

Digital Twin for Processes and Products

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Abstract

A virtual representation of a system is referred to as digital twin technology. Digital twin technology helps a company to enhance their rate of production and profitability in global market. Temperature and vibration sensors are used by an organisation with help of this digital twin technology. Manufacturing sector, healthcare, automotive and energy related industries are benefited by this digital twin technology. Importance of digital twin technology is mentioned in this study. Everyone can easily gather a brief idea about this process. Every industry tries to implement digital twin technology in workplace. Implementation process of digital twin technology is discussed critically here. Quality and quantity of products are managed by this digital technology. Digital twin uses several types of technology like: IOT and AI. Proper internet connectivity is needed for this particular process. For this reason every company may not be able to maintain this process. High amount of money is required for an organisation to implement this process. Small companies cannot be able to use digital twin technology. Importance of AI and IoT is also mentioned in this study for using this particular technology across the world.

Keywords

Digital twin technology, IoT, products, process.

INTRODUCTION

A virtual representation of an object or framework is referred to as digital twin technology. A physical object is reflected by this digital twin work within an industry. This digital twin technology helps a company to manage several types of sensors. Temperature and vibration sensors are available in market, by which a company can use modern technology within a workplace. These sensors are effectively beneficial for an organisation to produce data related to different aspects of a physical object's performance, such as: temperature, energy output and weather condition [1]. Digital twin technology helps a company to manage span of an object's life cycle and uses of real time data sent from various kinds of sensors globally. Every company has a goal to supervise their operational management in a modern way. This digital twin technology helps a company to monitor operations and stimulate behaviour of an employee [2]. Several real world items are replicated by this digital twin technology from single pieces of equipment in a factory to full installation process.

Digital twin technology allows overseeing performance of an asset in a significant way to maintain proper process and strategy of work within a company. Various kinds of potential faculty are identified by a company with help of this digital twin technology in market [3]. In case a firm identifies their potential faults, this is beneficial for this company to mitigate those issues significantly to enhance their performance. Digital twin technology helps a company to make better informed decisions about lifecycle and maintenance process in workplace. Several types of industries are benefited by this digital twin technology such as: manufacturing, construction, energy, healthcare and automotive. Residential, commercial and infrastructure projects plans are made by construction companies. Entire

manufacturing sector lifecycle of an industry from designing and planning to maintain existing facilities is managed by using digital twin technology [4]. Better and modern plans for those projects are supervised by this digital twin technology.

MATERIALS AND METHODS

A blueprint of a study is gained by research design to finish a research work within a given deadline. Relevant and authentic framework of a research methods and techniques are chosen by researcher with help of research design. Various types of questions are available related to a research work; this research design helps to answer all questions in a simple way [5]. Researcher can make decisions related to a research work by this research design. In this study, these individuals use "qualitative" research design to collect accurate and authentic information related to this study. This qualitative research design helps researcher to gather in depth knowledge and data related to this study [6]. Various forms of qualitative research designs are available such as: narrative model, historical model, ethnographic model and case study model. This is advantageous for a researcher to conduct a particular research work. Researcher can easily provide unique insights related to a study by this qualitative research design.

Research approach refers to a framework by which researcher can easily maintain their strategy and process of a research work. Several types of research approaches are available such as: "inductive", "deductive" and "adductive". In this study, researcher uses an "inductive" research approach to provide a rich description of complex phenomena. Relevant and authentic process of a research work is maintained by this "inductive" research approach [7]. Researcher has a responsibility to collect, analyse and interpret data related to this particular study. These

individuals can easily provide different meanings of a research work by this inductive research approach. Inductive research approach helps a researcher to achieve aims and

objectives during research process from start to end [8]. Several types of theories, patterns and observations are used by a researcher to find answers of research questions.

