

Digital Transformation in the Construction Industry

By: Anil Ipekci





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Embracing the Future: Digital Transformation in Construction





**Which one describes your
role/organization better?**

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What is "Digital Transformation"?

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Defining Digital Transformation in Construction

- **Digital transformation** in construction means using advanced technology in every part of construction projects, changing the way we design, plan, execute, and manage them.
- By using **digital tools**, the construction industry is paving the way for smarter, safer, more efficient, and sustainable building practices.





What do you think the global spend on Digital Transformation will be in the next 3 years?

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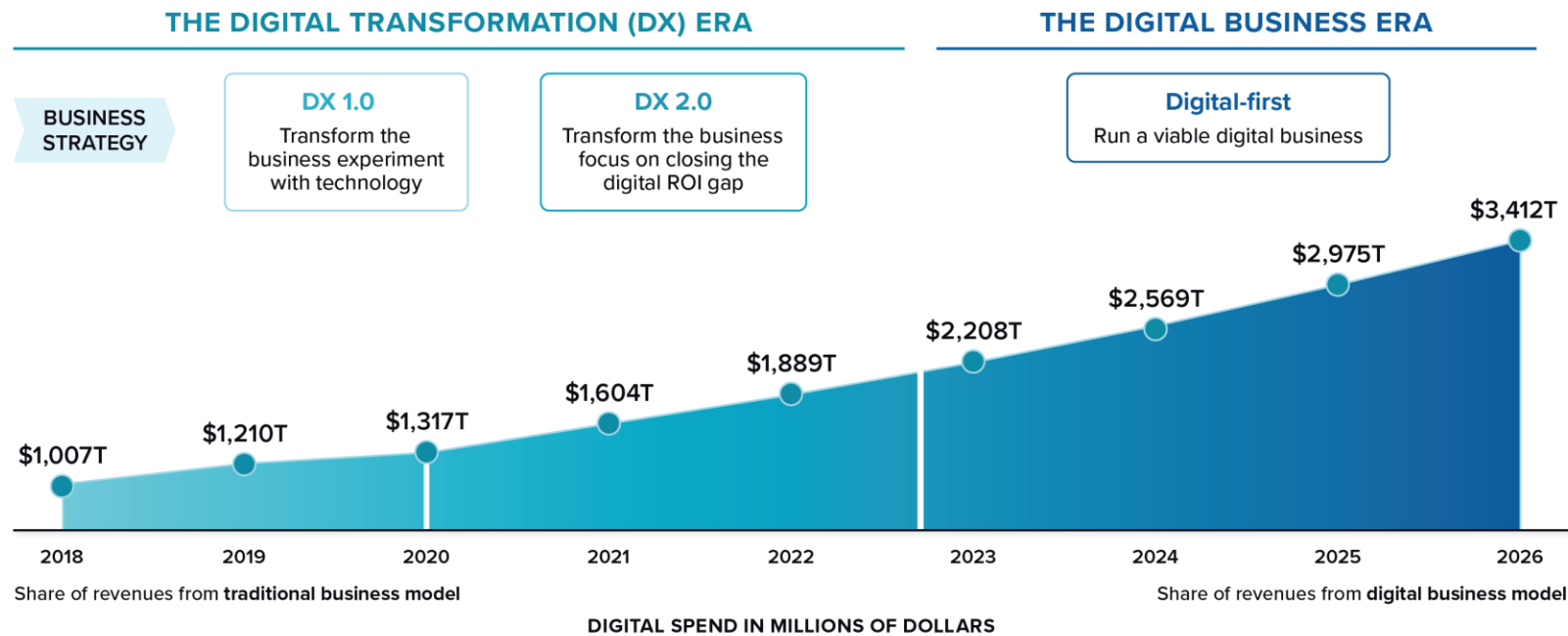
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Digital Transformation

(Digital Spend Projections)

- **\$57 Trillion** in Infrastructure investment is required by 2030 to keep up with the global economy.



Source: IDC's Worldwide Digital Transformation Spending Guide, October V2 2022 Forecast, October 2022

Why do we need Digital Transformation in Construction?



Why do we need Digital Transformation in Construction?



