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POSITION PAPER

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Artificial Intelligence in the European Construction Sector: Strategic Adoption, Responsible Use, and Sectoral Leadership

The construction industry is a cornerstone of European society and economy. It designs and builds the spaces where people live, work, learn, and move. As such, the quality, safety, and sustainability of the built environment are of the highest societal importance. With a contribution of nearly 10% to EU GDP and employment of over 12 million people, the construction ecosystem is also a key player in the EU's strategic goals: productivity growth, digitalisation, decarbonisation, and resilience.

Artificial Intelligence (AI)—and in particular generative AI, robotics, and autonomous systems—promises to transform the industry. While disruptive, these technologies offer unmatched opportunities for improved efficiency, better safety, predictive maintenance, waste reduction, and smart infrastructure. The danger lies not in adopting AI, but in failing to adopt it soon and strategically enough. However, technology remains a tool. In construction, legal and ethical responsibility must reside with qualified, accountable professionals. Engineers and contractors must stay in control of the process, with AI acting as an assistant, not a decision-maker.

This position paper sets out the construction industry's view on AI adoption. It supports technology-neutral regulation focused on use and outcomes rather than tools. It highlights the need for sector-specific experimentation, open access to public data, and investment in human capital. Finally, it argues that construction, as a highly demanding and safety-critical sector, should not only adopt but also help shape the

FIEC is the European Construction Industry Federation, which through its 32 national member associations in 27 countries (24 EU countries, Norway, Switzerland, and Ukraine) represents construction companies of all sizes, i.e., small, and medium-sized enterprises and "global players", carrying out all forms of building and civil engineering activities.

development of AI technologies in Europe—ensuring they serve societal needs while preserving professional integrity and public trust.

1. Introduction

The European construction industry stands at a pivotal moment. Long regarded as one of the most foundational sectors in society, it provides the physical infrastructure upon which all other economic and social activity depends. The spaces in which we live, work, learn, and travel—our homes, schools, hospitals, roads, and public spaces—are all shaped by the construction ecosystem. The quality, functionality, and safety of these environments have direct consequences for individual well-being, economic efficiency, and societal resilience.

At the same time, construction remains one of the least digitised sectors of the European economy. Despite progress in Building Information Modelling (BIM), prefabrication, and automation, productivity growth in construction has lagged behind other industrial sectors for decades. Recognising this challenge, the European Commission's *Transition Pathway for Construction* and broader digitalisation and Green Deal strategies call for a profound transformation—one that leverages emerging technologies to increase efficiency, sustainability, and competitiveness.

Among these technologies, artificial intelligence (AI)—including generative models, robotics, and autonomous systems—has emerged as a particularly promising yet disruptive force. AI offers the potential to revolutionise project planning, design optimisation, construction management, quality control, and predictive maintenance. However, its adoption also raises significant challenges related to responsibility, trust, labour transformation, and regulatory adequacy.

Emerging technologies, particularly AI, can drive a sustainable and efficient transformation of the sector. This position paper sets out the views of the European construction sector on how AI should be introduced, governed, and integrated into practice. It affirms that while AI can and should serve as a transformative assistant, it must not replace the human professional whose judgment, accountability, and ethical responsibility remain central to the built environment.



Romain Henrard
Policy Officer Economic & Legal Affairs
FIEC - European Construction Industry Federation
Avenue des Arts 20, BE-1000 Brussels - +32 2 514 55 35 - info@fieec.eu
Transparency Reg. 92221016212-42 aisbl Nr Enterprise: BE 0688919.140



2. Construction as a Public Good Industry

The construction sector occupies a unique position among economic activities: it does not merely produce commodities or services but shapes the very environments in which human life unfolds. From housing and workplaces to transportation infrastructure and civic spaces, the outcomes of construction exert a direct influence on public health, social inclusion, safety, and cultural identity. The quality and resilience of these outcomes are, therefore, of public interest in the strongest sense.

Unlike purely private markets, the construction industry serves an inherently collective function. Decisions made during the planning and design phases embed long-term consequences—environmental, social, and economic—that extend far beyond individual users or clients. The spatial configurations established by construction projects persist for generations. Once built, these structures influence how people move, interact, and inhabit their world. The imperative of long-term safety, sustainability, and durability elevates construction into the category of industries with quasi-public responsibilities.

This is why the principle of **professional responsibility** is so fundamental in construction. Chartered engineers, licensed architects, and qualified contractors do not merely execute tasks—they assume legal and ethical obligations for the adequacy, safety, and performance of what they deliver. These obligations do not—and cannot—be transferred to subcontractors, tools, or software, no matter how sophisticated.

As artificial intelligence systems enter this domain, it must be recognised that their role is auxiliary. AI can assist with optimisation, automation, and prediction, but it cannot assume liability, nor can it substitute the deliberative judgment of human professionals. The moral and legal architecture of construction practice must remain human-centric, ensuring that quality, dignity, and responsibility remain at the core of the built environment.

