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THE ROLE OF HUMANS IN ORGANIZING DESIGN PROCESSES WITH BIM TECHNOLOGIES

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Abstract:
This article addresses the role of humans in the organization of design processes when using Building Information Modeling (BIM) technologies. By examining the history of BIM technology, its stages, and the impact of human involvement, the article highlights the importance of human expertise and collaboration throughout the entire lifecycle of a building project. The significance of human decision-making in each phase of BIM—from planning and design to operation—is explored, demonstrating how effective management and skilled professionals are essential for the successful implementation of BIM.

Keywords: *BIM, project, traditional construction, operation, information, building, design, human factor.*

INTRODUCTION

Architecture and urban planning have long been integral to human civilization. Over centuries, as societies developed, the need for buildings—ranging from residential homes to schools, hospitals, and large-scale public buildings—grew significantly. Today, the field of construction continues to evolve alongside advancements in technology. One such technological breakthrough is Building Information Modeling (BIM), a process that integrates various disciplines involved in the construction of a building or structure.

Since the introduction of electronic computing, Information Technology (IT) has transformed various industries, including construction. BIM technologies are rapidly becoming indispensable for architectural design, construction, and management of building operations. As BIM systems continue to evolve, they have increasingly integrated human skills and expertise into the design and construction process, demonstrating the importance of the human factor in their success.

This article examines the stages of BIM processes and the crucial role those skilled professionals play in organizing these processes effectively. While BIM is a powerful tool, it is the people using it who ensure that it delivers optimal results throughout a building's lifecycle, from design to demolition.

METHODS

The methodology for this article consists of reviewing literature on BIM technologies and the integration of human factors within these systems. A qualitative approach was used to analyze various stages of the BIM process, the skills required at each stage, and how collaboration and communication among professionals contribute to project success. The article explores different human factors such as training, collaboration, data management, and decision-making in the context of BIM. Additionally, real-life case studies and examples from the field are used to highlight these human-centric aspects of BIM.

RESULTS

Stages of the BIM Process (Figure 1). The implementation of BIM involves several key stages, each requiring human expertise and collaboration across various disciplines.

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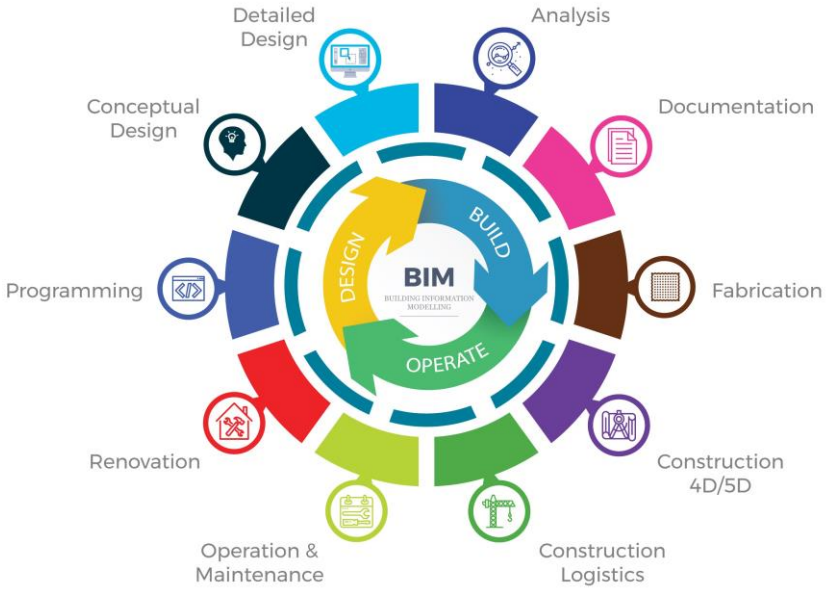

Figure 1. BIM project process

These stages are:

1. Planning and Preparation:

- Defining Project Goals and Requirements: At this stage, clear goals and requirements are set for the project, which must be communicated effectively among all team members. The alignment of goals ensures that everyone is working towards the same objectives, from architects to engineers;
- Developing a BIM Strategy: A BIM strategy is developed to ensure the smooth implementation of BIM. This strategy involves choosing the right BIM software, defining data management methods, and outlining roles and responsibilities within the team. A well-designed BIM strategy is essential for the success of the project;
- Team Formation: Bringing together a team of professionals—including architects, engineers, and managers—is crucial for the success of a BIM project. The human factor here involves ensuring that the team possesses the right skills and knowledge for their roles.