20% Schedule Overrun



Up to 30% of initial data created during design and construction is lost by project close-out



80% Cost Overrun



Up to 40% of the cost of a building project is attributable to poor quality



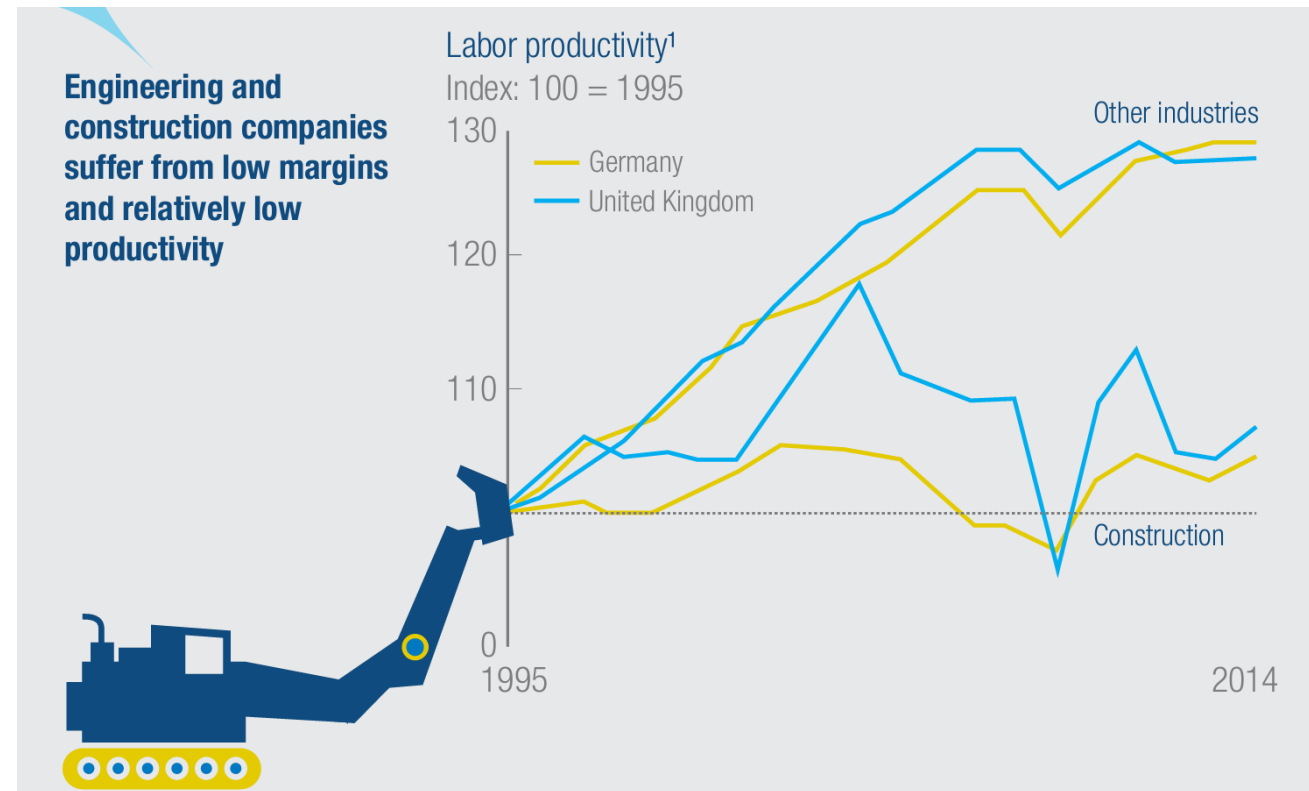
2.8M Worker Deaths Reported Globally Each Year



Up to 30% of all building materials end up as waste

Labor Productivity in Construction

- Index represents labor productivity and gross value added per hours worked.
- Labor productivity in other industries has increased significantly over the last 3 decades, while productivity in the construction industry has remained relatively flat or declined.



Where does the Construction Industry Stand?

