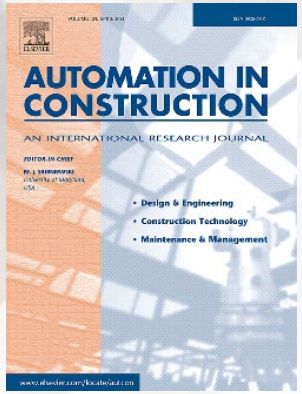
PROJECT MANAGEMENT

EDUCATION AT THE UNIVERSITY OF MARYLAND

Industry/Construction 5.0

Mirosław J. Skibniewski, Ph.D.

Professor of Construction Engineering & Project Management



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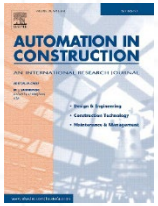
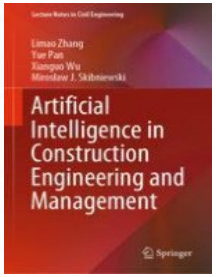
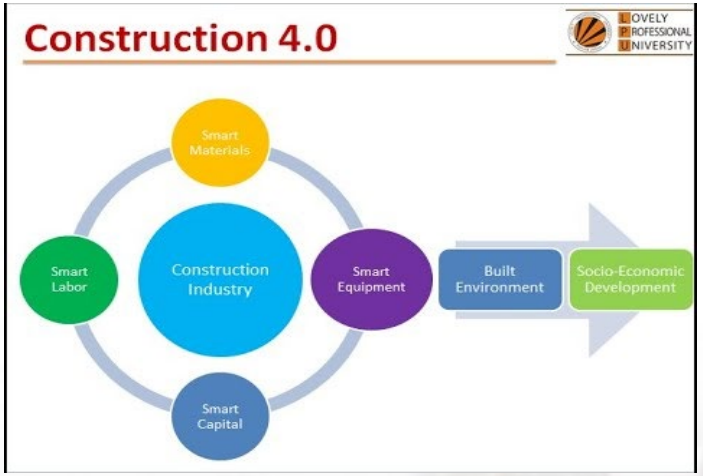
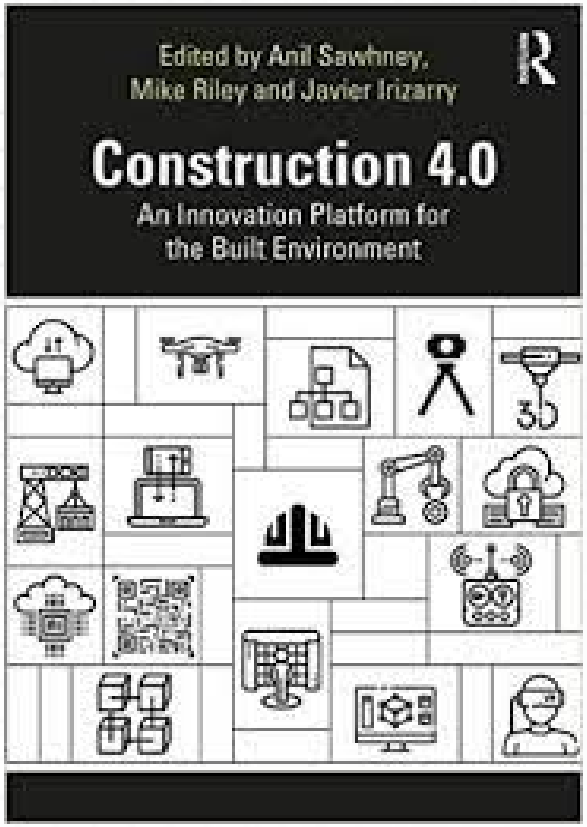
About the Speaker

