

## INNOVATIVE DIGITAL TECHNIQUES: NEW PARADIGM FOR THE FUTURE CONSTRUCTION INDUSTRY

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**Abstract:** The study primarily focuses on the cutting-edge digital innovations that represent today's new viewpoint for the construction business. The paper's goal is to describe the latest, cutting-edge digital technologies being employed in the construction industry, which will improve job quality and environmental sustainability. Innovation is currently a necessity of the situation, and all industries are attempting to increase the acceptability of new innovative digital techniques in their work in order to reach the new business dimensions. The significance of digitization and how it is applied in the construction business are discussed in the article.

The study concentrated primarily on the benefits of environmental sustainability as well as future digital views, which are already applied in building and giving the situation a new working aspect. In the construction industry, a networked value constellation has been identified and realized with the help of professionals (including a standardization body), software companies, and our technology transfer Centre. This paper demonstrates how this innovation process has been applied to this business case.

**Keywords:** Innovative construction, Digitalization, Environmental Sustainability, Digital Techniques.

### **Introduction:**

Any nation's socioeconomic development is greatly influenced by the building industry. The sector achieves this through translating various resources into built-in economic and social infrastructures, and its output is crucial to other sectors of the economy in any given nation. Despite its importance, the industry in the majority of emerging nations has struggled with subpar product delivery. Adoption of digital technologies (DTs), such as building information modelling, promises better project execution, particularly in terms of cost and time, as clashes in designs are detected early and the possibility of flawed design and rework, along with their associated cost and time wastage, is eliminated. The issue of inadequate communication in project delivery is expected to be resolved through the deployment of the Internet of Things.

In view of the ongoing changes throughout the city as a system, its urban realm, and the physical environment, governmental and non-governmental efforts are urging us to reconsider the role of the city user in the city of the future. The innovative technological advancements of the twenty-first century have altered the way we think about, perceive, and interact with our cities, the urban environment, and the built environment. One of the most important developments of the twenty-first century is digitalization, which came about as a result of the development of the information, communication, and technology (ICT) sector.

A shift in decision point could potentially shatter the kick-back culture between wholesaling and

installation companies, installation companies receive a new role, construction companies' sourcing practices may change and affect wholesaling companies' role, new actors who provide BIM object online cloud may play a significant role in the future digitalized construction industry and likely take over some of the decision-making authority currently held by wholesaling companies.

### **Literature Review:**

This study promotes the adoption of DP in construction organizations in South Africa by assessing DP's adoption, inherent benefits and the factors that could act as barriers to its adoption. Using a quantitative approach, the study concludes that DP is not being adopted among construction organizations in the study area. However, if adopted correctly, construction organizations stand the chance of having a better competitive advantage, improved project performance, and risk reduction through shared digital resources. Further to this, the findings revealed that the factors that could act as barriers to the proper adoption of DP are the poor definition of partnering goal, getting the right digital partner, trust issue, partnering risk issue, and investment cost (Aghimien et al., 2020). In recent study and practises, digitalization and the concept of the future city are growing popular. Literature discusses the use of digital technology as the primary engine for creating the perfect future metropolis (Saeed, et al., 2022). This thesis sought to investigate potential industry dynamic changes brought on by fully developed BIM adoption in the construction sector. The research was guided by three research questions, and the results were then used to discuss future changes in the industry dynamic (Jensson Alexander, 2017).

This work aims to examine how relationships between organizations in the construction industry are changing under the influence of IT. The impact of various digital tool types on the relationship between the buyer and the provider varies. BIM may help the parties involved build a local partnership, but the partnership cannot extend across the project border because the companies are concentrating on using BIM as a standard tool to ease collaboration at the project level. An integrated web portal is a crucial tool for managing the interaction between material suppliers and clients. The relationship to central partnership may be facilitated by the integrated system (Pham Hanh Thi Hoa, Hoang Hoa Thanh, 2018).

### **Innovative Digital Techniques:**

Every aspect of society has experienced the spread of digitalization. Digitalization in business has been shown to be transforming the basis of competitive advantage through enhancing firms' market responsiveness, productivity, or customer value generation. Particularly, the improvement in information accessibility and visibility has weakened the distinctions between parties, making inter organizational collaboration easier. By expediting the interchange of information and business that naturally occurs over time, IT adoption can improve company partnerships. Additionally, because it allows knowledge interchange, IT has been viewed as a critical component for knowledge generation.

- a) BIM: Many businesses in the architecture, engineering, and construction (AEC) sector have adopted BIM as a catalyst for IT-based change processes in their operations, and major construction projects are becoming more and more dependent on BIM to be finished quickly.

