce their workload, the legal system is heading toward the implementation of sustainable legal technologies such as blockchain, digital business, and smart legal contracts. In the legal system framework, blockchain technology is assumed to be an essential part of it, which keeps all the recording details of transactions between two or more two parties by considering secure design [87]. This technology would help jurisprudence to perform proper verifications of legal documents and provide damage immune proof examinations that will enhance the judicial system's effectiveness and efficiency. The implementation of blockchain technology in the legal system will ensure the stoppage of unethical use of technology and financial fraud [23]. On the other hand, smart legal contracts are the legal contracts that bind all the contractual obligations, which are clearly explained in the form of or/and codes and performed spontaneously by a computer system. Its primary purpose is to increase efficiency and effectiveness with certainty in the legal system and reduce errors for client satisfaction [86]. Sometimes, smart legal contracts also create challenges in front of clients due to the complex languages or terms of the law mentioned in documents, due

to which clients have to face problems in understanding the documents [81]. Studies have observed that if blockchain were a part of the legal industry, it would provide accessibility, cost savings, transparency, data integrity, and automation in work. The use of blockchain in a legal firm leverages lawyers' work to be more simplified and streamlined by using smart contracts and digitally signed and automated contracts. The automated contract management system decreases the unnecessary time spent on the preparation of law documentation and maintaining personal records. Using this technology in a legal firm, the cost can be saved significantly. Moreover, if blockchain is implemented in legal law, it provides complete freedom to the legal justice system by reducing customer difficulties and lawyers' hefty fees [88]. Cybernetics is the science that investigates the rules, regulations, constraints, and opportunities inside the system. The main aim of cybernetics in the legal system is to understand the functioning of numerous processes such as hardware, computer device, and IT technologies that are part of the system. It works either in a circular form, chain form, or many others forms. And lastly, it senses the forms and equates them parallel with the ultimate goal so that the final goal can be attained. Cybernetics is also called "Kubernetes," which means steersman. The word cybernetics explains the information which flows from one system to another and its impact on the control system. This novel approach works on cognitive, normality, and interpretative theory, which were introduced by cybernetics. It can change the direction of the legal field, socially and economically, so that industry 6.0 can regulate all the processes effectively by using various technologies. Moreover, lawyers spend 48% of their time on administrative paperwork like the transfer of legal documents and related information midst the software to the client, making a list of clients, etc. Using this technology, excessive manual work can be reduced and reduces the legal herrings cost [89]. Figure 4 shows the summarize flow diagram of legal informatics.

6. Challenges in Adoption of Legal Informatics Framework

6.1. Legal Challenges for Lawyers in Future

The Indian judiciary system is continuously facing many challenges that are produced during the time of the COVID-19 pandemic and still trying to overcome this by using online services for urgent matters through video conferencing. The legal system has to understand the importance and potential of digital technologies in the legal industry. So, it's time for the judicial system to open its eyes and move from traditional to digitalized law practice

using industry 6.0 key technologies. But currently, the Indian judiciary system has many intrinsic flaws that prevent the law system from using technology in a 100 percent efficient way. So, firstly legal system has to overcome these challenges, and then only it would be capable of embracing the digital technologies of industry 6.0. Some glitches in the present legal system are discussed here.

6.2. Architecture Structure

Because during the online herrings of court, lawyers and clients have to use either their own devices such as laptops/mobile phones to continue the hearings or the devices provided by the court. Now the biggest challenge is the insufficiency of the physical system (Laptop/Desktop/Mobile) utilized during the time of court proceedings. Thus, the E-committee of the supreme court has also faced lots of trouble during the online proceedings, E-filling, and operating virtual courts through video conferencing due to less availability of essential infrastructure in the legal system. Because India is a developing country, where about 65.07% of people belong to rural areas [90], in such a scenario, vast numbers of clients cannot afford the expense of digital devices.

6.3. Difficulty in Embracing Digital Technologies in the Legal System

The legal jurisprudence system has been working on traditional law systems for many years, but now it's time to renovate the law system by adopting legal Tech and new computational technologies to improve the efficiency and effectiveness of the legal system. But it has been seen that for the last some years, the majority of the lawyers and judges are not ready to embrace the new technologies because they know that it would require a set of new skills, and they have to learn these skills to deal with them, and they deny to adopt the technologies due to dearth of understanding and it will put an adverse effect on the jurisprudence system.