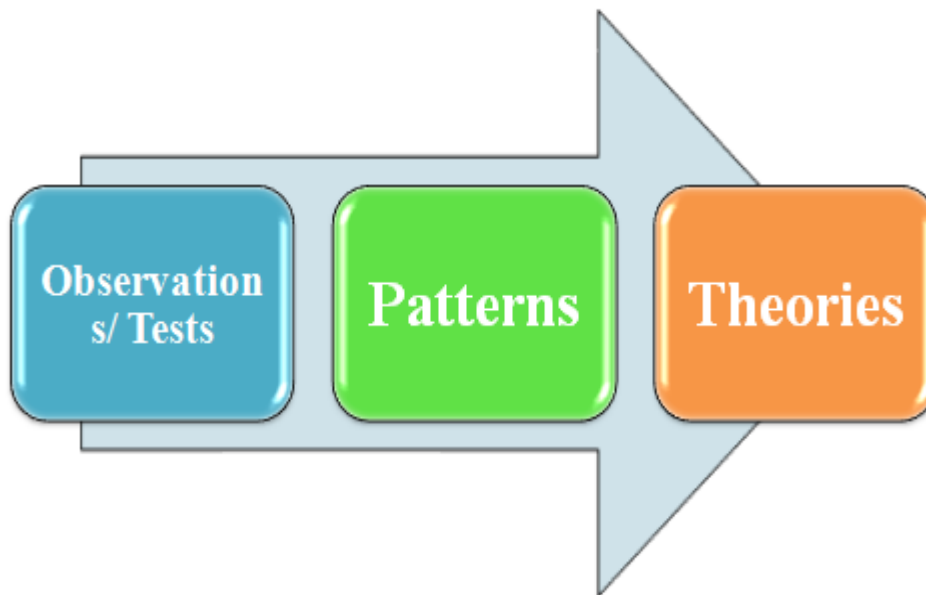


Figure 1: Inductive research approach

Data is collected by researcher to maintain a proper strategy of work. In this study, these individuals collect secondary data from several types of newspapers, online journals and websites. A certain amount of time and money are required for a research work. Hence, a secondary research type helps a researcher to save money and time significantly. Two types of secondary data are available such as: internal and external secondary data sources [9]. Internal secondary resources include databases containing reports from prior research. This research type is economically sound for a researcher to provide their better performance. Quick and faster process of a research work is managed by this particular research type. In this study, researcher includes qualitative research design and inductive research approaches. These individuals collect existing data related to this study with help of qualitative research types. Researcher excludes quantitative research design and deductive research approaches.

RESULTS

A brief idea about digital twin for processes and products

Digital twin technology is effectively beneficial for a company to enhance organisational performance and financial condition. Construction, manufacturing, energy, healthcare and automotive industries are benefited with help of this digital twin technology in market [10]. Existing projects are enhanced by this particular technology significantly. 2D designs are made by architectures for a construction industry. Digital twin technology helps a company to make 3D modelling of buildings. Commercial building managers use digital twin technology to monitor

temperature, occupancy and air quality within rooms. Digital twin technology helps a manufacturing company to monitor their machines on a daily basis to maintain their process and strategy of work. This digital twin prototype technology helps a firm to analyse their performance in a simple way. Strategic project planning of an energy sector is overseen by this particular digital twin technology [11]. Performance of a company is managed with help of this digital twin technology in global market

Performance and life cycle of existing assets are supervised by this twin prototype technology. Digital twin technology helps an organisation to maintain their several types of existing assets such as: refining facilities, wind farms, offshore installations and solar projects [12]. Automotive industry is also benefited by this process. Digital models of vehicles are made an industry with help of this digital twin technology in market. Physical behaviours of vehicles are known to everyone by this digital twin technology. This particular prototype technology helps a company to maintain software, electrical and mechanical models significantly. One of essential parts of a healthcare industry is digital twin technology. Usage of several types of modern technologies and machines are known to everyone by this digital twin technology [13]. Digital twin technology helps a healthcare industry to provide modern treatments to their patients, by which these individuals are attracted by this industry. Different types of digital twins are available such as: asset twins, component twins, system twins and process twins.

A single piece of an entire framework is managed by digital presentation of component twins. Operations of a machine are supervised with help of this digital twin

technology in market [14]. Operational managers always try to maintain their performance in workplace with help of this particular digital twin prototype technology. Two or more components are used by a company in a digital twin terminology. This digital twin technology helps an industry to manage a comprehensive framework of a work process. Organisational and financial performance of a company is managed by this digital twin terminology in market. System twins are referred to as a higher level of abstraction from asset twins. A system twin shows different assets work together as a part of a single framework. This visibility of an industry helps to enhance their performance and decision making process in an organised manner [15]. Process twins help a firm to show digital environment of a whole object. Various components and assets are used by a company to maintain their economic growth. Various components are used by a firm in a single framework with help of these process twins of digital twin prototype.

