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The Beneficial Future Of 3D Printing In Construction

In the current discussion surrounding the future of 3D printing in construction, we are now at a point of time in which innovative technology has the potential to revolutionize the industry, entering an era of unprecedented efficiency, cost-effectiveness, and architectural innovation. Contrary to skeptics who may perceive 3D printing as a distant or uncertain expectation, the following evidence suggests that embracing this transformative technology can fundamentally alter how we approach and execute construction projects. My discussion contends that the future of 3D printing in construction is not just a speculative possibility; rather, it is an imminent force that, if embraced, will reshape the landscape of construction, offering endless benefits in terms of speed, cost savings, and sustainable practices.

The future of 3D printing in construction holds significant benefits, primarily driven by, the first reason, efficiency. The technology we have in this day of age revolutionizes the construction process, streamlining project timelines and reducing overall construction time. Traditional construction methods often involve intricate manual labor and time-consuming tasks, leading to extended project durations. However, the use of 3D printing allows for the rapid fabrication of structures layer by layer, offering a remarkable reduction in construction time. According to “A systematic review and analysis of the viability of 3D-printed construction in remote environments”, written by Steven J. Schuldt, on ScienceDirect¹, detailed research states, “Research on 3D-printed construction began a noticeable upward trend in 2015, with the body of

literature steadily growing over the following years. Research has expanded into printing applications, methodologies, labor analysis, logistics, cost, efficiency, environmental impact, structural design, and even space applications. This rapid growth of research and expansion of viability considerations indicates that future research in the field presents many unique opportunities and challenges.”

The second reason, that overall benefits construction in an economical sense, is the idea of cost-effectiveness. 3D printing allows for precise use of materials, minimizing waste and reducing overall construction costs. The efficiency of material usage and the potential for incorporating recycled materials contribute to a more sustainable and cost-effective construction process. As discussed in “The Evolution of 3D Printing in Architecture Since 1939” in the ArchDaily², it is stated, “As of 2023, Exploring applications of large-scale robotic 3D printing, researchers at ETH Zurich used cement-free mineral foam made from recycled waste to develop a lightweight insulated wall system that can reduce building materials, labor and costs.”

The architectural innovation that can arise from the implementation of 3D printing develops the final reason for its benefits in construction. Today’s technology offers flexibility in design, enabling architects to create intricate and customized structures that were once thought to only be dreamed of. This newfound freedom in design not only allows for aesthetically pleasing structures but also promotes functional optimization. Architects can explore complex structures, pushing the boundaries of traditional construction methods. According to “A systematic review and analysis of the viability of 3D-printed construction in remote environments”, written by Steven J. Schuldt, on ScienceDirect¹, it goes into further detail stating, “3D-printed construction has the potential to transform the way architects and engineers design buildings by permitting greater geometric complexity and freedom. Increased structural complexity allows for the

construction of hollow structures, which can achieve the same strength as their solid counterparts at a lower mass, and of structures optimized to meet weight, performance, and efficiency standards”. The ability to create designs precisely to the project requirements promotes a new era of construction where structures are not just built; they are crafted with meticulous attention to both form and function, further supporting the benefits of 3D printing in the construction workspace.

One issue that could come to mind is how this could be a threat to those who work in the construction industry. The automation and efficiency described as benefits in the thesis could be seen as a threat to the livelihoods of construction workers, leading to losses of jobs and economic challenges in the industry. The implementation of 3D printing in construction may possibly change the nature of certain roles, but it also opens availability for the development of new skill sets and job roles. Training programs can be established to equip existing construction workers with the necessary skills, ensuring a smooth transition to a more technologically advanced construction landscape while also not risking a potential loss of jobs. According to “3D printing in construction: What’s the impact on HR?”, on OpenWage³, it is stated, “However, 3D printing won’t replace traditional manufacturing, instead it will complement it. This technology is a long way from being able to print every type of object, and it isn’t designed to replace traditional manufacturing. In addition, 3D printing will increase the need for people with particular skills. 3D printing technology will transform the workforce, but change will be gradual.”

Another issue that could come to the mind of readers is quality and durability concerns. Some might express doubt about the durability and structural integrity of 3D-printed structures, thinking that they may not match the standards of traditionally constructed buildings. However, ongoing advancements in material science and engineering are actively addressing these

concerns. According to “A systematic review and analysis of the viability of 3D-printed construction in remote environments”, written by Steven J. Schuldt, on ScienceDirect¹, it goes into further detail stating, “3D-printed construction is capable of the same strength as cast components and improved mechanical and thermal properties compared to conventional construction.”

In conclusion, the future of 3D printing in construction is not a distant or uncertain prospect; it is a transformative force that promises benefits unheard of. Embracing this technology will lead to increased unprecedented efficiency, cost-effectiveness, and architectural innovation within the construction industry. While concerns about job displacement exist, time and time again, history has shown that technological advancements create new opportunities. The evolution of 3D printing in construction, as evidenced by ScienceDirect, ArchDaily, and Openwage, serves as a testament to the positive impact this technology can have on the landscape. It is time for industry to embrace the future and accompany in a new era of construction that is faster, cost-effective, and sustainably practiced.

Works Cited:

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