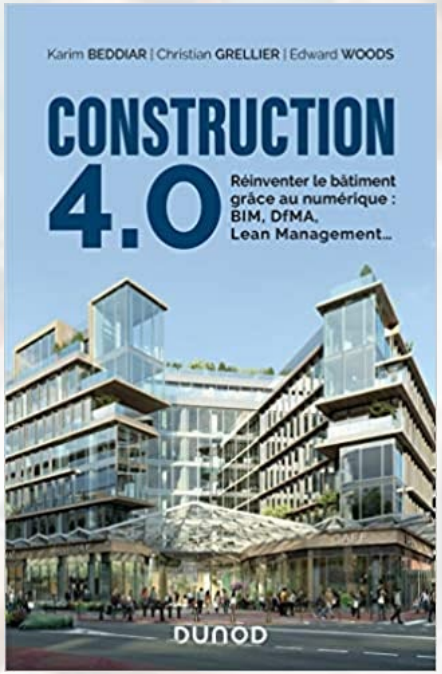




- Dr. Miroslaw J. Skibniewski is a Professor of Engineering Project Management in the Project Management Center for Excellence at the University of Maryland - College Park. Prior to his current appointment he served for 20 years as a faculty member and a senior administrator at Purdue University in West Lafayette, Indiana. He received his M.S. and Ph.D. degrees in Engineering Planning and Management from Carnegie-Mellon University.
- As a researcher and educator, Professor Skibniewski focuses on information and information technology applications in construction project management.
- Prof. Skibniewski is a member of National Academy of Construction (USA) and served on the National Academy of Engineering USA-Germany and USA-Japan Frontiers in Engineering committees, American Society of Civil Engineers' Robotics and Field Sensing Committee, Information Technology Committee, Intelligent Computing Committee, Modularization Committee of the Construction Industry Institute at the University of Texas at Austin, and on the National Academy of Sciences Assessment Panel for the National Institute of Standards and Technology in Gaithersburg, Maryland. He was a founding member of the Board of Directors and is Past President of the International Association for Automation and Robotics in Construction. Prof. Skibniewski serves as the Editor-in-Chief of ***Automation in Construction***, an international research journal published by Elsevier, and as Co-Editor-in-Chief of ***Frontiers of Engineering Management***, a scholarly journal published by Springer with Higher Education Press.
- Prof. Skibniewski is an author or co-author of over 400 technical publications and has made more than 150 invited conference keynote presentations worldwide.





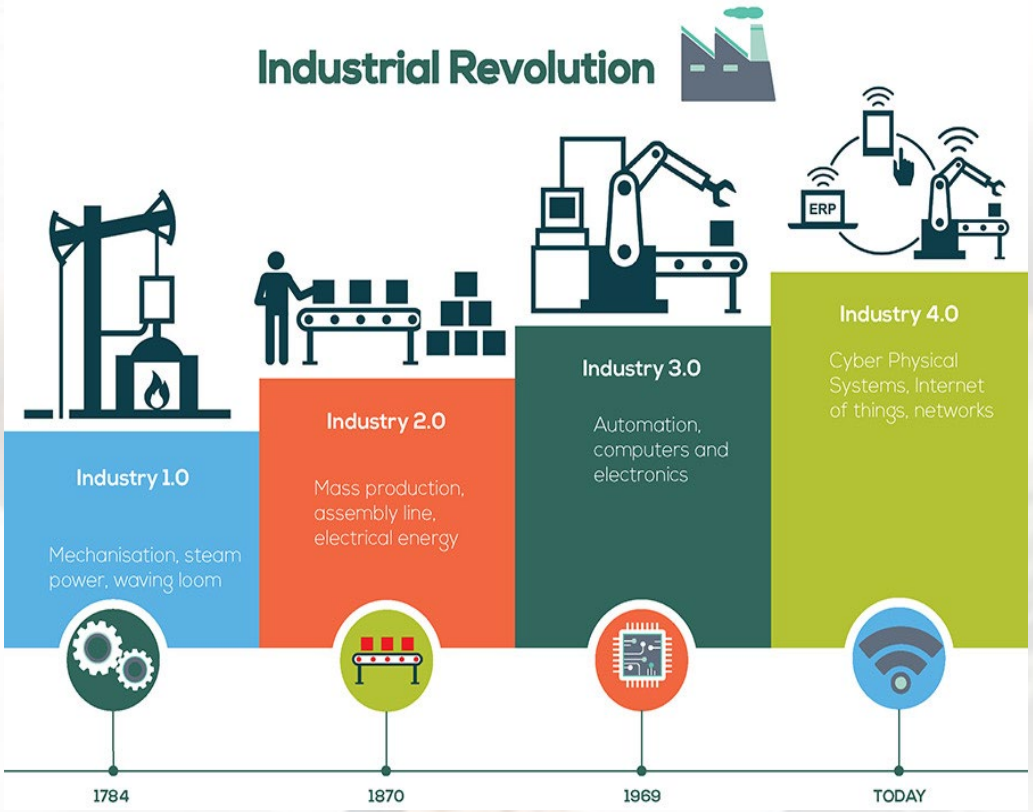


Reviewing Construction 4.0

Image from: https://en.wikipedia.org/wiki/Blockchain#/media/File:Blockchain.svg

Genesis of Industry 4.0

- The application of *Industry 4.0* to the construction sector
  - Physical Domain/Automation
  - Simulations and Modelling
  - Digitalization and Virtualization



https://eskills.org.mt/en/news/Pages/2018/Industry-4-0-in-a-Nutshell.aspx

Muñoz-La Rivera, F., Mora-Serrano, J., Valero, I. *et al.* Methodological-Technological Framework for Construction 4.0. *Arch Computat Methods Eng* **28,** 689–711 (2021). https://doi.org/10.1007/s11831-020-09455-9