3. Economic Weight and Strategic Importance

Construction is one of the largest industrial ecosystems in the European Union. According to the European Commission's Transition Pathway for Construction (2023), the sector comprises nearly 5 million enterprises—90% of which are SMEs—and employs over 12 million people, accounting for roughly 9% of EU GDP. Its impact extends far beyond economic metrics: the



Romain Henrard
Policy Officer Economic & Legal Affairs
FIEC - European Construction Industry Federation
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sector is critical to the delivery of EU objectives in climate neutrality, energy efficiency, circularity, and social cohesion.

Despite this centrality, construction productivity has stagnated in recent decades. Eurostat and OECD data show that while productivity in manufacturing and information technology has grown steadily, construction productivity has remained nearly flat. Fragmentation, low levels of digital adoption, and conservative procurement models are among the causes. Addressing these structural inefficiencies is not merely an economic priority—it is essential for meeting the EU’s broader strategic goals, including the Green Deal, REPowerEU, and the Digital Decade.

Digitalisation is thus a declared priority for the sector. The European Commission’s 2030 Digital Compass envisions “digitally transformed businesses” in all industrial sectors, supported by interoperable data spaces, widespread AI adoption, and advanced digital skills. The Bauhaus Initiative, the Energy Performance of Buildings Directive, and recovery plans under NextGenerationEU all hinge on increasing the construction sector’s technological maturity.

AI adoption must be seen in this context: not as a marginal upgrade but as a catalyst for systemic transformation. Properly harnessed, AI can help the industry overcome chronic inefficiencies, deliver higher-value outputs with fewer resources, and meet rising expectations for resilience and sustainability. If Europe is to remain globally competitive and meet its climate and housing objectives, construction must be empowered—not hindered—to lead its own digital revolution.

Digitalisation and AI adoption are not only opportunities to improve productivity and competitiveness but essential requirements to meet Europe’s commitments on sustainability, climate neutrality, and circular economy. Transforming the sector through smart technologies is ultimately an investment in protecting the environment and ensuring fair and lasting social development.

4. Technological Opportunities and Disruptions

The construction industry is at the cusp of a technological inflection point. Advances in artificial intelligence (AI), robotics, data analytics, and automation are converging to enable fundamental changes in how buildings and infrastructure are designed, delivered, and maintained. These innovations promise significant gains in efficiency, safety, and



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Policy Officer Economic & Legal Affairs
FIEC - European Construction Industry Federation
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sustainability—but they also carry the potential for structural disruption across the value chain.

Key Technological Vectors

Generative Artificial Intelligence

Generative AI (GenAI), based on large language and multi-modal models, introduces a new class of tools for rapid content and design generation. In construction, GenAI can:

- Draft specifications, tenders, and contracts automatically
- Generate 2D and 3D design proposals through parametric modeling
- Assist in building code interpretation and compliance checking
- Support claim management and project documentation

Predictive and Prescriptive Analytics

AI models trained on historical and real-time data enable advanced forecasting:

- Cost estimation through "should-cost" modelling
- Predictive maintenance for infrastructure based on sensor inputs
- Early warnings on project delays and budget overruns
- Safety risk prediction using contextual site data

Robotics and Autonomous Systems

Construction robotics are increasingly used for:

- Automated layout and rebar tying
- Bricklaying and 3D concrete printing
- Autonomous earthmoving and excavation
- Site monitoring with aerial drones and rovers

Virtual Assistants and Digital Twins

AI-driven virtual assistants provide on-demand support to back-office, procurement, and site teams:

- Natural language query systems for regulatory data
- Real-time construction progress and compliance monitoring
- Integration with BIM-based digital twins to simulate outcomes and optimise decisions



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AI-Enhanced Planning and Project Management

Tools powered by AI enable:

- Optimisation of construction sequencing and logistics
- Scenario modelling under variable resource constraints
- Dynamic rescheduling in response to site conditions

Cross-Cutting Enablers

The above innovations rely on enabling ICT technologies managed by specialised providers. The construction sector's role is to specify relevant use cases, define safety and compliance requirements, and validate solutions. The technologies include:

- **IoT and sensor networks** for real-time environmental and performance data
- **Cloud computing and edge AI** for scalable, location-sensitive deployment
- **Data platforms and common data environments (CDEs)** aligned with BIM and ISO 19650 standards
- **Digital Product Passports** and standardised ontologies to enhance material traceability and lifecycle assessments

Sector-Specific Impacts

- **Design and Engineering:** Faster iteration cycles, greater optimisation, and earlier clash detection
- **Procurement:** Automated analysis of offers, supplier vetting, and document-matching against regulatory criteria
- **Construction Execution:** Semi-autonomous machinery, wearable safety monitors, and defect detection via computer vision
- **Post-Execution Management:** Predictive facility maintenance and smart energy optimisation
- **Cross-sectional:** Process automation, regulatory compliance bots, and AI-supported ESG reporting

Risks and Disruptions

While the opportunities are manifold, risks are real:



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- Commodification of core services through AI standardisation
- Disintermediation of SMEs lacking digital capabilities
- Intellectual property concerns in AI-generated design
- Labour displacement in manual-intensive tasks
- Over-reliance on opaque AI systems without domain-specific grounding

The strategic imperative is clear: construction actors must adopt these tools proactively and thoughtfully, lest they risk obsolescence in an industry being rapidly reshaped. Equally, policies must ensure fair access to innovation and mitigate the concentration of technological power in a few dominant platforms.

