Advancement of Digital Twin Technology on transforming the Construction Industry

Greeshma A. S.[1], Jeena B. Edayadiyil[2]

[1]PG Student, Department of Civil Engineering, Amal Jyothi College of Engineering, affiliated to APJ Abdul Kalam Technological University, Kanjirappally, Kerala, India – 686518 (corresponding author). Email:
[2]Assistant Professor, Department of Civil Engineering, Amal Jyothi College of Engineering, affiliated to APJ Abdul Kalam Technological University, Kanjirappally, Kerala, India – 686518.

Abstract - *Construction industries are dynamic communities that are rapidly changing and the growth of digital technologies is tremendously increasing. Considering digitalization, the construction sector has begun its race recently. Hence the technical complexity of the electronics field, understanding the application of technologies that enabled digitalization will be a challenge for a civil engineer, which must be overcome by these engineers through adaptability and technological updation. Digital twin technologies are increasingly able to address those technological challenges. This paper explores the concept and implementation of twin technology design by the literature review. The study investigates and fully analyses how the use of artificial intelligence and deep learning assist civil engineers in their working environment in the context of managing projects. The review also highlights and discusses the vision for the role of these technologies in project management and productivity. Further research must be done by the modeling of structures with smart technologies to develop a framework to advance real-time maintenance tracking and infrastructure protection through the incorporation of digital twin systems and BIM technology to mitigate safety risks and other disasters. Moreover, BIM applications may be combined with artificial intelligence (AI) advancements to provide visibly intelligent control management in the realm of smart cities. This paper will serve as a revamping tool for the current digital twin management strategy in construction.*

Key Words: digital twin technology, BIM, artificial intelligence, machine learning, construction industry

1.INTRODUCTION

Digital twin technology is changing the engineering and construction field in a way that has never been seen for ages. Having access to live in our structure before it gets constructed or can get access to monitor every step of construction before the work gets started will be fascinating, and it will be changing the way how the industry works and opening up a world of opportunities. Digital technologies are often increasingly identified with fields such as computing, applications for the Internet of Things, and other electronics. Still, the fact is that every industry is being transformed by digitalization [1]. Considering digitalization, the construction sector began its race recently. Hence the technical complexity of the electronics field, understanding the application of technologies that enabled digitalization will be a challenge for a civil engineer, which must be overcome by these engineers; as adaptability and update ourselves with the technology change will be a worthy cause for development. And digital technologies are increasingly able to address those technological challenges. One such potential is Digital Twin Technology [2].

Recently, the use of digital twins has been in the hands of design professionals; for instance, 2D and 3D models of buildings can be considered as a digital twin technology in CAD programs. But it will be taken even further by the experienced and advanced construction companies, as digital twins will give a construction project an entirely new path when entering altogether into it [3].

The construction industry has been falling behind in digitalization over the decade, specifically in the use of data and analytics or artificial intelligence. This implies that the digital twin will account down to the individual materials and components for the actions and processes involved in construction [4]. Ultimately, digital twins in construction could help democratize architecture and management. While technology is still in its beginning days, it will soon unlock the opportunity to explore endless ideas using technology at our fingertips, both for the industry and the design community. By prioritizing these concepts, minimizing risk, and providing efficiencies, digital twin construction can be implemented by the firm in ways that are not previously possible [5]. Hence the focus of this study is to provide an assessment on how the digital twin technology helps in intelligent management and how to improve the personnel interaction in the built environment. This paper will serve as a revamping tool for the current digital twin management strategy in construction.

The focus of this work is to examine and thoroughly analyze the intelligent management of the construction project via the digital twin method. Also, the paper highlights and explored the importance of the digital twin in smart-cities and their development. The article concluded with the identification of a gap and the goal of filling it. Next section deals with the definition and application of design twin technology followed by the literature review and gap identification.

1.1 Research Methodology

This work used a comprehensive study, which is an integral function. This gives a synopsis of prior research in a particular topic of study and also reveals knowledge gaps in the articles that have been published. This approach adheres to certain guidelines, such as a comprehensive study or representation of a fair way, reliability and validity, and summaries and synthetization of the study's core topic.