6.4. Uniformly Admittance of New Technology

The next challenge for the judiciary system is the availability of technologies in every corner of the country without affecting their economic conditions. Another challenge is uniform access to technology in all places so that lawyers, judges, and clients can use it conveniently. Before going into the law system in the digitalized world, all litigators should have proper knowledge of technologies and know-how to use them to maintain court dignity. Because the tradition of the Indian litigation system is supposed to be archetypal and combative. While abstaining

Fig. 4 Summary of the flow diagram of legal informatics
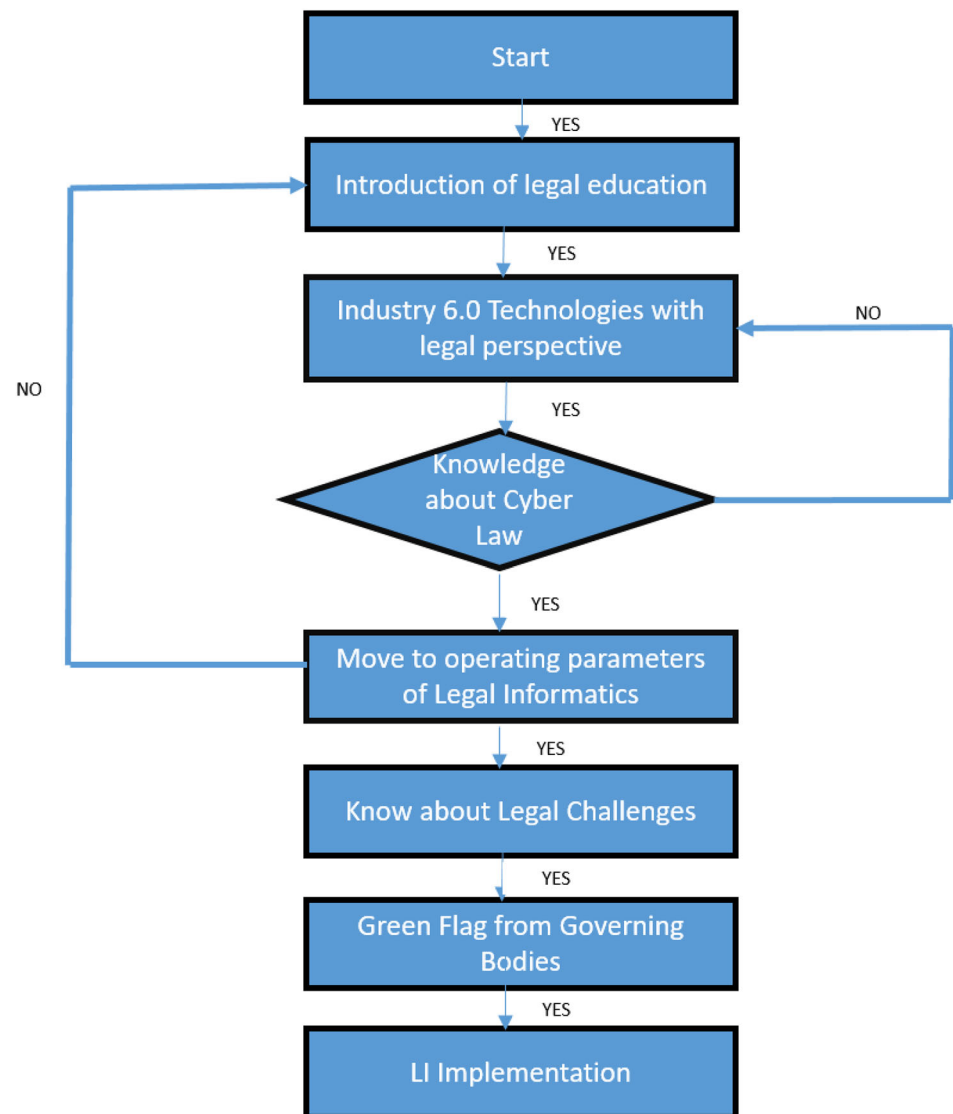
from discussing the profit and loss of this stereotypical culture, if the condition of culture is archetypal and combative, it will raise the burden on a virtual platform and result in interruptions of proceedings [58].

6.5. Internet Connectivity

India is moving toward the digital India concept, where every service is made available to customers electronically, and online services are provided to customers by enhancing Internet connectivity or making people empowered in technology. To achieve the aim of digital India, the government has to provide 6G and 7G Internet connections. High-speed Internet is the first step toward digitalization. In the absence of high-speed Internet connectivity, embracing digital technologies will remain a dream. It will never come true and just remain a dream. It has been noticed

from many legal blogs that approximately 60 court cases come to different courtrooms of the supreme court on Friday or Monday. In a simple calculation, 1140 court cases have to be heard daily. The question is whether our present Internet connectivity can support the supreme court in all 60 cases simultaneously. We cannot make proper judgments and confident statements in India toward adopting industry 6 technologies [58].

6.6. Standard Operating Procedure, Protocols, and Unvarying Platform

Presently, it has been noticed that different courts, lawyers, and judges are using various online platforms (Skype, Zoom, hats app, and Microsoft teams) for proceedings that are creating trouble for clients and courts to understand the app's functioning. That is why it is necessary to adopt a

uniform platform and uniform protocol with the standard operating process for proceedings in-country and hearings to remove the complexity of understanding among the clients, lawyers, and judges. The legal system would have to ensure that all the records regarding hearings, proceedings, etc. It should be maintained in a pleasant way to quickly be understood. The platform should comprehend such an option that one can show the objection in between the hearing or in arguments without speaking a single word. These objections should be kept in such a way that it automatically recorded in the software itself and to help the judge to mention them to the alike later. These challenges recently brought fundamental changes in standard operating procedures on April 15, 2021 [33]. In this comprehensive standard procedure, only the team/party can address the court; if there is any objection to the opposition team, they can raise their hands in teams/Zoom; otherwise, all have to remain mute till directed by the court to unmute.