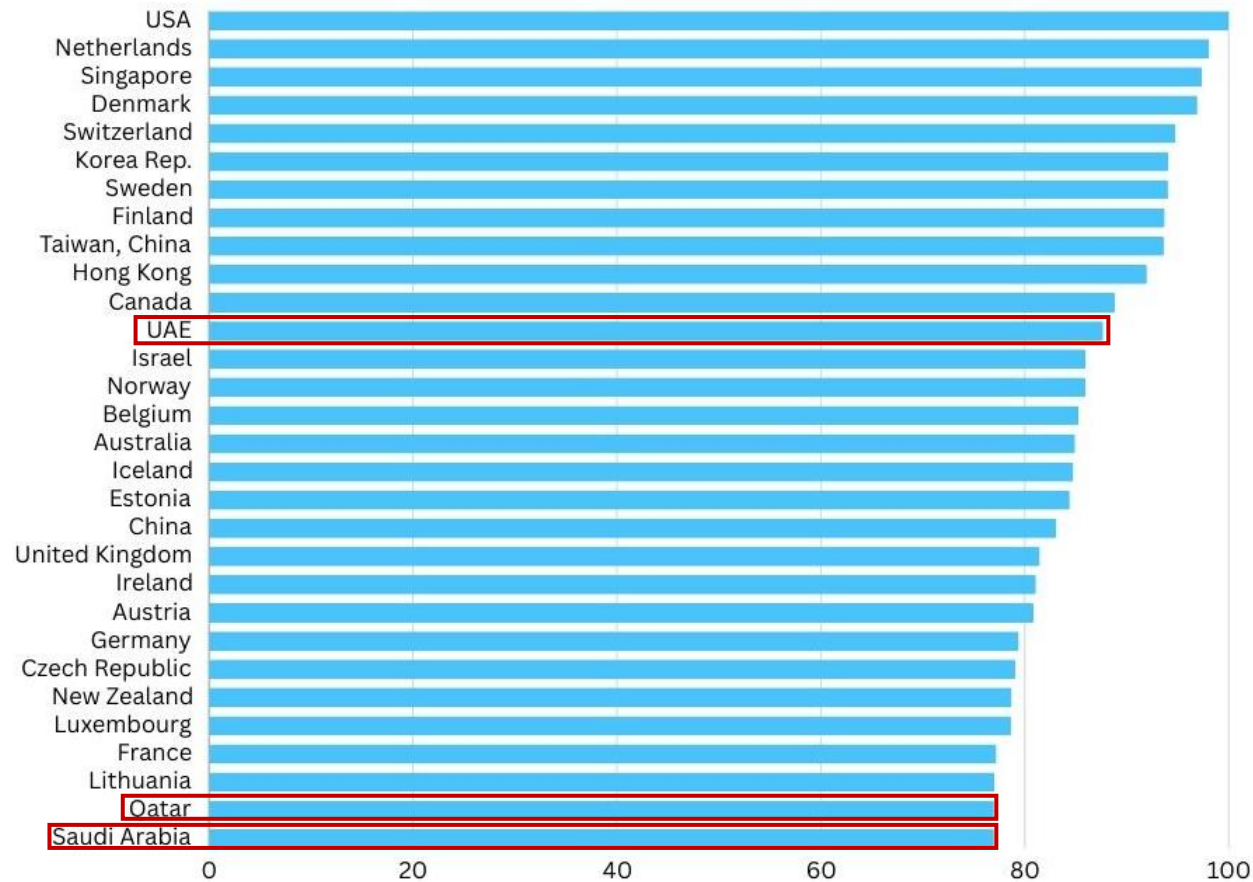
- Sectors are assessed on their digital assets, usage in digital transactions/interactions/processes, and labor digitization, with colors ranging from green (highly digitized) to red (low digitization).
- The construction sector, highlighted at the bottom, shows low digitalization across all categories, while ICT (Information and Communication Technology) at the top is highly digitized.



Digital Initiatives in Middle East Market



Where does the Construction Industry Stand?



Source: IMD World Digital Competitiveness Ranking 2023

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Initiatives in the Middle East

There are important steps taken by Middle Eastern Governments that demonstrate a clear commitment to integrate technologies into the Construction industry.