The research method used in this paper is broken down into numerous parts, with the goal of answering the key research questions raised in the introduction:

The first one is that the various construction applications of digital twin were reviewed after finding published research from construction, power, industrial, and green infrastructure and summarizing similar DT principles, characteristics, and technology. Second one is the analysis of DT development, i.e., the article emphasizes on how the building industry has evolved digitally, with an emphasis on the transition from BIM to DT; and, finally highlights the research gaps by evaluating the two earlier processes thru the perspective of building a Construction Digital Twin.

1.2 Overview of the study

A comprehensive review of the literature is carried out by reviewing recent research articles; these papers provide a better knowledge of the concept of the usage of twin technology in an infrastructure sector.

Recently, when Ham Y and Kim J [6] unveiled a novel platform for 3D model creation using crowdsourcing, virtual reality, participatory sensing, and many other digital twin technologies with immersive and interactive visualization of a structure, Fan C. et.al. [7] come up with an integrated textual visual geo framework for the better enhancement of the geographical disruptions thus risk on site can be reduced.

Disaster management has a strange with construction management. To focus on risk management and safety detection, journals that relate to smart city development and disaster management are referred. Ford D. N and Wolf C. M [8] focused on disaster response in smart buildings with digital twin devices. Zhong C. et.al. [9] explore a concept for combining robotic and human intellect in smart city disaster monitoring. Francisco A. et.al. [10] formed a real-time energy management system using a benchmark approach whereas, Zhao D. et.al. [11], developed a simulation model for optimum energy management also O'Dwyer E. et.al. [12] presents an energy management tool with the help of IoT's. Cognition digital twin for personalized management of smart cities is proposed by Du J. et.al. [13].

Digital twin technology also focuses on virtual reality and Olde Scholtenhuis L. L. et.al. [14] presents a 4D visualization for the up-gradation of utility reconstruction works. Also, research in automation in construction gets one step up with the proposal of prefabricated construction with IoT by Zhong R. Y. et.al. [9] and a built asset tracking framework for servicing with Digital Twin by Lu Q. et.al. [3].

A paper connecting construction personnel management also included in the literature review, i.e. proposal of a structure for detecting stress zones to improve geriatric mobility and interaction in an in-built environment by Lee G. et.al. [15] and Austin M [16] investigates techniques and concerns in designing and operating a smart city utilizing a digital twin concept.

Two review papers are referred one of which is done by Berglund [2] explaining the recent developments in research and a perspective for the civil engineering profession's involvement in the creation of smart cities while the other one by Boje [17] mention directions for future research. The detailed review is mentioned in the next section.

2. DIGITAL TWIN TECHNOLOGY

A twin technology is simply a replica of a real entity that lives fully inside a digital environment. A digital twin may be a model of an electric power grid that can operate on simulations, can be a map-based representation of the properties of a government, or in the sense of construction, and can be a design depiction in digital form, construction, and complex structures of the building. The government has placed strong attention on Smart City growth in recent years. However, with the changes impacting city environments, the idea of the Smart City must evolve at the same time. Usually, cities have three main features that make them intelligent or smart [18].

First comes awareness. Smart cities must have a real-time updation of constantly changing circumstances, such as their climatic condition, traffic which involves congestion and accidents, and public safety. In the operations and growth of Smart Cities, much slower or regularly changing factors such as population or demographic shifts and levels of economic activity also have an impact. Then comes the response. Significant awareness levels, together with quick response times, make a city truly intelligent. Effective responses in city operations can prevent risky situations, prevent disasters, and save lives. The final feature is the prediction. For the creation of Smart Cities, the ability to predict and respond to events is essential. The possibility of such a prediction and detection technology came into reality from the past two decades, and the use of Artificial Intelligence and Digital Twin systems make a massive difference in the construction industry by promoting automation in construction [19].