6.7. Internet and Bandwidth Connectivity

To achieve the aim of digital India, the government has to provide 6G and 7G Internet broadband speed. Because high-speed Internet is the first step toward digitalization. But due to the absence of high-speed Internet connectivity, the dream of embracing digital technologies will remain to be a dream and will never come true and just remain a dream. It has been noticed from many legal blogs that approximately 60 court cases come to different courtrooms of the supreme court every Friday or Monday. In a simple calculation, 1140 court cases have to be heard daily. Whether our present Internet connectivity can simultaneously support the supreme court in all 60 cases? At present, we are not able to make the right judgment and confident statement in India toward adopting industry 6 technologies.

6.8. Infrastructure and Technology Training

The conduction of virtual courts is not as easy as we think. Virtual processing requires seamless robust architecture infrastructure and secure audio–video and Internet connectivity with trustworthy technologies that should have the capability to hold all the conference meeting data securely. After seeing all these requirements, the E-committee of the supreme court has placed some solutions to deal with the present problem. They suggested that the fund comes for phase 2 E courts could be used to improve the speed of Internet connectivity. If these solutions are thoughtfully implemented, maximum problems related to infrastructure and technology can be reduced.

6.9. Issue of Cybersecurity

Cyber security is one more challenging issue legal system while implementing the concept of virtual courts. All the technologies work on Internet-based technologies, where all the data are stored in the cloud. As such, data security is the biggest challenge. The present study also provides the theoretical framework of LI and a futuristic model for the legal informatics system. This futuristic model is based on quantum-based AI and machine learning techniques of Industry 6.0 to improve and advance legal informatics systems. Industry 6.0 technologies have enormous capability to bring man and machine (robot judges and lawyers) together to make the decision-making process easy without taking time years and provide a collaborative solution to judges relevant to cases lawyers and judges [9].

7. Futuristic Model for Legal Informatics System based on Quantum-Based AI and Machine Learning in Industry 6.0

The quantum-enabled ML and AI models can be proved helpful in solving complex problems in legal industries. Studies have found that if quantum computing works collectively with machine learning and AI, AI and ML will rise as a more powerful weapons in the field of law in the future [91]. Quantum computing has enormous potential to bring enormous improvement in artificial intelligence and machine learning. Machine learning is the branch of AI and CS (computer science) that use data and AI algorithms and try to copy human behavior as he learns, reacts, behaves, etc., so that significant improvement can be achieved in ML with precision and accuracy. It also tends to prove itself as the most powerful technology in the field of law in the future. ML can predict system behavior after learning the system model. In the last many years, ML models have been employed several areas to tackle many challenging problems such as weather predictions and earthquake forecasting. In the present study, the hypothesis-based quantum machine learning and AI models [57] represent the legal system. Quantum, ML, and AI-based models have more extraordinary abilities to gather data using mechanical origin.

This model will work on two concepts; the very first one is the quantum database, i.e., if we are applying in the field of law, the database will be the total number of cases, pending cases, solved cases, complaints recorded, Lawsuits, herrings, judicial decisions, etc. And the second one is hybrid quantum–classical models. Figure 5 shows the Futuristic model for a legal informatics system based on quantum-based AI and machine learning in Industry 6.0. In this model, a large circuit is divided into small sub-circuits,

and they are evaluated distinctly either by using a quantum processor or using a classical supercomputer running a quantum simulator [69].

In the very initial stage, for solving the cases, herrings, and counts of pending cases., a quantum database will be prepared which will cover all the information regarding cases, herrings, and counts of pending cases. with all the data that keep concerned with these issues. And these data are denoted as multi-dimensional arrays of numbers called quantum tensors. Multi-dimensional array implies an array that contains more than two dimensions. If we co-relate this with the legal system, a multi-dimensional array will be court hearing cases containing several solutions. In the second stage, as per all the quantum data gathered for specific court cases, the basis of that one quantum neural network will be selected. Quantum neural networks are network models based on computational neural networks and work on quantum mechanics concepts. The primary purpose of this is to take out concealed information in an entangled form. In the third stage, quantum stats or averages are measured by extracting classical information of value from the random variables. In the previous stage, classical information related to the court case of the client is converted into classical data; now, in the subsequent step, evaluation of the classical neural network model will be performed by using deep learning, machine learning, and AI techniques that would be used to study the relationships among the various variables. After receiving the proper correlation between the problem and its solution variables. After that, the cost function will be evaluated. The cost function is the function that helps ML to understand the fundamental difference between the assumed value and the value which exists [92]. The accuracy of the result of the cost function could be based on how intelligently the model had selected to perform functions when quantum data was categorized, or any other measures were taken. And at the last stage, after evaluating the cost function, gradients are evaluated as well as if there is any change, new parameters will be updated [93]. Using this