Implementation process of digital twin within an industry

Digital twin technology is immensely advantageous for an organisation to enhance their brand value and brand equity. Every company has aims and objectives to maintain their work process. Digital twin technology helps a firm to achieve their aims and objectives in a significant way [16]. Several types of steps are followed by a company to implement digital twin technology prototype technology. A clear vision of digital technology is an essential step to implement digital modern technology. Every company has a responsibility to create a blueprint of work process in workplace. In case a company maintains these blueprint concepts, employees can easily understand their work strategy. For this reason, these individuals provide their better performance within a company. Operational managers and human resource managers have a responsibility to manage digital twin technology to maximise value and profitability of an industry [17]. Proper process of a firm helps to enhance rate of production in workplace. Consequently, an industry can fulfil demand of markets and customers by this process.

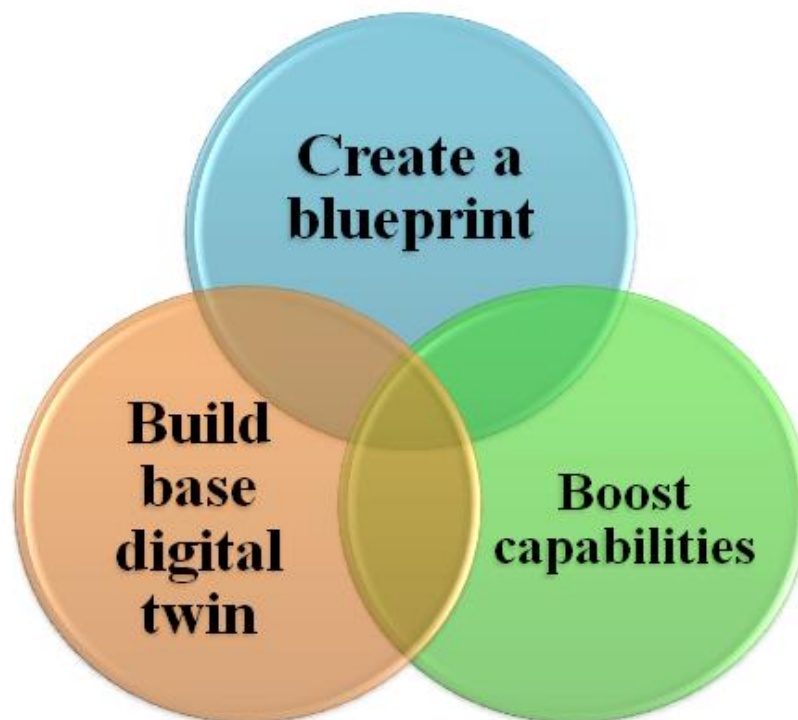


Figure 2: Implementation process of digital twin technology

Second step for implementing digital twin technology is to build a base digital twin during working hours. In case a company implements digital twin technology within a workplace, employees may not be able to use those technologies in an organised way. For this reason, this digital technology is not beneficial for an organisation. Company management team has a responsibility to provide training to their employees about usage of modern digital technology [18]. Basic digital twins are built within a company by this blueprint of work process. Core data products are assembled by this build phase of an organisation. Data team's engineers

always try to maintain digital twin technology at time of working. Quality and usability of structured and unstructured data are over seeded by a company by this digital twin technology. This particular process helps a firm to supervise development of visualisations. Digital twin processes help to generate additional data and insights of a company [19]. An early digital twin is supervised by this particular process.

Digital twins help a company to boost their capabilities in a simple way. Consequently, this company can enhance their economic growth by using these digital twin technologies. Smart sensors are used by a company in market to represent

real time digital twin technology. Several types of technologies are used digital twins such as: internet of things (IoT) and artificial intelligence (AI) [20]. This IoT helps a company to maintain usage of several types of sensors in workplace such as: vibration and temperature sensors. Those sensors are immensely beneficial for an organisation to gather several types of information and knowledge of work process.