2.1 Technologies that enable digital twin

The digital twin is constructed and controlled by various technological innovations that capture, compute and view the data. A collection of fundamentals that are already in place in most companies today provides digital twins with operational and data process support, the digital twin is a category of emerging technologies that are typically implemented as a result of the digital change processes of organizations that enable them to achieve their maximum potential and become resource-spanning live data models. Some technologies are the most important pillars of digital twin system; hence one must understand those technologies to fully grasp the concept of digital twin system which includes Internet of Things, 5G technology, AI and Big Data Analytics, Visualization Tools, Digital Platform, Social Sensing, Participatory Sensing, Spatio-temporal fluctuation, Semantic Model Approach, Machine Learning Approach and Energy Benchmarking Approach and many more.

IoT is a network of things linked by sensors., programs, and other technologies to interact and exchange information with various systems and platforms over the internet. Equipment monitoring by IoT enables construction companies to monitor usage, control costs, and make better decisions on equipment. Cloud computing and real-time monitoring help building companies minimize theft, improve efficiency and manage resource costs.

5G (Generation) is an integrated digital twin accelerator with ultrahigh speeds, fast response times, and the ability to accommodate large device densities. Since construction sites are dynamic and continuously changing their working environments, teams may focus on 5G to understand real-time job-site activities and conduct virtual or autonomous building operations. Working with conventional speeds of connectivity, this will provide almost seam-less access to the data-intensive edge and cloud applications for those employed in construction, allowing multiple users to communicate with each other in real-time and globally [20].

AI and Big Data Analytics are other important features of digital twin technology. Combined with analytics tools, artificial intelligence facilitates decision-making by city managers and allows operational activities to be automated. An audio sensor that is part of the city infrastructure, for example, will alert operations center workers of an accident and include a list of potential answers. This sort of sensor can also activate drone surveillance of the affected area automatically. The concept of automation in construction emerged using AI and huge data mining technology [21].

Another critical technology is Visualization Tools. The key components of digital twins are real-time operations centers with video walls and 3D simulation software such as BIM. These techniques could be taken towards the next level through augmented reality and virtual reality technology, improving the usefulness and precision of digital twins. In operations, training, architecture, and simulation, such technologies also have significant implications.

Digital Platform combines all of the technologies mentioned above, connecting apps and data to avoid storage facilities. To thoroughly explore the potential of the ecosystem and surpass the capabilities of individual systems, the platform also links different businesses and socioeconomic and educational.

Social sensing typically refers to a series of paradigms of sensing, and data collection was on their behalf data is obtained from humans or computers. Supporting the monitoring and sensing of mobile targets with mobile sensing devices is essential in social sensing. Social sensing generally refers to three forms of data collection, which include participatory sensing, opportunistic sensing, and scavenging of social data. Individuals are directly and actively involved in the sensing phase in participatory sensing and chose to conduct particular essential to fulfill the criteria of the application [13,22].

Spatio-temporal fluctuation is the process of change in a specific landscape is calculated based on its patterns of change. The measures of Spatio-temporal variation show the shifts in various ways in the landscape structure. The direction and frequency of the fluctuation show the spatial variations. This helps to find the physical vulnerabilities which may be the cause of hazards and risks in construction [22].

A method of structuring data to represent it in a particular logical manner is the semantic data model. It is a conceptual data model that contains semantic knowledge that gives the data and the relationships that lie between them an important meaning. Using semantic settings and prior information, a semantic approach to information processing and execution implicitly specifies the purpose of represented knowledge [23].

Machine learning is a portion of AI that allows computers to adapt and improve via experience rather than direct programming. Machine learning seeks to develop computer systems that can acquire and interpret data to learn on their own. In one or more aspects of their tasks, benchmarking is characterized as the process of comparing goods, services, and strategies against those of organizations considered to be leaders. Benchmarking acts as a method to calculate the energy efficiency of a particular building over time in comparison to other equivalent structures or modeled simulations of a reference building designed to a given standard when applied to building energy usage.