quantum-based AI and ML can improve the decision-making system of the Law industry.
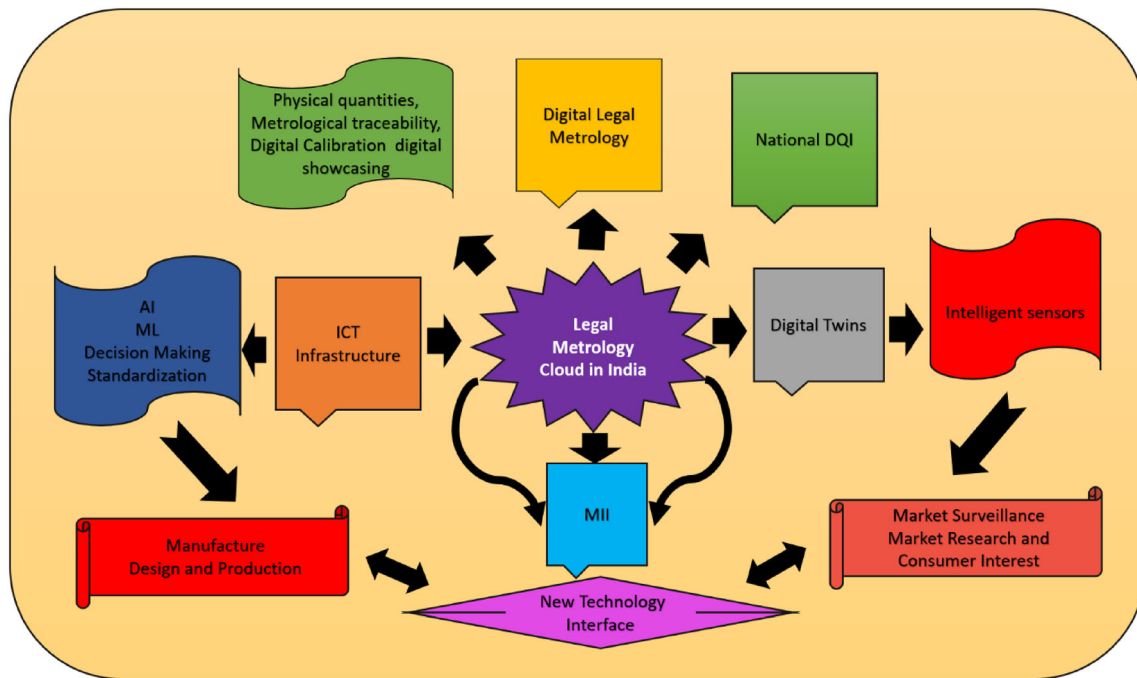
8. Framework of Digital Legal Metrology

Legal digital metrology would bring an excellent output that would be beyond the measure. It will help to develop, interpret and apply the measurement results to the specific situation. It has been observed that approximately 4 to 6 percent of shares of EU countries which is equal to 660–990 million euros annually are saved due to the adoption of a legal measurement system. That is why in India lots of efforts are required from the legal metrology department, Bureau of Indian Standards (BIS), National Metallurgical Laboratory (NML), and Quality Council of India (QCI) to establish the digital metrological quality structure in India so that it can subsidize the GDP and economy of India. Developing a legal informatics framework for the legal digital metrology system will provide the stage and authority to the legal system that can provide legal assistance to the legal metrology industry in the future. The primary profit of developing the LI framework for the legal metrology industry is to assist the National Metallurgical Laboratory (NML) and Quality Council of India (QCI) legally and accountable to stage authority. After an inclusive literature review, the present study proposes a framework for legal metrology informatics that could help the legal digital metrology system in a future perspective. Figure 6 shows the framework for legal metrology informatics that could help the legal digital metrology system in a future perspective.

8.1. System of a Unit Digital Framework for Digital Metrology

It has been noted that the International Committee for Weight and measures (CIPM) has formed a workgroup on a digital system of the unit to perform some tasks. Here, SI digital metrology would use for developing a uniform measuring system throughout the world. The digital system that would be designed should be explicit and in data secured format by using enabling technologies of industry 6.0 such as IoT-based networks that would be SI entirely described in the present SI booklet [94]. This target can only be achieved by proper coordination with pertinent stakeholders by fixing appropriate connections. Legal metrology industries have to propose such a broacher that can be machine-readable.
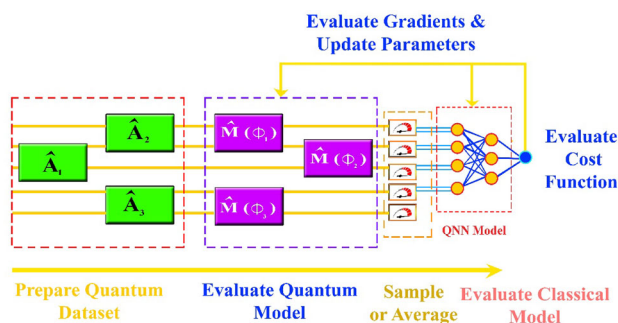
Fig. 5 Futuristic model for a legal Informatics system based on quantum-based AI and machine learning in Industry 6.0