Reviewing Industry 4.0

- Industry (Construction) 4.0 Technologies
  - 5G
  - Additive manufacturing
  - Mobile Apps
  - Artificial intelligence
  - Augmented reality
  - Automated regulation checking and audits
  - Big data
  - Big data analytics
  - Blockchain
  - Building information modelling
  - Cloud computing
  - Common data environment
  - Cyber-physical systems
  - Cybersecurity
  - Data mining
  - Data sharing
  - Deep learning
  - Digital signage
  - Digital twin
  - Edge computing
  - Embedded systems
  - Geographic information system
  - Human-computer interaction
  - Improve asset utilization
  - Industrial internet
  - Internet of Things
  - Machine learning
  - Mass customization
  - Mixed reality
  - Mobile computing
  - Modularity
  - 3D scanner
  - Photogrammetry
  - Predictive maintenance
  - Off-site construction
  - Product-lifecycle-management
  - Radio frequency identification
  - Robotics
  - Self-sustainability and self-sufficiency
  - Sensors
  - Simulations models and tools
  - Social Media
  - Supply chain management
  - Unmanned aerial vehicles
  - Virtual reality
  - Wearable technology
  - Neural networks

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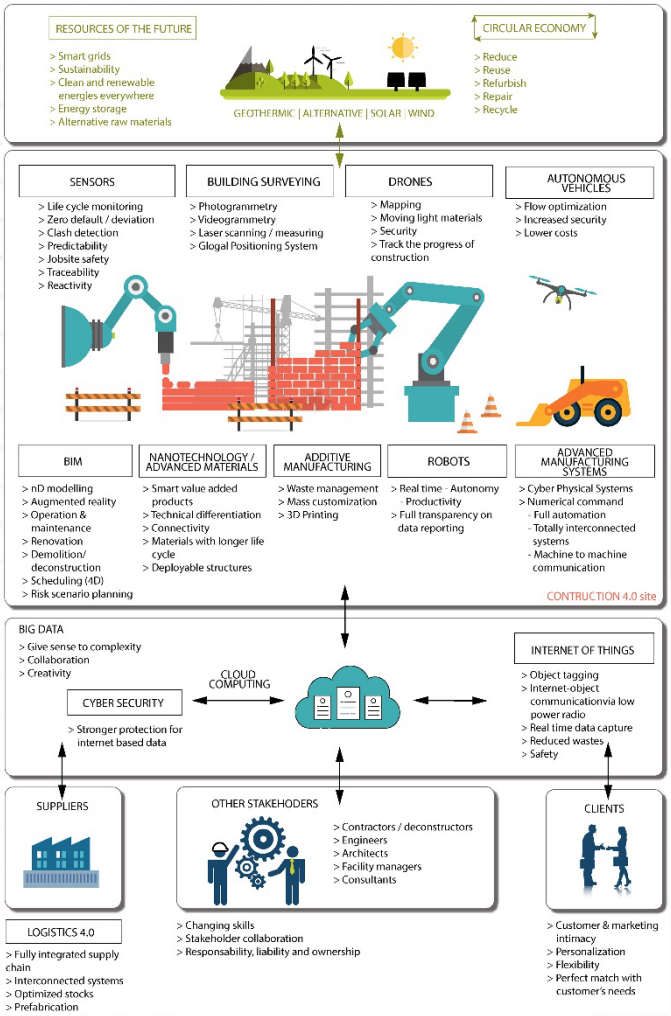
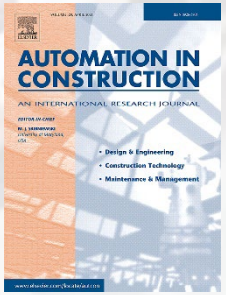
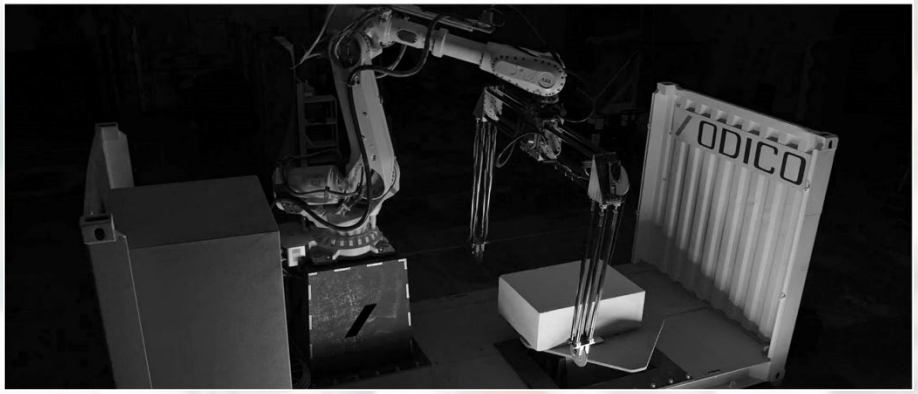
Reviewing Construction 4.0
Additive manufacturing

