

HOW AUGMENTED AND VIRTUAL REALITY CAN BOOST PRODUCTIVITY IN CONSTRUCTION

The U.S. construction industry builds nearly **\$1.3 trillion** worth of structures every year and employs more than **7 million** workers.

For various reasons, poor productivity in construction is a costly and difficult challenge to address. Virtual reality (VR) and augmented reality (AR) technology can improve communication, reduce costs, and identify problems in advance.

Thought leaders and researchers have predicted that VR and AR technology applications in the construction industry could boost productivity, adding an estimated \$16 trillion in value.

THE CONSTRUCTION INDUSTRY'S PRODUCTIVITY PROBLEM

Globally, the construction sector employs 7% of the world's working-age population. Every year, \$10 trillion is spent on construction-related goods and services. Nevertheless, the sector has a productivity problem that can no longer be ignored.

ANALYZING THE PRODUCTIVITY CHALLENGE

According to McKinsey

“Globally, labor-productivity growth in construction has averaged only 1% a year over the past two decades, compared with growth of 2.8% for the total world economy and 3.6% in the case of manufacturing.”



Employees in the global economy add \$37 of value per hour, compared with \$25 of value per hour added by employees in the global construction sector.

Economic value lost annually in construction due to low productivity:



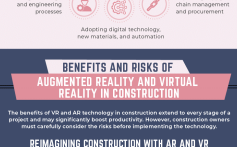
If construction-sector growth matched the growth of the global economy, the global economy would grow by an additional 2%. The U.S. construction sector could potentially contribute one-third of this growth.

REASONS FOR POOR PRODUCTIVITY



PROPOSING SOLUTIONS

Innovative firms are pursuing the following solutions to boost productivity:



BENEFITS AND RISKS OF AUGMENTED REALITY AND VIRTUAL REALITY IN CONSTRUCTION

The benefits of VR and AR technology in construction extend to every stage of a project and may significantly boost productivity. However, construction owners must carefully consider the risks before implementing the technology.

REIMAGINING CONSTRUCTION WITH AR AND VR

HOW IT WORKS

- VR: The user is immersed in a virtual rendering of the designed project and can experience it like a physical space.
- AR: The user's current reality is overlaid with virtual images, and the user can digitally manipulate and interact with the space.

VR APPLICATIONS

- Planning during the pre-construction phase
- Anticipating future access and usability needs once construction is completed
- Providing remote tours of a project site during the construction phase
- Preparing a site for the trades necessary to complete the design
- Assisting in worker training by recreating actual hazards and a construction site

AR APPLICATIONS

- Identifying mistakes or design issues during construction
- Assisting tradesmen during installation by providing overlaid visual aids
- Providing on-site skills training

BENEFITS OF VR AND AR

- Expedite construction projects
- Minimize risk by identifying issues in advance
- Eliminate costs associated with rework
- Increase the quality of a project

UNDERSTANDING THE RISKS

DESIGN ERROR LIABILITY
It can be difficult to assign liability for design mistakes in collaborative projects involving AR and VR. As changes are made, it can be difficult for each team member to keep up, which may potentially lead to project delays.

SAFETY CONCERNS
The careless use of AR or VR software may increase the risk of accidents. Teams must be aware of the differences between sensory-distracting products and actual physical conditions when using AR or VR on a construction site.

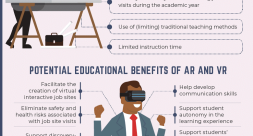
DATA PRIVACY
Proprietary information stored in the technology may be vulnerable to hacking and may pose a risk to customer data. A cyberattack may purposely or unintentionally alter project specifications and potentially lead to delays, errors, and safety threats.

INTELLECTUAL PROPERTY CONCERNS
Having a large number of users may lead to disputes regarding the right to use AR and VR programs and ownership. Rights and conditions of using AR and VR platforms should be agreed upon and memorialized in contracts.

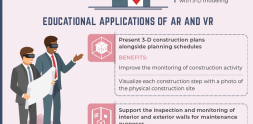
AR AND VR IN THE CIVIL ENGINEERING CLASSROOM

Engineering students can benefit from exposure to AR and VR technology in the classroom. AR, in particular, can help students better understand complex engineering theories by enhancing visual examples of their applications.

CHALLENGES OF TEACHING ENGINEERING



POTENTIAL EDUCATIONAL BENEFITS OF AR AND VR



EDUCATIONAL APPLICATIONS OF AR AND VR

Present 3-D construction plans alongside planning schedules
BENEFITS:
Improve the monitoring of construction activity
Visualize each construction step with a photo of the physical construction site

Support the inspection and monitoring of interior and exterior walls for maintenance purposes
BENEFITS:
Allow users to identify irregularities
Attribute an irregularity to specific coating

CONCLUSION

To become prepared for the engineering workplace, students need instruction and training on how to use AR and VR technology. Master's in engineering coursework involving AR and VR technology helps prepare students for the technological demands of the industry, because AR and VR technology plays a key role in developing solutions for construction's productivity problem.

Source: McKinsey & Company, "The Productivity Challenge in Construction," 2017. <https://www.mckinsey.com/industries/construction/our-insights/the-productivity-challenge-in-construction>.
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