Fig. 6 Framework for legal metrology informatics that could help the legal digital metrology system in a future perspective

8.2. Measurement of Information Structure

MII is defined as the group of normative standards that could explicatively define the data, its structures, service ethics, certification, conformity assessment, and market survey which is digitally connected with a digital network and behaves like an interoperable [9]. In simple words, in MII all the measurements should be linked to a digital system and each system communicates with the other without doing any manual data processing, or transcription work [95]. The demand for digital transformation in every field such as manufacturing and production has swiftly increased. To establish the quality structure with the adoption of all challenges, digital transformations are needed in the field of legal metrology by adapting proper quality assurance, conformity assessment, certification, market survey, etc. by using a digitally enabled platform that would act as an interoperable.

8.3. Legal Metrology Clouds and Digital Structure

The developed countries such as Germany, National Metrology Institute has recently started a program that is related to the development of EDQI (European digital quality infrastructure). In this program, the metrological institute predicted to use the of metrology as a main platform in every state, country, and city for designing, supporting, and streamlining the regulatory courses by connecting all the infrastructures, and databases to the single point of communication for all the stake holders [96]. The EU aims to apply digital metrology to strengthen the rank of Europe in the field of innovation, and data-driven and to develop a single digital metrology market in Europe [97]. The same approach and efforts can also be applied in India with more innovation in legal metrology perspectives for establishing a national digital quality infrastructure for helping the manufacturers and shareholders. If we see at the perspective of India, CSIR and NPL play an important role in establishing and developing the basic to standard concepts and pillars of cloud-based legal metrology. In India, such kind of transformation needs the embracement of digital technologies in legal metrology.

8.4. Digital Data and Digital Twins in Legal Metrology

To decrease the managerial load over the businesses and manufactures and accelerate the harmony between the administrative process of conventionality assessment, market survey and digital-enabled infrastructure is needed in India by adopting the industry 6.0 technologies such as digital twins and AI. A digital twin is the copy model of physical assets, natural environment, and processes. This uses real-time data from distinguished assets. Digital twins would play a significant role in establishing digital legal metrology. Digital twins would involve a replica model, a set of data related to that model, and able to update and change the model according to the availability of data [98].

This model will contain all the information related to measuring instruments, their substructure, and particular information about the instruments. Digital twins will contain all the information about the instruments, sensors, and authorization of profiles. In a generalized way, the establishment of digital twins would bring new development in the history of measurement standards with a high degree of accuracy and precision. The main challenge in the implementation of digital twins is the repairing of software, its streamlining, and validation support [29]. The flowchart for digital metrology is shown in Fig. 7.

### 8.5. Challenges in the Adoption of Legal Metrology Framework in the Future

The COVID-19 has brought a massive pace of digital transformation all over the globe. In legal metrology, one of the primary challenges is the transition from current working practices to digitized solutions. For instance, digital twins. Digital twins based on virtual models of the non-virtual system. The digital object model will be made first which would evolve all the possible sets of data or the model can be adjusted as per the requirement of data. In a generalized manner, the digital model will give precise decision-making when the set of data received from the measure would be accurate. Reliable data is one of the biggest challenges in legal metrology [99, 100]. Another challenge in adopting digital transformation in legal metrology is the cost of digital instruments, standardization of measuring instruments, training required as well as government policies toward the adoption of digital technologies in the field of legal metrology [11]. The security of data is another risk which is associated with cloud computing. There is a chance of loss of control of data if there is inadequate security contrivance. These risks are data breaches, insecure interfaces, hijacking of accounts, data loss, etc. After seeing these risks, there is no doubt that cloud computing can come under the risk of cyber attack and data theft.

8.6. Opportunities in the Adoption of Legal Metrology in the Future

Digital transformation has the tremendous capability to bring significant change in the field of legal metrology by instituting digital quality measurement instruments,