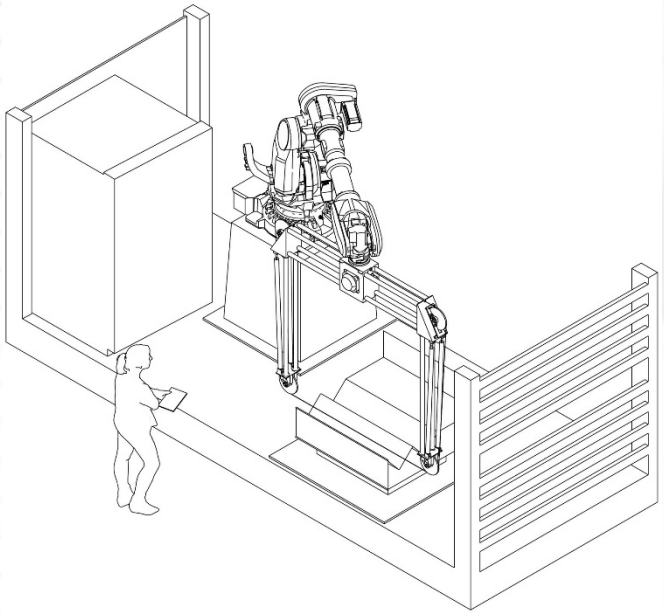


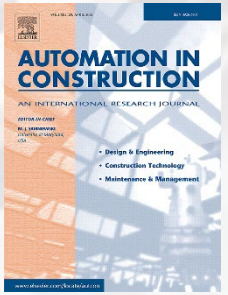


Flávio Craveiro, José Pinto Duarte, Helena Bartolo, Paulo Jorge Bartolo, Additive manufacturing as an enabling technology for digital construction: A perspective on Construction 4.0, Automation in Construction, Volume 103, 2019, Pages 251-267, ISSN 0926-5805, https://doi.org/10.1016/j.autcon.2019.03.011.