2.2 Digital twin in risk management

To improve the DT modeling precision, and to properly comprehend the vibrant spatial-temporal fluxes for data-driven choice, a proactive approach is required to sense dynamic spatial-temporal fluxes and to represent this knowledge in a city model. A unique paradigm for effectively grasp city fragility, with the ability to encourage interaction and integration with social service platforms to avoid threat [30]. In emergencies, a precise assessment of essential infrastructure performance will guide the risk reduction and infrastructure prioritizing assessment and planning process. Both decision-makers will gain benefits with a smarter city

DT platform using a sensory element that analyses textual – visual – geo input from digital networking to provides ease of infrastructure outages and their societal consequences [24]. The expansion of Smart City Digital Twin (SCDT) is possibly jeopardized by the requirement to do anything from scientific training to implementation, during which the gains of SCDT may not surface rapidly enough to sustain technical assistance. SCDT innovation will be benefited from shifting the focus away from one or several parts of the design and toward learning procedures that illustrate how SCDT platforms might influence com-munity management. A digital twin layout in which data representation and ML classicism operate in parallel, offering comparable and supportive roles in documentation providing improved tactical awareness and choice assistance for such manning of space-time integrated public services and infrastructure. Several lines of study on the application of AI in hazard response were explored in an attempt that develops an integrated perspective for the Crisis Community Virtual Care Model. The Catastrophe City Digital Twin Sight significantly contributes and will have far significance for the research or the use of AI, as well as city-wide catastrophe response, helping to guide future research [24].

2.3 Digital twin in energy management

The migration to more linked energy consumption settings presents both issues and opportunities regarding the adoption of advanced sensors and coordination techniques. To tackle the first issue, a sophisticated energy management system is a resource management technique for managing and organizing linked energy assets in a smart city or zone [25]. The energy gap in charging stations is a result of peak demand and a shortage of smart charging as a result of high development costs. Power storage technology, as a developing solution, provides cities with secure and convenient power buffered at rush hours; nevertheless, it is uncertain to integrate power retention properly to fast chargers at the lowest feasible cost. Cities are tasked to analyze energy-efficiency design quality and prioritize upgrades across existing structures to fulfill energy-reduction objectives. While top-down energy comparing methodologies are valuable for identifying general good and bad operators across a city's collection of buildings, they are limited in their capacity to give practical recommendations into achievement possibilities.

2.4 Real-time monitoring system with digital twin technology

The incorporation of digital images and drawings will allow the construction manager to produce progress reports more consistently and accurately. And more detailed as-built project schedules would be transferred to facility managers to provide information on the company's knowledge of the facility for operation and repair, reconstruction, and demolition. The Digitalizing Construction Monitoring (DCM) model will allow project managers to enhance decision-making, efficiency, and delays. Construction sites must be carefully assessed to detect unsafe situations and safeguard workers from potential occupational hazards. Accidents that result in death. In present practice, worksite control depends primarily on monitoring, it takes effort and may be vulnerable to failure. Due to the extreme unpredictable impact of construction workplaces, it is exceedingly impossible for safety inspectors to follow and physically classify all mishaps that may expose personnel to safety dangers continuously. Considering recent advancements in automatic progress tracking techniques and infrastructure, the majority of construction businesses across the world do not employ them for their tasks [26]. The construction project starts with a work plan that contains an expenditure, a timeline, and an engineering strategy aimed to finish the job as quickly as possible. To guarantee the project's success, effective project management necessitates monitoring of all areas of the construction project, including quality and quantity of work, prices, and schedules. It is critical to monitor the overall performance of the building project.