Fig. 7 Flowchart for digital legal metrology
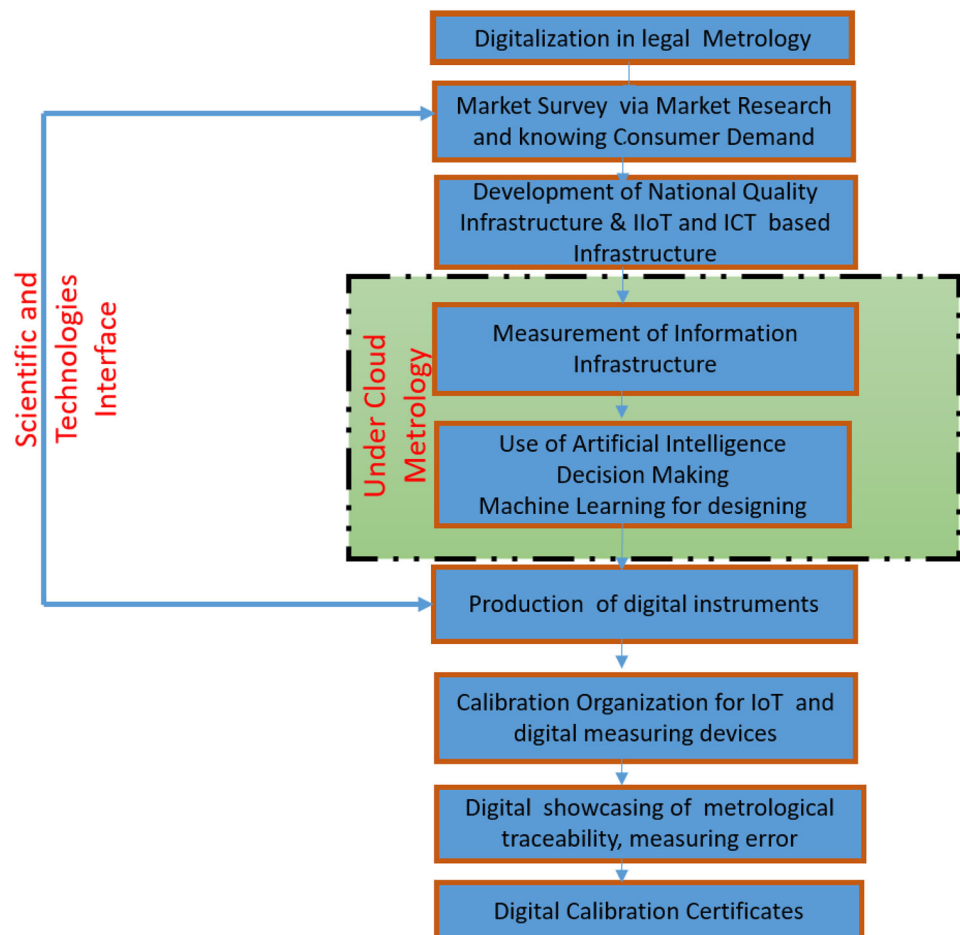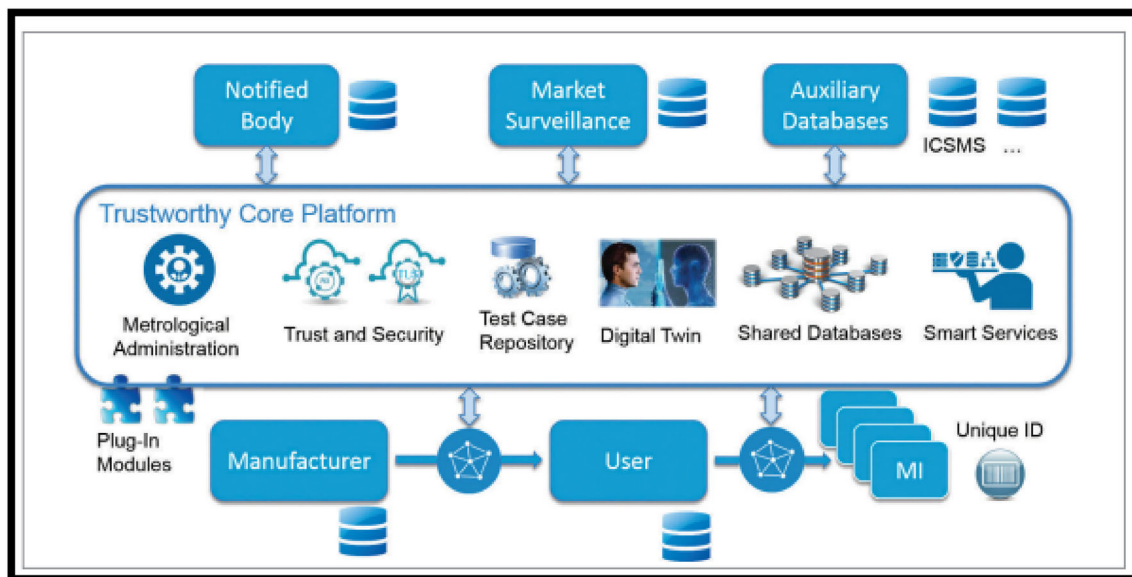
Fig. 8 Proposed concept of a faithful core platform for state members [96] [103]

digitally enabled infrastructure, nurturing economic and trade growth, standardization of market scrutiny, conventionality assessment, and legal metrology. The inducement of digital technology in legal metrology would be crucial in keeping the founding of legal metrology clouds enabled by machine learning for developing the excellent quality structure for metrology, enhancement of industrial growth, innovations, and many more. Machine learning is quality data-dependent and can efficiently handle and process the data. For instance, machine learning. Machine learning is data-dependent. The right quality of data in ML provides precise results. Machine learning has tremendous capability to process the data effectively by using filtering techniques to filter incorrect, non-accurate data and systematic error data that are caused by mature aged measurement devices. The next digital technology. IoT can also increase the effectiveness of measurement in metrology by the usability of data for marked requests and outside parties. The trusted data produced by IoT helps the stakeholders to taking accurate decisions. Consequently, a significant social impact can be produced by using this industry 6.0 technology by introducing quality data metrics with IoT in metrology. The IoT-based sensors make metrologies work easier by securing the non-virtual system to digital traceability series potentially by using digital twins.