Reviewing Construction 4.0
Adaptive robotics

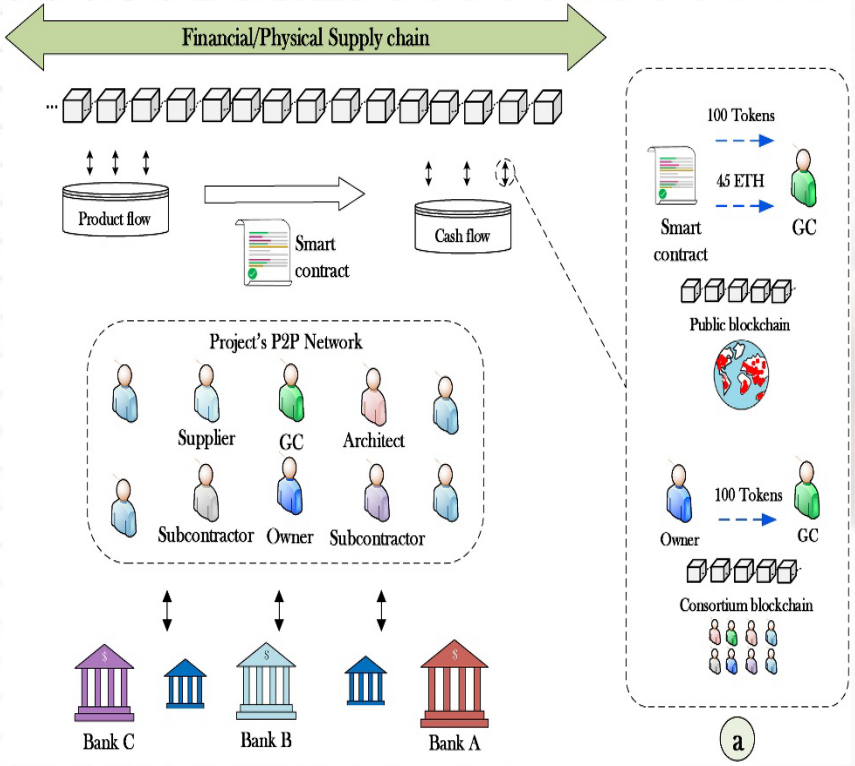


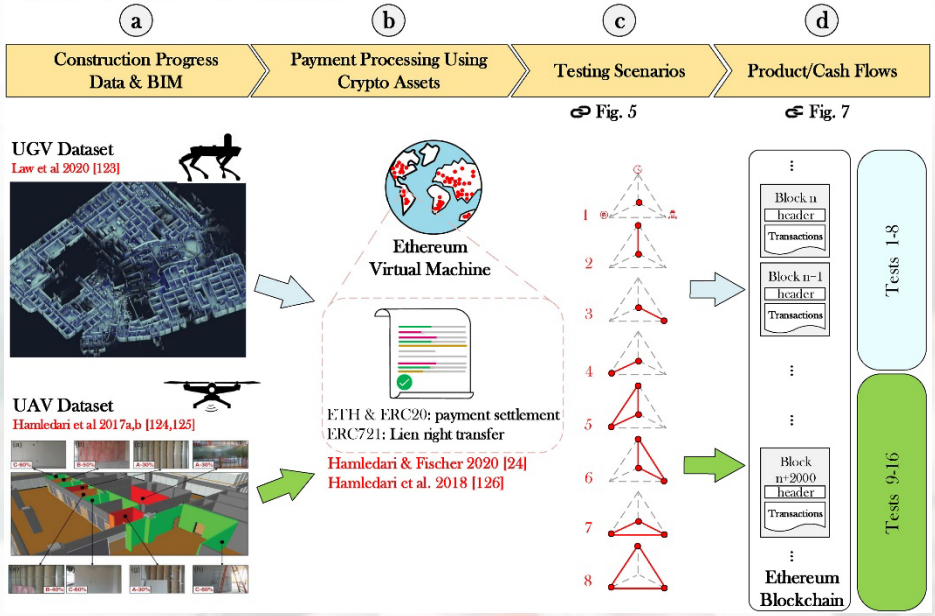


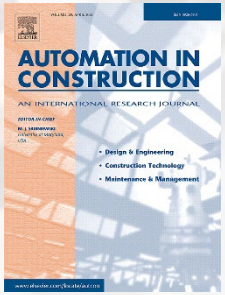


Narendrakrishnan Neythalath, Asbjørn Søndergaard, Jakob Andreas Bærentzen, Adaptive robotic manufacturing using higher order knowledge systems, Automation in Construction, Volume 127, 2021, 103702, ISSN 0926-5805, https://doi.org/10.1016/j.autcon.2021.103702.

Reviewing Construction 4.0
Blockchain technologies







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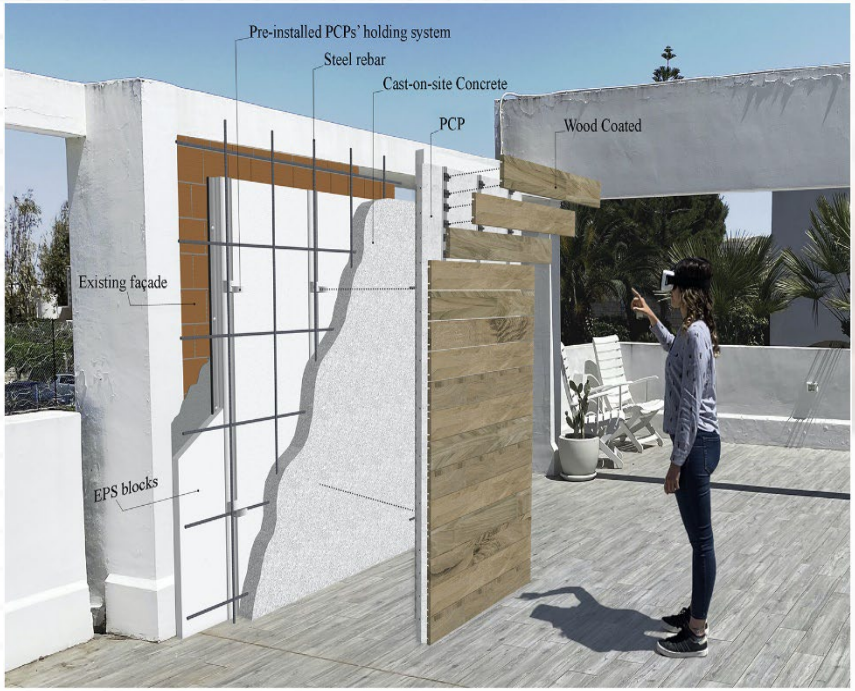
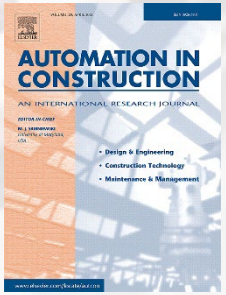
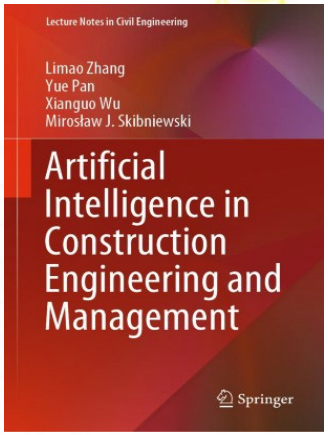
Reviewing Construction 4.0
Augmented reality