2.5 Digital twin automation in infrastructure management

The digital twin is a simulated model that digitally generates the actual components, which imitate the functioning of actual things in a controlled setting using data, and contributes or enlarges new capabilities for physical beings through virtual and real interaction responses, data fusion assessment, decision adaptive optimization, etc. [27]. These are innovative novel methods for persistent digital surveillance. and active physical performance of integrated products, technologies, and automated systems. In addition, the benefits of longitudinal and transverse implementation in manufacturing are focused on the introduction of digital twins [28]. The construction industry had placed itself in the field of automation. Construction automation is critical to the successful execution of any project. It can also aid in reducing manual input, but it aims to enhance the total productivity of building projects. To further the generation of effective cities, automation was the stepping stone. Digital twin helps in the real-time monitoring of the cities which had made the automation in construction even stronger. There are many factors which affect the construction. While incorporating automation we should consider those factors. Such an important factor is the geometric area of the region where construction is expected to be done. Another important factor is the economic condition. Most of the automatic facilities need maximum economic consideration. A model is developed by a researcher to understand the role of demographics in cities and developed a model of smart city with the help of an urban operating system. This frame-work is being assessed in Tallinn to evaluate and detect healthcare costs in urban centers, demonstrating why trends in urban areas ought not to be neglected. In the instance of Tallinn, a blend of demographic, financial, and labor force models show that protracted healthcare spending is growing [29]. Paradigm design-specific module explains situational elements in a series of unique design-specific occurrences. These data are utilized to update the current Building Efficiency Framework so that it more accurately reflects the structure of a proposed structure under development. These models help in the intelligent management of the project which indeed helps in the effective decision-making project which is required in an ongoing project.

Geometric study of a region is most important in intelligent management. While managing a particular project first we should examine those areas to address how the geometric accept the automation process to reduce human efforts. The digital twin could be used to evaluate various situations for future planning, such as changes in density and their impact on urban climate or traffic and even flexibility. These results will open up new opportunities for problem solving and decision within the management and external project team members [30]. The lifecycle of a project can also be defined with the help of DT technology. With centralized DT system across a desktop application, mobile application, and tablet application has been developed based on a continuous integration technique by a researcher for conducting a case study through constant lifecycle implementation to achieve the desired efficiency by decreasing energy usage, decreases the number of required restorations and raising the standard of regular maintenance [31]. Cost pressures and environmental concerns make service providers conscious of the need for power generation across the full spectrum while fulfilling dependability standards [32].

The emerging advance to make cities smarter is DT technology. The transition plan for the construction of a digital twin at the region level, on the other hand, is still not applicable [33]. If designed with appropriate algorithms, a digital twin will portray and forecast the status and effectiveness of its digital tasks. The latest trends related to digital twins are still at a preliminary phase concerning structures and other asset management. Most of such advancements emphasize the perspective of architecture and technology or construction. The operation and maintenance (O&M) stage, which has enormous potential, can also be examined with the aid of a DT [34]. Adopting a DT management approach assists experts in developing a long-term approach for bridging operation and management, often known as preventative maintenance. Instead of using standard quality control measurements, the evaluation is mechanized from data acquisition through picture processing and data retention [30]. Safety, a further important factor can also be enhanced by digital twin and automation in construction. The automated DT schema neither collects tracking data of labors and aspects in real-time, but it can also obtain timely alerts as spatial-temporal safety barriers for people involved on and off the construction site in an automatic and timely manner in a harsh environment [35]. Mostly the growth of digital innovation in the construction environment, a slew of new challenges for safer implementation have emerged. Current re-searchers mentioned multiple approaches to increase safety quality, using computational technology [36].

2.6 From BIM to Digital Twin

The Digital Twin is described widely but usually defined as the flawless connectivity between a physical and a digital system. Digitalization can combine the challenges, capabilities, and recent advances for AI Technology and IoT [37]. One advantage of 5D BIM is, it is conveyed to respondents via 3-dimensional illustrations. The usage of neural networks in BIM pro-grams such as Autodesk Revit involves rule-based reasoning streams of data that optimize processes and cognitively assess vast judgment features [38]. Digital Twins are instantly noticed as the most crucial component of the building's technology platform; a comprehensive image of the ones-built environment in real-time whereas BIM is not intended for the instantaneous functional reaction [39]. Both the Digital Twin planning system and simulation techniques have numerous important commonalities. BIM is concerned with building design and construction, whereas digital twin simulations are concerned with how users engage with the physical environment [40]. Even though digital twin technology helps to incorporate automation in construction, Physical labor is vital, and the advancement of digital twin mechanisms will not be able to displace it. Most in-service characteristics do working principle exist, i.e., the advances in artificial intelligence have still not met the requirements, and some processes can only be accomplished by humans; also, computers could be used to substitute physical effort, but no relating software has been built up. With the rising use of BIM for capital control in the engineering, building, and design domains, BIM-enabled resource management during the construction process has gained a lot of attention in both learning and research [41]. BIM systems are focused on the formation of a proper validation set, unique and centralized to the anticipated building or infrastructural facilities. The model shall consist of all the elements necessary for its development, and each element shall be assessed by the parameters necessary for its interpretation [42]. Digitization and their deployments are critical for combining existing systematic and logical information with smarter, better ecological urbanism, as well as incorporating people's perspectives and establishing a smart, inclusive city planning process. The modeling and presentation of complex functionalities, including the engagement of disadvantaged groups, is critical in this context [43].