UNITED ARAB EMIRATES

- **Dubai Municipality** released circular (207) in 2015, new strategy and requirements for the usage of BIM on projects in Dubai
- **Dubai's Blockchain Strategy:** Dubai has been actively exploring the use of blockchain technology in various sectors, including construction, to improve transparency and data sharing.
- **Decree No. (24) of 2021** regulating 3D Printing in Construction and setting a strategic target to ensure 25% of buildings are constructed using 3D Printing by 2030.
- In 2017, the UAE government unveiled its **Artificial Intelligence Strategy**, signaling the country's commitment to using AI in a wide range of future services, industries, and infrastructure investments.
- The UAE Government has missionized to make the construction industry completely **sustainable by 2030** with the help of modern technology.

Initiatives in the Middle East

QATAR

- **FIFA World Cup 2022:** Projects undertaken during World Cup preparations brought high standards into Construction Industry, increasing awareness and adoption of new technologies
- **Qatar Smart Program:** This program aims to integrate technology into various sectors, including construction and infrastructure development, to enhance the overall quality of life and efficiency in the country.
- **Qatar Foundation:** The Qatar Foundation has been actively involved in promoting research and development in technology and innovation, which indirectly supports technological advancements in the construction industry.
- Qatar has also been encouraging the **adoption of sustainable and environmentally friendly construction** practices through various regulations and incentives.

Initiatives in the Middle East

KINGDOM OF SAUDI ARABIA

- **National Transformation Program (NTP):** Part of the Vision 2030, the NTP includes specific targets and initiatives to promote digital transformation and innovation in various sectors, which indirectly benefits the construction industry.
- **Saudi Building Code:** The government has been working on updating and implementing building codes that incorporate modern construction techniques and technologies, promoting safety, efficiency, and sustainability.
- **Saudi 4.0 Industrial Revolution:** This initiative aims to promote advanced technologies, including the use of IoT (Internet of Things), automation, and AI in construction and manufacturing processes.
- **Investment in Smart Cities:** Saudi Arabia is investing in the development of smart cities like NEOM, which prioritize technology and digital infrastructure in their construction and operation.

What are the challenges?



Challenges in Adoption of Technology in Construction

- **Mindset Barrier:** Senior positions have some suspicion for technology, and they see it as “We do it how it’s always been done”.

75% of High Performing Construction projects globally use a project management software BUT **44%** of Project Managers **do not believe** in the use of software to manage projects

- **Industry with Diverse Stakeholder Dynamics:** The multi-layered nature of construction projects, involving players of different sizes and structures, presents unique challenges for the uniform adoption of digital technologies.
- According to GlobalData’s Trend Insight: The barriers construction companies face are:

↓ **36%**

Lack of financial resources
allotted for technological
innovation

↓ **34%**

Lack of sufficiently skilled
staff & labor

↓ **28%**

Lack of awareness of
new technology

Challenges in Adoption of Technology in Construction

- **Decentralization:** Large Engineering and Construction companies work with business units and divisions that are following their own processes rather than standardized ones.
- **Governance:** Government initiatives can effectively drive industry to change. Lack of new legislation and regulations are an important barrier in adoption.
- **Nature of Construction Projects:** Since construction projects have long durations, it is difficult for companies to implement new technologies and see the returns in short time. This creates a reluctance in changing the way we do things.
- **Uncertainty** about the required technical skills and capabilities
- **Competitive Pressure:** High competition and low tender margins push construction companies to maintain traditional methods and avoid investment in new tools and technologies

How do we address the challenges?



How do we address the challenges?



Focus on pain points:

Companies usually focus too much on acquiring technology or software solutions before understanding how these solutions can improve their operations.

It is important to analyze daily problems of the owners and operators in detail before understanding the specific value of any technology.



Identify Processes Not Individual Tasks:

Picking use cases that apply to only one activity or trade is not the right approach.

Digital transformation's ability is to unite processes, data and risk management more holistically. Hence, it is a better practice to identify activities that require collaboration and involve multiple disciplines and groups.

Contractor – Supplier Defects Feedback



Train & Restructure Teams:

As digital transformation takes place, administrative duties gets smooth and more efficient.

It is crucial to restructure the teams and train them. This will ensure the teams that rather than being replaced, they are being upskilled.

How do we address the challenges?



Develop an organization-wide strategy



Build the motivation for change, backed by a robust change management plan



Develop in-house digital capabilities



Partner with trusted advisers



Focus on business outcomes of digital adoption strategies and investments



Create an integrated data system



Encourage fast decision making and risk mitigation

What do new technologies offer for the industry?