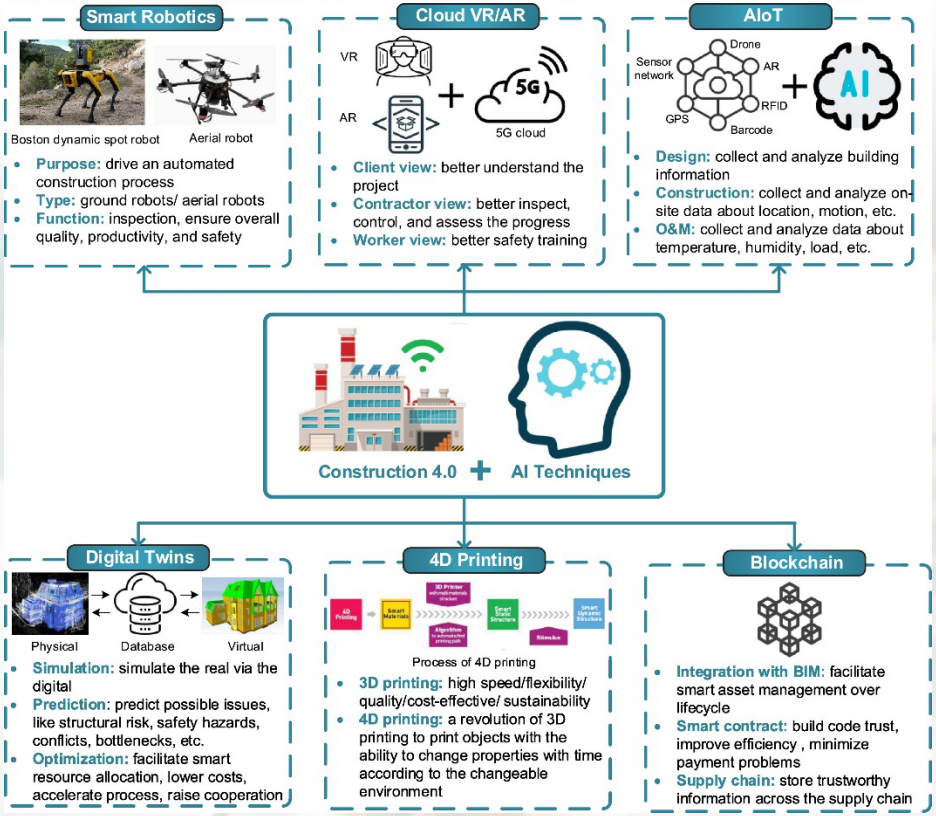




Valentino Sangiorgio, Silvia Martiradonna, Fabio Fatiguso, Ignacio Lombillo, Augmented reality based - decision making (AR-DM) to support multi-criteria analysis in constructions, Automation in Construction, Volume 124, 2021, 103567, ISSN 0926-5805, https://doi.org/10.1016/j.autcon.2021.103567.

Reviewing Construction 4.0
Artificial intelligence





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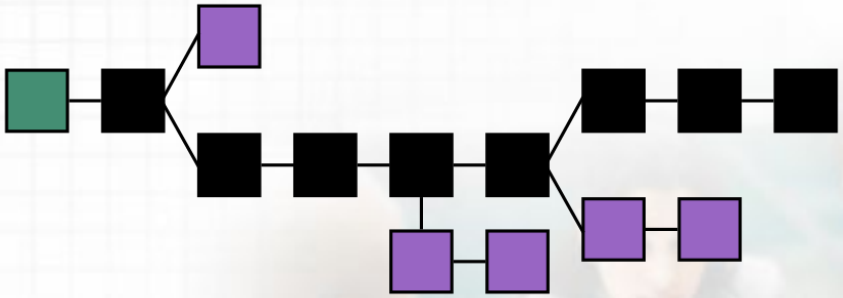