2.7 Digital transition of the construction sector in the current scenario

The building sector is considerably slower to transform its ecosystem into a digitized one. With the aid of digital technologies, streamlining business processes will go a long way to addressing challenges faced by the industry. DT Construction is a contemporary mode of development quality control that optimizes communication technologies from a variety of site sensing devices and AI-powered features to provide exact updates and productively evaluate and improve ongoing design, process design, and quality control [44]. The construction sector has access to cutting-edge ideas and ambitions. IoT is one such solution. As an IoT system platforms expand as well as connect with various IT advancements like Big Data, skillsets will emerge as existing professions are digitally displaced, such as budget estimators' labor, and potential careers such as Construction Data Analytics. As a services Management System acquires from a scientifically aware construction sector, one could also expect to see novel activities conducted on a building site and beyond, such as analyzing the state and quality of wearable devices [45]. The construction project comprises many disciplines. This implies the presence of several disciplinary members, functioning as silos in their respective offices. It also means that in three broad ways, i.e., they contribute to every project which includes, price, time, decisions. Digitization has the potential to change the whole construction sector and significantly enhance it. It is the strongest lever to increase productivity and save time and cost. The biggest advantage is clarity through digitalization, which enables efficient control and management [46]. New digital technologies are practically pouring into the construction sector. There are many excellent interactive solutions. But all of these solutions are only separate solutions and just one piece of the whole life cycle problem. Digitization and BIM are already developed in the construction industry, but the sector is still having problems with many difficulties that make digital transformation complicated.

In the construction and development processes and even in the use as well as maintenance stages digital architectural designs may be used to preserve knowledge without using either technology output or cyber-physical operation. Nevertheless, when a process is carried out in an improvised fashion without being specified in the virtual representation of a design, the successive operations in the phases of use and reconstruction begin with incorrect details and incomplete initial conditions that have been left without documentation. To be effective in a digital transition, executives and leaders need to start with a precise description of how digital can generate value for the organization [47]. The construction industry is one of the most urgent and exciting prospects for change with its outsized environ-mental exposure to carbon emissions by creative use of novel and traditional materials and construction techniques; waste reduction; and a planning framework and mechanism that is more respectful of the natural environment. Experimental methods used by higher-wealth countries to adopt development models for more productive urban environments also include the use of ICTs and the pursuit of a Smart City strategy. However, there is a need to assess whether the transition of digitalization affects the built-in environment. The way pro-jects are delivered also changes digital information; enabling higher sharing, internet connectivity, browsing, and enhanced information with visibility through production processes and with owners, providers, and end-users. In the construction industry, emerging innovations are expected to create disruptive change. By integrating a variety of emerging technologies and patterns to change architecture, there has been minimal research into how invention enthusiasts envision the future. Development has become increasingly heterogeneous and highly decentralized over the last few decades, relying on a range of various occupations, extending from planning and engineering sectors to producers of components/goods, with ever-customer demands to produce sophisticated facilities on schedule and under budget [13,48,49].