9. Requirements, Challenges, and Progress in Developed Countries

In the present time, fast change in developing technologies like BD (big data) and CC (cloud computing) can be seen in the market of instruments and measurement. These changes bring huge changes in the globalized market and increase the efficiency of work and the demands of the customers. In India, products are loaded onto the ships, and adjacently legal deals take place in the Netherlands, and the UK monitored and controlled the automatic weight measuring in Indonesia The importance of this is that new developments and changes are read to endure solely any framework of legal metrology. The external forces are controlling the driving forces [101]. ICT (information and communication technologies) are not only contributing to developing innovation in products but in innovation in processes and structural arrangement of legal metrology. As per the view of the industry, it is time for moving toward the DSM (Digital Single Market) where the single point of communication for all the stakeholders. The digital single market is the market that provides great access to consumers, industries, and businesses and provides online services across Europe [102]. To this end, in this study, the framework proposed by Europe on European Metrology Cloud for setting the digital quality infrastructure in legal metrology. The concept proposed by Europe for the single digital market for European legal metrology focuses on the founding of a data infrastructure by using the trust full platform of the European Metrology Cloud core platform. The proposed concept of a faithful core platform for state members is shown in Fig. 8. This platform helps the legal metrology market to support the processes of conventionality assessment and market survey. So that if the digital transformation has been embraced by legal metrology the distinguished benefits in measurements can be achieved by stakeholders and industrialists in lesser time. The crucial

prerequisite of the manufacturers of technologies and its possibilities have provided the guiding aim for achieving conformity assessment, market survey, and digital quality infrastructure for legal metrology services based on the future of measuring instruments and data-driven metrological services to the European country. To attain the said objective the following actions are proposed as Link Infrastructures an databases, references architectures, streamlined with the inducement of new metrological services and European COE (center of Excellence). In joint infrastructure and databases, a single quality digital infrastructure and database will be provided to stakeholders, and industrialists by providing a core platform to every state member of legal metrology. This platform will serve as a communiqué and service-providing platform rather than a data-discarding environment.

In reference architectures, industries needed new technologies such as digital twins, IoT, cloud computing, and Big data. These are the important pillars of future European digital quality infrastructure to complete the need for a legal metrology system. These technologies would make work easier, and provide sufficient security and easy verification of measurement data [103]. In streamlined with the inducement of new metrological services, the concept of digital twins will be introduced, where the administration will contain all the descriptive data of individual measurement instruments and may present DQI (digital quality infrastructure) and can be easily accessed by official parties. The 100 million data of measurements are used in the European single market which generates huge data in volumes over the complete life cycle in the distinct database. This merging of data definitely will produce a brook of metrological data through which new data-based smart services can be consequent for industrialists, and stakeholders to make their work easy in present controlled processes [102]. This concept of Europe also emphasizes developing novel technology and data-dependent metrological services for quality infrastructure to endorse manufacturer innovations and could sustenance harmony in Europe. In this regard, a project proposal for the development and implementation of future digital quality infrastructure was succumbed by Europe in industries in Call 2017 to the EMPIR (European Metrology Programme for Innovation And Research) to the EMPIR (European Metrology Programme for innovation and Research) and that would be funded by EMPIR participating countries. The main challenge in the proposed framework is the security costs that would be paid to IT, and the technology gap between the manufacturers and notified authorized bodies of market investigation agencies. Authorities may refuse new technologies and innovative solutions in the legal metrology field.

9.1. Preparedness of Academia and Industry in India in the Context of Digital Technologies

In the revolution of industry 6.0, universities will have to play an important role. Universities have to take a dynamic step in developing and describing the prospects of industry 6.0 and its enabling technologies. Now it's time for universities to redefine their roles, responsibilities, and way of delivering knowledge to students. Now the universities have to adopt new adaptive learning models, collective educating models of teaching and learning for professors and learners that should be enabled with digital technologies such as AI, ML, and DM. Universities are required to motivate for developing a curriculum that offers opportunities to students and professors to examine their knowledge, caliber, and competency in their study and teaching methodology respectively to acquire the latest skills, critical and creative thinking, digital literacy physical skill, and cognitive learning. The power of digital or IT tools such as ML, and AI, can play a prime role that could be more in the form of democratic approaches in dealing with, transferring, and circulating knowledge from universities to industries to society. But in India, the present scenario, the scope of AI and ML is in the initial stage but its pace is slow. To see this lap, DRDO (Defence Research and Development Organisation) has started an autonomous college (Defence Institute of Advanced Technology) and announced short-term courses on AI, and ML with cyber-security. This is an online course for 10 h where learners can learn about basic and advanced concepts of AL and ML such as (BDA) big data analytics, probability theory, AR (augmented reality), deep learning, and related advancements in technologies. After the completion of courses, DRDO conducts for giving the course successful completion of courses [104]. In the same way, ISRO has also launched the course for DL and ML. These courses are developed for students who are pursuing their degree in sensing data in distinguished applications. In these course classes, fundamental to advance of ML, fuzzy-dependent ML, ANN, and CNN [105]. IIT Madras is offering a master's program in AI to motivate students who belong to distinguish backgrounds to learn about new technologies. The main goal of introducing these technologies in the curriculum is to develop the concept of new technologies such as AI and ML so that the students can become the future leader of India as well as all over the world and also fill the gap between the source and demand of the AI and ML in India. IIT Hyderabad provides excellent laboratory amenities with state of art in research areas, good Internet connectivity, and hardware and software support. In the same way. IISC Bangalore, VIT Vellore, and many more are offering specialization in AI and ML for upgrading the skills of students for achieving the future vision of India