Understanding Industry 5.0

Image from: https://en.wikipedia.org/wiki/Blockchain#/media/File:Blockchain.svg

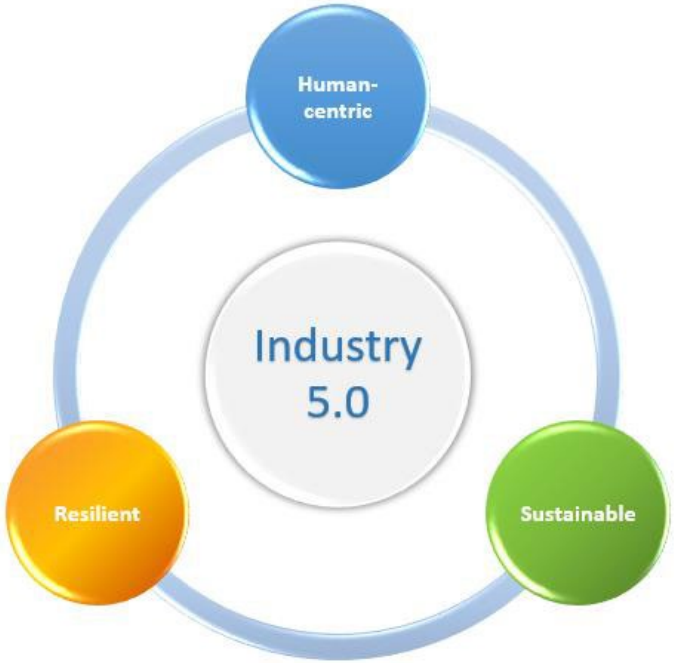
Understanding Industry 5.0

European Commission

- Go beyond producing goods and services for profit
- Shift the focus from the shareholder value to stakeholder value
- Reinforce the role and the contribution of industry to society
- Place the wellbeing of the worker at the center of the production process
- Use new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet
- Complement the existing "Industry 4.0" approach

https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/industry-50_en

Understanding Industry 5.0



Defining Industry 5.0

- Human-centric
- Sustainable
- Resilience

Industry 5.0 recognizes the power of industry to achieve societal goals beyond jobs and growth to become a resilient provider of prosperity, by making production respect the boundaries of our planet and placing the wellbeing of the industry worker at the center of the production process.

Industry 5.0 European Commission doi: 10.2777/308407

Understanding Industry 5.0

- Industry 5.0: An innovative, resilient, socio-centered and competitive industry, which respects planetary boundaries and minimizes its negative environmental impact.

- Enabling technologies
  - Human-centric solutions and human-machine-interaction
  - Bio-inspired technologies and smart materials
  - Real time based digital twins and simulation
  - Cyber safe data transmission, storage, and analysis technologies
  - Artificial Intelligence
  - Technologies for energy efficiency and trustworthy autonomy

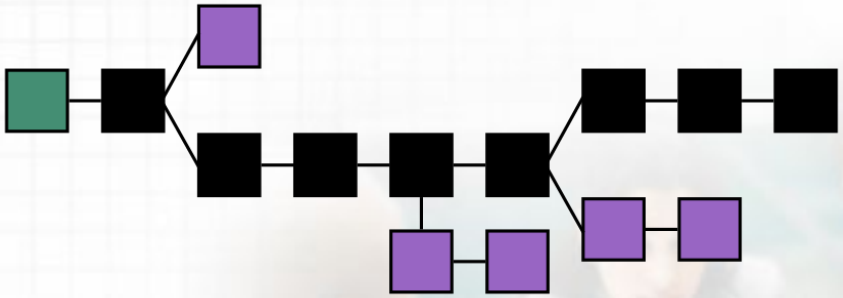
Enabling Technologies for Industry 5.0 Results of a workshop with Europe's technology leaders doi: 10.2777/082634

Understanding Industry 5.0

- The concept of Industry 5.0 could also be described as re-introducing the lost dimension of a ‘human/value-centered Industry 4.0’

- Challenges to be addressed
  - Social dimension
  - Governmental and political dimension
  - Interdisciplinarity and transdisciplinarity
  - Economic dimension
  - Scalability

Enabling Technologies for Industry 5.0 Results of a workshop with Europe’s technology leaders doi: 10.2777/082634