Globally, cities benefit from innovative digital technology to obtain their intention of sustainability. To enhance productivity and sustainability and waste management within the community, rising trends such as sensors and IoT, AI, and data analytic technologies are used. With conventional design frameworks being increasingly replaced by novel virtual modeling technologies, the construction system is experiencing a transition. This change occurred gradually rather than abruptly, and while modern technologies in the field are be-coming more popular, many old systems and practices remain unchanged. Recent developments in ICT have made it easy to collect, coordinate, as well as to process vast quantities of information, such as participatory, cloud technology, and sensor connectivity. This knowledge can be used to track and manage the operation of urban structures and encourage urban services' performance and outreach; it can also be used to help the participants of a city become more educated and engaged. With advancements in digital technology, asset owners need a digital twin of their designed facility at hand-over which can be used to facilitate construction and maintenance processes in real-time. With innovation and modern viewpoints, digital transformation has, even more, to do with it. The aim is to adapt businesses amid a new economy to an optimal way of competing. As unbelievable as it might seem, it's not enough to adopt technology, you need to know how to pick the best innovations and use them in the right way to build creativity and a sustainable competitive ad-vantage [15,50–52].

3. RESULT

Relying on an assessment of the relevant literature, this article proposes a theoretical approach for implementing a Digital Twin. Following a review of recent published studies, the researchers have expressed their point of view. Because of the scientific methodology's nature, not all parts of DT fit within the coverage of this review, keeping several pathways all around issue unexplored. The re-examination was undertaken to draw out the relevant tasks and explore elements regarded significant for discourse the future building industry study to counterbalance the quantitative summary.

4. DISCUSSIONS

Numerous technological advancements have enabled the creation of "digital twins," or virtual duplicates of real things, processes, or sites, such as AI systems, augmented and computer vision, etc. The concept of creating "twins" to serve as decision-making tools has long been employed in engineering. Cities may continue investigating ways to employ digital twin technologies to make their cities intelligent, easier and safer, and more efficient. In-vesting in technical enablers, such as smart infrastructure and other smart city solutions, will improve the volume of information needed for cities to profit from digital twin innovation. It is evident from the research papers reviewed that there are many gaps in the literature for further integration and advancement in the area of smart city technology development using the digital twin method. The incorporation of new sensors, the accurate integration, and analysis of collected data, the incorporation of artificial intelligence in the field of smart infrastructure monitoring, real-time visibility programs to ensure safety and performance, etc., are still required.

Facilitating actual data presentation for various wired users in various places is also a challenge for Smart infrastructure. Developing a program that combines several forms of information for the surveillance of a smart building is an area for future expansion. While there is research mostly in domain of digital twin application in smart city development, there is a lack of research in the field of infrastructure monitoring and control after construction. As an overall scope for further research, incorporating all of these data points towards the modeling of smart cities with smart infrastructures and providing an application framework for the development of advanced real-time monitoring of the maintenance and protection of these infrastructures through the incorporation of digital twin systems and BIM technology to mitigate safety risks and other disasters. Moreover, BIM applications may be linked to AI technology for graphically intelligent control management in smart cities.

5. CONCLUSIONS

Digital twin operations have become problematic due to the amount and range of new data sources such as digital audio and video, IoT sensor data, social media, and biometrics. There is also tremendous pressure to reduce the time taken to interpret information, accelerate the response process, and use modern techniques such as cognitive computing to unravel patterns that would otherwise be invisible. Digital twins, allowed by a digital interface, have immense potential benefits in this respect. Many digital twin projects in the Smart City area are currently based on transport and infrastructure or confined to properties or buildings. Although this approach is a good start, city management teams can link assets to processes and ultimately link entire ecosystems to under-stand the true potential of these initiatives.

The goal of this review was to explore and evaluate in clarity the intelligent management of the smart city using the digital twin approach. The paper highlighted and explored the role and advancement of these technologies in smart cities. The paper ended with the identification of the gap and the purpose of filling the gap. The paper explored the concept and implementation of twin technology design followed by the literature review. Engineers have a significant role to play in building and sustaining sustainable communities around the world, and we need to solve the problems we face very quickly. Governments in both developed and developing countries face the need for more, larger, smarter, and more viable large cities, yet those same cities, where 50 % of the globe's populace lives and is presumed to increase dramatically, account for 75% of the earth's environmental impact. Realizing what we know now, implementing what we achieve to-day, and using existing technologies and procedures, is a failure. A call for a change of current strategies has begun. So much time has passed by and it is time to adopt sustain-ability and risk management, technology and computer science, work across broader realms, and ensure that cities are genuinely able to meet the current recommendations of our future.

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