Benefits from Introducing New Technologies



Increased Productivity



Improved Employee & Customer Experience



Increased Safety



Reduced Costs & Waste



Increase in Quality



Winning New Projects & Increased Revenue



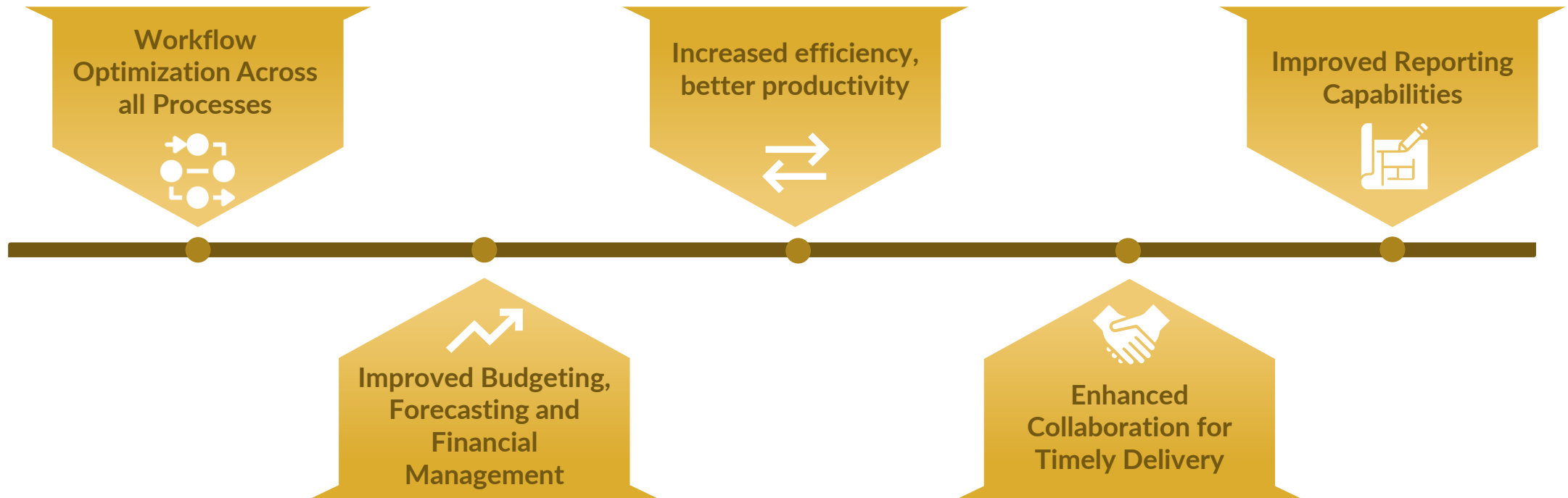
Expand into new Markets



Improved Compliance with Regulations

Benefits from Introducing New Technologies

Transforming the operations with the help of technology, construction companies could achieve 20-30% operating margins.



Technologies likely to be adopted





**Which of the following technologies
are more likely to be adopted in
Construction Industry?**

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Technologies Likely to be Adopted

Technology/Sector	AGRI (%)	AUTO (%)	CON (%)	DIGICIT (%)	EDU (%)	ENG (%)	FS (%)	GOV (%)	HE (%)	MANF (%)	MIM (%)	OILG (%)	PS (%)	TRANS (%)
3D and 4D printing and modelling	54	67	39	39	69	69	27	45	65	69	48	79	40	60
Artificial Intelligence (e.g. machine learning, neural networks, NLP)	62	76	73	95	76	81	90	65	89	71	76	71	76	88
Augmented and virtual reality	17	53	58	73	70	75	62	56	67	54	57	71	57	62
Big data analytics	86	88	91	95	95	76	91	85	89	81	90	86	86	94
Biotechnology	50	18	48	40	46	47	46	38	65	31	16	36	28	23
Cloud computing	75	80	82	95	95	88	98	95	84	92	87	86	88	94
Distributed ledger technology (e.g. blockchain)	31	40	41	72	61	50	73	40	72	41	50	46	53	38
E-commerce and digital trade	80	75	85	82	72	71	90	67	78	82	62	62	70	87
Encryption and cyber security	47	88	85	95	86	88	95	95	84	72	83	71	78	75
Internet of things and connected devices	88	82	94	92	62	94	88	79	95	84	90	93	74	76
New materials (e.g. nanotubes, graphene)	15	46	22	36	67	65	36	33	47	51	37	36	27	27
Power storage and generation	75	64	59	38	27	88	55	33	31	62	57	69	45	46
Quantum computing	18	21	17	51	25	41	44	36	38	21	29	25	19	38
Robots, humanoid	42	50	38	44	47	24	47	31	47	41	15	17	25	21
Robots, non-humanoid (industrial automation, drones, etc.)	54	60	52	61	59	65	53	50	56	79	90	79	85	69
Text, image and voice processing	50	59	82	90	89	88	88	89	88	64	76	87	79	65