Construction 5.0

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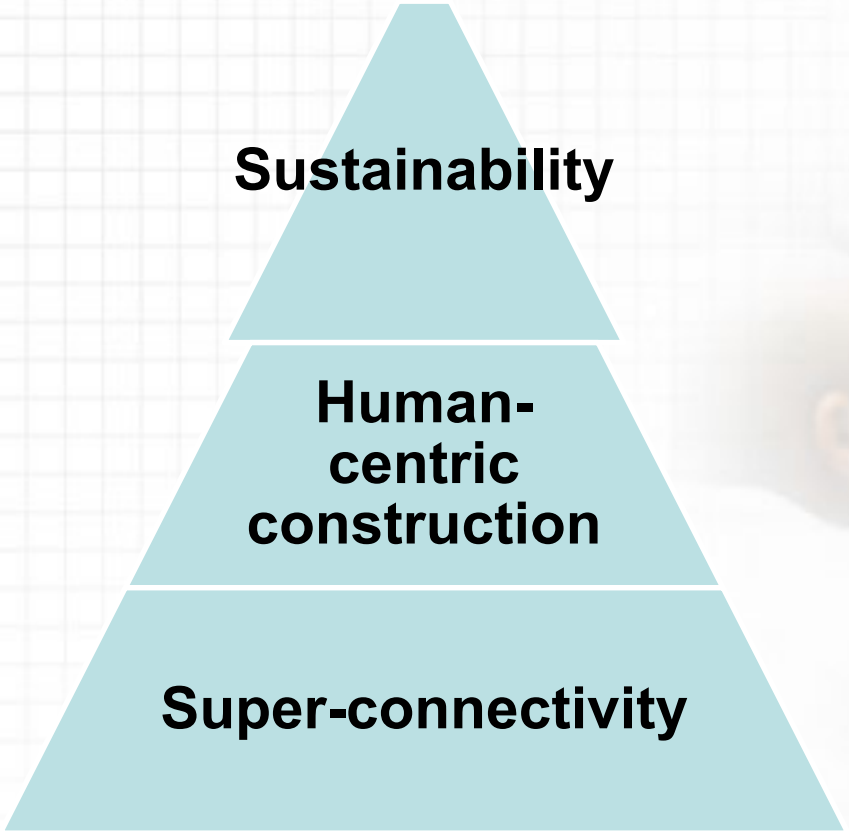
Construction 5.0

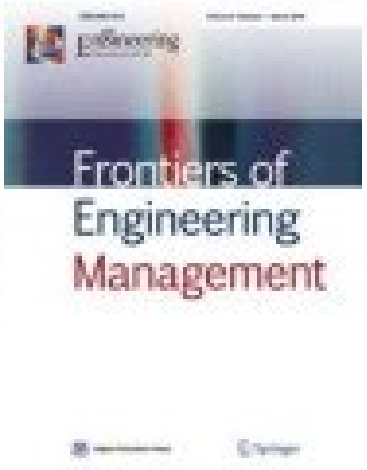


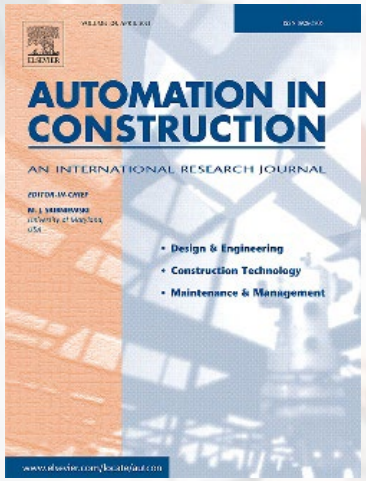
- Human-centric construction
- Built on super-connectivity
- Aiming at sustainability

Enabling Technologies for Industry 5.0 Results of a workshop with Europe's technology leaders doi: 10.2777/082634

Construction 5.0
Directions for research

- Human-centric accessibility
- Bio-inspired construction technologies
- Construction waste recycling
- Injuries and fatalities on construction sites
- Connected infrastructure systems
- BIM-GIS, BIM libraries, and Big Data in sustainable construction





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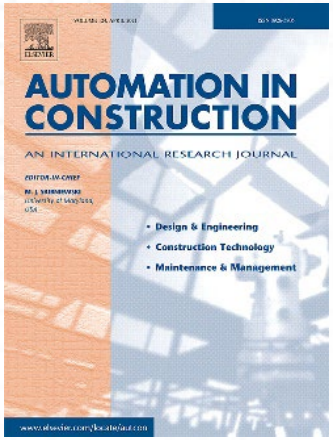

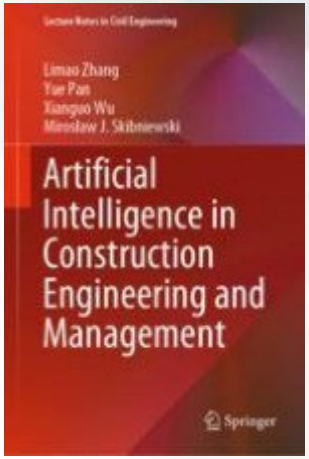

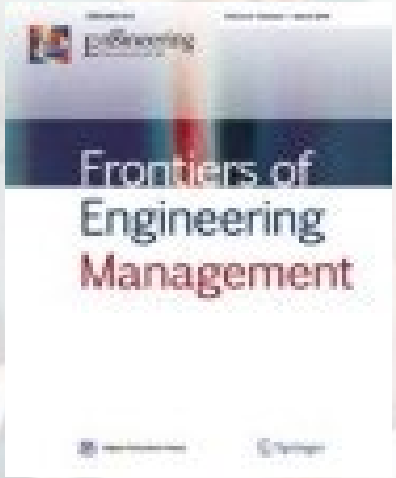

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