Communication between devices and clouds are managed by a firm with help of this IoT process. IoT refers to a collective network of various kinds of devices. High bandwidth of digital telecommunication is managed by this IoT framework at time of working [21]. IoT sensor data is transmitted by a firm with help of these digital twins in workplace. Several types of information from real world objectives to digital world objectives are gathered by this digital twin technology. In case a company gathers different types of information and knowledge related to work, relevant work processes are maintained by a firm. AI helps a company to enhance their brand value and brand equity. Every company has a responsibility to maintain their AI, by which a firm can easily earn high profit from market. Sustainability and environmental factors are also controlled by an organisation with help of this AI. AI can adjust to new inputs and perform like human beings within a company. For this reason, AI is immensely beneficial for a company to enhance their performance.

Advantages and disadvantages of digital twin technology

Performance of an organisation is supervised by this digital twin technology. An industry can monitor a constant stream of performance and usage of data in real time. Constant stream of usage and performance of data helps a company to enhance their organisational and financial performance. Digital twin technology helps a firm to enhance their rate of production within a company. End to end asset or product life cycle data is combined with help of these digital twins [22]. Digital threads are managed by an organisation to use digital twin technology during working hours. This digital twin helps to maintain service business models within a workplace. For this reason, a firm can easily enhance their profitability and productivity by using this modern technology [23]. Digital twins help a firm to produce several types of modern products. In recent days, every customer tries to grab better quality and quantity products from market. In case a company provides better products to their customers, these individuals try to purchase their necessary products from this company.

Innovative products are produced by a company within a workplace by these digital twins. Better service business model helps a company to maintain their performance significantly [24]. Manufacturing sector requires innovations in their production. For this reason, modern and unique products are produced by a manufacturing industry. This industry can easily fulfil demand of markets and customers. Supply chain management, services and logistics are supervised by an organisation with help of this digital twin

prototype technology. Better supply chain management helps a company to produce several types of products at less time [25]. Green and sustainable raw materials are gained by proper supply chain management within an organisation. Suppliers are an essential part for a company to supply raw materials in manufacturing sector and also provide materials from manufacturing sector to market. Digital twin prototype technology helps an organisation to manage proper supply chains in global market. Sometimes, suppliers may not be able to provide pepper raw materials in proper time, for this reason work process is hampered due to lack of materials.

Digital twins have various kinds of advantages and also disadvantages, by which a company can easily identify importance of digital twins at time of working. This technology is maintained by proper internet connectivity. In case a company may not be able to maintain proper connectivity of internet, this firm cannot be able to use digital twins [26]. Security process is not managed by these digital twins at the time of working. Company management team has a responsibility to control security of employees in workplace, by which these individuals are attracted by this company. Hence digital twins cannot be able to provide security to employees. Retention of employees is also hampered due to lack of security processes [27]. 3D cad models are needed for an industry to manage digital twin's concepts within a company. 2D designs are not used by a firm for using digital twin prototype technology.

Proper supply chain management is required for a company to use digital technology. However, an organisation cannot be able to manage supply chain in a simple way. Globalisation process and new manufacturing techniques are used by a firm for using digital twins [28]. Every company has a responsibility to control sustainability and environmental factors significantly. Digital twins may not be able to manage design data among all partners and suppliers for maintaining their financial and organisational performance.

Challenges faced by a company to implement digital twin technology

Digital twins are an essential segment of a firm to enhance their performance. Hence every company cannot be able to implement this digital twin technology in workplace to produce better products. A certain amount of money is required for a company to implement this technology [29]. Usage of modern technology is not known to each and every employee in workplace. For this reason, these individuals may not be able to provide better performance. Rate of production and work process is hampered within a company due to lack of knowledge and skills. Every company may not be able to use this technology within a workplace. For this reason, modern strategy and process is not maintained by this company in market. Several types of new designs are available in market; hence a company is not capable enough to implement this particular technology during working hours. Every customer always tries to grab better quality products from market. Consequently, a firm has a

responsibility to provide modern products to their customers in a simple way.