- By offering a shared environment for all information identifying a structure, facility, or asset, together with its common elements and operations, BIM offers a new way of working.
- b) **Smart factory:** Companies can save a significant amount of money by eliminating reactive maintenance, in which machines and equipment are used up until failure before being repaired, by employing IoT (Information technology) in the construction process to identify failure areas. Prefabricated construction is another term for the notion of modularization. It describes the production of major building components away from the construction site, which are typically manufactured in a factory before being brought to the construction site and put together using cranes.
  - c) **Tracking technology:** A tracking system is used to track the movement of people or objects, and it gives a model that can display the motion on a display capability a timely ordered sequence of the relevant location data. Utilizing GIS, GPS, and RFID were all part of the tracking technologies. Geographically referenced data is stored, edited, analyzed, shared, and displayed using GIS. While RFID is a sensing technology that uses radio signals to identify items from small sensor devices made of RFID tags or transponders and RFID readers, GPS enables a GPS receiver to detect its location, speed, and direction.
  - d) **Simulation and analysis:** It is feasible to uncover trends and probabilities of construction risks for performance improvements in future projects or improved decision making by analyzing previous big data (such as weather, traffic, or company activities). Simulation can be used to enhance the design of construction operations since construction projects are distinctive and extremely complicated endeavours that are influenced by external elements including weather, labour performance, and supply changes.
  - e) **CAD and 3D CAD technology:** Buildings of all sizes, both small and huge, are designed and drafted using computer-aided design (CAD) technology, which can also be used to create curves and other shapes in either 2D or 3D space. One of the most helpful technologies for enhancing the efficiency of product design and drawing tasks was computer-aided design (CAD).
  - f) **Web-based technologies:** Web-based technologies, which offer a platform to manage and share construction information by doing away with paper documents, improving access to data, allowing common documents between agents in different locations, doing away with discrepancy and misunderstanding in the versions of documents, and recording data in a multimedia format, are another effective and widely used tool. Through their empirical findings, some studies have recommended commonly utilized web-based technologies, including intranet and extranet, email, mobile devices, and the internet, as well as cloud computing.

### **New Dimensions of Construction Industry:**

The idea of the digital city is one of the key concepts for comprehending the future city paradigm. Early in the twenty-first century, the ICT revolution that exposed several options for thinking outside the box gave rise to the idea of "Digital Cities." The idea gained traction in related studies and offered a fresh viewpoint on the future of our cities. The creation of the concept of the "digital city" and the

proliferation of digitalization apps have changed how we view and interact with our cities, the urban environment, and the built environment.

The inefficiency of the construction sector has fueled the development of operational procedures and technology technologies aimed at streamlining the sector and boosting efficiency. Building information modelling (BIM), which was first presented in the early 2000s, has been at the Centre of this growth in recent decades because to advancements in information and communication technology. In the construction business, BIM is seen as a fundamental tool for achieving greater collaboration and, consequently, greater efficiency.

In terms of integrating digitization into production and management, the construction industry globally lags behind other manufacturing sectors. The construction industry is the one that has been least digitized overall in both the US and Europe. Many owners of construction contracting and subcontracting businesses are hesitant to invest money on the newest technological fads and trends. Construction companies have not been able to adopt cutting-edge technology to compete with their counterparts in the automotive or mechanical engineering sectors, despite the advantages that have been demonstrated in other industries. The maturity level of IT applications also varies along and within the value chain of construction.

The relationship between IT and enhanced innovation or better performance has received a lot of attention in the present study stream. Other authors investigated how IT affected the connections between the parties, or the commercial relationships. Robotics will help the construction sector employ less labour as it becomes more prevalent. Additionally, the robot system can operate for considerably longer periods of time than a person, which lowers labour expenses and shortens the working day. This will be brought about by the capability to effortlessly fulfil project deadlines, accomplish work on schedule, and do so without the requirement for maintenance.

### **Conclusion:**

With the growth of the Internet, more and more technologies are emerging today. Even though it is not at the cutting edge of new technologies, the construction sector is catching up. The development of the construction sector is being aided by new technology, which are allowing for faster, safer, and more unified progress. Through a new production process, industrial innovations like 3D printing and wearable exoskeletons are radically altering how the entire industry functions. The development of information and software technologies like CIM and GIS is linked with that of these industrial technologies. A higher BIM maturity within the construction industry could, directly or indirectly, shift the decision point of product choice upwards the supply chain. The industry is evolving toward a higher BIM maturity where more decisions may be made in the future higher up in the supply chain. These results support the theory that a higher BIM maturity moves the product selection decision point up the supply chain. According to this theory, future industry dynamics should include the developments listed below. These newly developed technologies will undoubtedly play an increasingly important role in the construction industry in the near future, bringing a more efficient and advanced industry to the whole world and building a better and brighter future for all.

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