2. Modeling and Design:

- 3D Modeling: Using BIM software, a 3D model of the building is created, incorporating all structural, mechanical, and electrical components. This process requires precise coordination between architects, engineers, and other specialists to ensure the model is comprehensive and accurate;
- Project Documentation: Once the model is complete, BIM software can automatically generate all necessary documentation, such as drawings, specifications, and cost estimates. This documentation is crucial for the construction phase and future maintenance;
- Simulation and Analysis: BIM allows for the simulation of various conditions, such as energy efficiency, lighting, and acoustics. This analysis helps to identify potential problems early, enabling the team to make informed decisions.

3. Construction:

- Construction Planning: Using BIM, construction processes can be planned in detail. This includes determining material quantities, transportation logistics, and the construction schedule. The involvement of construction specialists at this stage ensures that the planning is realistic and achievable;
- Construction Management: BIM aids in managing tasks during construction by providing real-time data on progress, resource usage, and any issues that may arise. This

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reduces errors and helps keep the project on track;

- Quality Control: Throughout the construction phase, quality control is maintained by using BIM to monitor the construction process, identify errors, and make necessary adjustments.

4. Operation and Maintenance:

- Building Operation: After construction is complete, BIM can be used to manage the building's operation, including maintenance schedules, system upgrades, and energy management;
- Energy Efficiency: BIM allows for the optimization of energy use, which not only reduces costs but also contributes to sustainability efforts;
- Maintenance Management: BIM systems also help manage ongoing maintenance tasks, ensuring that the building is kept in optimal condition over its lifespan.

Each of these stages highlights the critical role that human expertise plays in the implementation of BIM. The skills of the team members, their ability to communicate effectively, and their expertise in managing data and processes are essential for the successful realization of the project.

DISCUSSION

The human factor in BIM is not just about using the technology; it is about ensuring that the technology is implemented effectively. The skills, experience, and collaboration of team members are critical to the success of BIM projects. However, there are several challenges to overcoming when managing BIM processes.

1. Skills and Experience: For BIM to be successful, team members must possess the necessary skills to work with BIM software. This requires ongoing training and development, as well as the willingness of the team to embrace new technologies. Teams must be equipped with the knowledge of how to use the software and how it can integrate with other aspects of the design and construction processes.

2. Collaboration and Communication: The complexity of BIM requires effective collaboration across various disciplines. Communication is essential for ensuring that all team members are on the same page, which reduces errors and delays. Open communication channels facilitate the exchange of ideas and solutions to problems, which ultimately benefits the project.

3. Data Management: BIM involves the handling of vast amounts of data, including project documents, design specifications, and construction materials. A robust system for managing and sharing data is critical for the successful execution of the project. Team members must ensure that data is accurately entered, updated, and accessible to those who need it.

4. Risk Management: Effective risk management is necessary to mitigate potential setbacks in a BIM project. This involves identifying risks early, assessing their impact, and developing strategies to manage them. Human decision-making plays a key role in recognizing risks and taking timely action.

5. Cost and Quality Management: Cost management ensures that the project remains within budget, while quality management ensures that the project meets the required standards. Both require the active involvement of skilled professionals who can forecast, track, and optimize both costs and quality.

CONCLUSION

In conclusion, the role of the human factor in BIM is indispensable. While BIM provides powerful tools for design, construction, and operation, it is the people using these tools who drive the success of the project. The skills, collaboration, communication, and decision-making of the team members determine whether BIM is used effectively and efficiently. Successful BIM implementation depends on the involvement of competent professionals who can manage data, risks, costs, and quality, ensuring that the project meets its goals and objectives.

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