Digital Technology	Using it already	Not yet, but planning to implement in the future	No and we do not have plans to implement in the future	Not aware of such technology
3D printing	27%	29%	38%	7%
AI and ML	26%	35%	29%	10%
Augmented & Virtual Reality	23%	31%	34%	12%
Blockchain	21%	29%	38%	13%
Building Information Modelling	40%	26%	22%	11%
Concrete non-destructive testing	32%	31%	31%	6%
Construction management cloud software	39%	31%	24%	6%
Construction wearables	34%	30%	25%	11%
Data analytics	33%	33%	26%	7%
Digital twin	28%	26%	28%	18%
Drones	37%	26%	31%	6%
Internet of Things and Smart sensors	28%	35%	27%	9%
Mobile apps	33%	39%	18%	10%
Prefabrication and modular construction	34%	28%	28%	9%
Robotics and Automated systems	26%	30%	36%	8%
Sustainable Building Materials	29%	30%	33%	9%

Source: Deloitte Access Economics based on construction and engineering business survey (2022)

Case Study: Project Utopia

What would a Construction Project look like if all processes integrated technological solutions?

PROJECT UTOPIA

Imagine a project where the best technologies are implemented for all stages and processes.

1. Design

- Use Virtual Reality and Augmented Reality tools
- Improve collaborative review process
- Enhanced stakeholder engagement
- Use Generative/Computational Design software with pre-defined criteria
- Cloud collaboration platforms to enable multiple teams working on the design

2. Feasibility

Advanced data analytics and AI algorithms to

- Review financial models,
- Data-driven insights for project viability,
- Benchmark analysis.
- Risk assessment.

3. Procurement

- AI-driven vendor matching based on project requirements and performance history.
- Blockchain-based smart contracts ensuring transparency and trust in contract negotiations
- Predictive analytics to anticipate material requirements and pricing fluctuations

4. Construction

- Drones / 3D Scanning for progress monitoring
- Mobile Apps for Instant Defect Detection
- Digital Twin for Real-Time Data
- Centralized solution to identify and manage change
- VR/AR for overlaying Design with Actual Site Progress
- Preventive maintenance for Machinery & Reduced Down Time
- Modular Construction / Pre-Fabrication
- 3D Printing of Sections & Components
- AI Powered Safety Management
- IoT Driven Material Management
- Paperless Inspection Regime

PLANNING & PROJECT CONTROLS

01

Advanced Scheduling

AI-Powered scheduling algorithms optimizing resource allocation and sequencing.

03

4D Planning

Better schedule communication, visualize change and impact, create scenario analysis.

05

Real Time Progress Monitoring

3D Scanning / Drones for real time progress monitoring

07

Integrated Risk Management

Receive real time data from all IoT Devices and capture risk with integrated systems.

09

Improved Forecasting

Use big data to improve forecasting ability.

02

Generative AI

Use project specific GPT trained with project info and utilized as a centralized repository.

04

Common Data Environment

Use a Project Management Software to integrate workflows and processes

06

Wearable Technologies

Monitor resource availability, optimize allocation and improve forecasting.

08

Change Management

Integrated Schedule and Workflows allowing to raise early warnings and take actions.

10

Collaboration

All these system will contribute better collaboration between team members resulting in timely solutions.



THANK YOU