This particular technology may not be able to manage relationships between complex objects and simple objects. Physical properties of those objectives are not controlled by a company in global market [30]. For this reason an organisation cannot be able to increase brand value and brand equity. Profitability and rate of production is hampered in workplace due to lack of physical properties of complex and simple objects. Collaboration process is also an essential part of a project work. In case a company fulfils this process, this company can easily enhance their economic growth. Several types of projects are available market; company management team has a responsibility to identify their necessary project work. A variety of contexts are available, this digital twin technology is immensely beneficial to increase their performance in market. Conflict detection process among employees is not supervised by a company with help of this digital twin technology [31]. Higher authority of an organisation has a duty to maintain their growth and operation process significantly.

DISCUSSION

Digital twins are effectively beneficial for processes and products across the world. This technology helps a company to enhance their rate of production and profitability. Several types of sectors are benefited by this digital twin technology such as: construction, automotive, energy and healthcare. Various kinds of designs are made by architecture with help of this digital twin technology. Only 3D cad models are designed by this technology globally, however customers can easily be attracted by these 3D models. Operational managers of construction industry use this technology to monitor temperature, air quality and occupancy. This particular technology helps a manufacturing sector to monitor their machines in a significant way. Existing assets of a company are controlled by this modern technology. Digital twin technology is advantageous for a healthcare industry to provide better quality treatments to their patients and modern facilities are also available within a company. For this reason, this industry can earn high profit from market and enhance their value and prosperity in an organised way.

Asset twins, system twins, component twins and process twins are available for maintaining this digital twin technology. Various components are used in a single framework by this technology in workplace. For this reason, a company can easily maintain a proper process and strategy of work. Digital presentation of component twins is measured by a single piece of an entire framework. Digital twin technology must be implemented by an industry to maintain their quality and quantity of products. Several steps are followed by a firm to implement this particular technology such as: build a strong base related to digital twin, create a blueprint of work process and boost capabilities of a firm. Every employee must know about digital base technology within a workplace. In case a company engages experienced

employees, these individuals can easily build a digital twin base to enhance their performance. Employees get an opportunity to enhance their skills and knowledge related to this digital twin technology.

Digital twins use IOT and AI during working hours to manage their financial growth. In recent days, every company tries to use machines to monitor their work process on a daily basis. Several types of computer systems and machines are controlled by stimulation of human intelligence processes. Four types of AI are available in market such as: limited memory, reactive, self aware and theory of mind. AI helps an organisation to manage cyber security to attract more employees and customers. Digital personal assistants are used by this AI process globally. In case a company gets personal assistants for using this digital twin technology, a firm can easily maintain usage of this particular technology. Collective networks of connected devices and technologies are referred to as IOT. This IOT process helps to maintain communication between cloud and devices.

This particular concept is beneficial for an organisation to add many devices in a single framework. For this reason, a company can easily collect daily progress reports from workplace by this process. Quality and quantity of products are overseen by a company by this digital twin technology. End to end process can be managed by a firm with help of this particular technology. Every company always tries to control constant stream of performance and usage of data in real time. Business models are immensely beneficial for an industry to attract investments, motivate management and staff. Experienced employees are engaged in workplace to produce several types of modern products within a company.

CONCLUSION

A virtual model of a physical object is referred to as a digital twin. Several types of objectives are available such as: complex and simple objectives. These objectives are immensely beneficial for a company to maintain usage of sensors. Temperature and vibration sensors are used by a company to monitor their work process and strategy. This technology helps a firm to improve their performance. Several types of plants and equipment are used to produce modern quality products. Supply chain management is an essential part of a company for using green and sustainable products. Quality of products is controlled by a company with help of these green and sustainable raw materials.

Usage of inorganic and synthetic products is educated by a firm due to this digital technology. Modern machines and technologies are advantageous for an organisation to reduce production time of products. Consequently, a firm can easily fulfil demand of markets and customers by this digital twin technology. Modern cars are made by an automotive industry in market with help of this technology. Better treatments are provided by a healthcare industry to manage their better performance. Component, asset, system and process twins are types of digital twins in market. Internet of things (IoT) and artificial intelligence (AI) are an important part of an

organisation for using digital twin technology across the world.

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