[106]. At the end, by developing technology-based literacy among the students, every citizen of India can help the development of society and attain the goal of industry 6.0. Presently, India is facing many challenges in adopting these digital technologies in their industries due to less strategic planning, less training in these technologies, and increasing difficulties among the technology and industries. As per the report of IBEF (Indian Brand Equity Foundation), the GOI (Government of India) has fixed a determined target for attaining the impact of manufacturing output from 25% of GDP by 2025 which is 16% at present. The government also has taken steps for the green corridor and Make in India initiatives. According to the IBEF report, IoT is the biggest weapon for India and it is expected that it will cover 20% of the share in the next 5 years. Metro states of India are taking wits to embrace digital technologies. Andhra Pradesh took a chance to capitalize on the IoT caliber in the country. The Andhra Pradesh government has an IoT policy with the agenda of turning itself into an IoT hub by 2020 and also achieved the 10% of the market share economy. In recent, the first smart factory in India is turning automation into autonomy. In this concept of automation to autonomy, the machines talk with another machine, this arrangement is being set up in Bengaluru. IISc Bengaluru, (CPDM) center for product design and manufacturing is working on this project with the monetary investment of Boeing Company. According to the reports, the concept of digitalization in the industry will touch 215bn US dollars by 2025 in India [107]. On an ending note, the capability to cuddle industry 6.0 enabling digital technology would provide enormous opportunities to industries, and businesses that would be the key to success.

10. Limitations of the Study and Research Implications

The present work is based on the theoretical perspective of the legal informative system and legal metrology for developing the framework of LI and a futuristic model for a legal informatics system based on quantum-based AI and machine learning for Industry 6.0. In upcoming work in the future, the quantitative perspective of LI will be considered by employing quantitative techniques to validate the results of the findings.

In current findings of work, it observed that industry 6.0 is a futuristic revolutionary idea that would have an affinity to change the entire scenario of the law system and legal metrology system. But due to this futuristic idea, the author has found minimal studies that show a detailed explanation of the problems faced by metrologists, lawyers, judges, and clients in legal industries in all respect either, socially, economically, and technologically. In legal Tech, Industry

6.0 technologies will bring opportunities and a challenging environment to lawyers, clients, and judges that will help them improve their skills and decision-making system with the help of digital technologies and robot lawyers and judges. At present time in India, industries are using 40-year-old measurement systems for weighing. This is the one implication that can be filled by proper training in the legal metrology field. The practice of digital measurement with digital enabling technologies requires high-skill in-house training for understanding digital practice. The next implications are the use of software in measuring apparatus. For instance, measuring software will work on some operating systems and sometimes it seems to become very difficult for metrologists to use OS (operating system). OS is programmed with high-level codes which need deep knowledge to understand. Lastly, the client's trust and confidence can be increased in legal metrology, jurisprudence, legal services, and sustainability when the industry 6.0 technological vision is embraced by the law and metrology communities.

11. Conclusion and Future

This study is based on an analysis of the legal industry in the context of industry 6.0. And how the critical technologies of industry 6.0 can benefit the Indian legal system and legal metrology in the future. In this study, the following conclusions can be manifested:

- This study found that necessary cyber security and data privacy are compassionate issues, yet no rigid rules and regulations are built up.
- The government has to look up these issues and must establish a powerful jurisprudence system in India that would have the capability to help the law industries protect their data from cyber threats.
- The implementation of industry 6.0 technologies pillars in the law system should focus not only on the effective working of the law system but also on client, lawyer, and judge satisfaction toward the insouciance of decisions that come out through digital technology data security.
- This study investigates how industry 6.0 technologies, such as quantum computing, AI, and ML, can provide excellent decision-making prop up to the legal system and its people.
- The implementation of the legal metrology framework in India could require inhibitors among the manufacturers and the government governing bodies because the inducement of new technologies in legal metrology could create fear among the manufacturers due to the technology gap.

- The cost of digital technologies and the security of data will be the main concern among the stakeholders, manufacturers, and notified bodies.
- The main challenge in the implementation of digital twins is the repairing of software, its streamlining, and validation support.
- The practice of digital measurement with digital enabling technologies requires high-skill in-house training for understanding digital practice.

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