5. Principles for Responsible AI Use

Artificial Intelligence presents not only a technological revolution but also an opportunity to reinforce the values and principles that underpin the construction profession. If integrated thoughtfully, AI will not undermine the role of engineers and contractors—but amplify their capabilities, streamline their workflows, and help them achieve the highest standards of safety, efficiency, and sustainability. The challenge is not to resist AI, but to harness it responsibly and strategically.

AI as a Professional Assistant, Not a Substitute

The most productive paradigm for AI in construction is that of an *assistant*: an intelligent, tireless, data-driven aide that complements human expertise rather than replaces it. Whether drafting specifications, generating design options, detecting construction defects, or analysing tender conditions, AI can automate the routine, accelerate the complex, and surface insights from vast datasets that no human could feasibly process alone.

But AI cannot—and should not—sign off on a structural plan, issue a compliance certificate, or bear legal responsibility for a built structure. These remain the exclusive domain of qualified professionals. Fortunately, the regulatory framework across the EU already reinforces this division of labour: responsibility rests with licensed engineers and certified contractors, regardless of the tools they use.

Technology-Neutral Regulation Focused on Outcomes



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AI systems are tools—powerful ones, but tools nonetheless. As such, regulation should focus on *how* these tools are used, not on their internal technical architecture. The EU’s commitment to technology-neutral legislation is both principled and pragmatic. What matters is not whether a decision was supported by AI, but whether the outcome meets the safety, quality, and legal standards of the profession.

For the construction sector, this means:

- No new layers of liability are needed if existing laws are enforced
- The use of AI should be documented and auditable, especially in critical domains (e.g., structural safety)
- AI-supported decisions should be reviewable and traceable by human experts
- The principle of *human oversight* should guide the integration of AI in design, engineering, procurement, and execution

Trust Through Transparency and Validation

Trust in AI-enhanced processes will grow as models become more transparent, explainable, and validated against industry standards. Efforts should focus on:

- Open benchmarks and validation datasets, especially for generative design and defect detection
- Sector-specific fine-tuning of foundation models to reflect construction codes, materials data, and environmental constraints
- Collaborative sandboxes where companies, regulators, and researchers can test AI systems in controlled real-world conditions similar to those used in other safety-critical industries.

A Professional Culture Ready to Evolve

Responsible AI use also means preparing the workforce. AI is not just a matter of software—it reshapes roles and workflows. Engineers and site managers must gain AI literacy, not to become programmers, but to understand what AI can and cannot do, how to interpret its outputs, and how to challenge its conclusions.

In embracing AI, the construction sector does not compromise its professional ethos—it renews it. By placing powerful new tools in the hands of accountable professionals, Europe



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can ensure that its built environment is smarter, safer, and more sustainable—without ever losing sight of the human judgment and responsibility at its core.

6. From Adoption to Leadership

The European construction industry cannot afford to be a passive recipient of AI technologies developed elsewhere. Given the sector’s complexity, societal importance, and safety-critical character, it must move decisively from cautious adoption to strategic integration. Construction should not merely implement artificial intelligence—it should actively collaborate with AI and ICT experts to ensure safe, effective, and domain-specific application of these technologies.

Construction as a Demanding and Strategic User

Few sectors place as many constraints on technology as construction: outdoor variability, multi-actor workflows, long project durations, tight margins, and zero tolerance for structural failure. These very challenges make the sector a powerful stress-test environment for AI. Use cases in generative design, predictive scheduling, autonomous equipment, and quality control are among the most demanding across all industries.

Because of this, the construction ecosystem can drive the development of more robust, interpretable, and context-aware AI systems—systems that will be useful not only in buildings and infrastructure, but also in other complex environments such as manufacturing, logistics, and disaster management. Europe’s commitment to “trustworthy AI” finds its most rigorous proving ground in the built environment.

Leveraging Scale: Large Firms and SMEs

Leadership must be distributed. While large construction firms are best positioned to engage in direct R&D partnerships—with AI providers, research institutions, and cloud platforms—small and medium-sized enterprises (SMEs) constitute the majority of the sector. Their practical constraints, diverse projects, and local knowledge must inform the design of AI tools.

Policy should support:

- Open-access AI platforms tailored to SME needs
- Sector-specific cloud services integrated with BIM and ERP tools
- Training schemes co-developed with vocational institutes and chambers of engineers



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- Innovation vouchers and tax incentives for AI experimentation

Creating Construction-Focused AI Ecosystems

Leadership also requires ecosystem-building. National and European actors—construction federations, public clients, standardisation bodies, and academia—should collaborate on:

- Common datasets for model training and benchmarking (e.g., annotated images of defects, anonymised cost estimates)
- Open interfaces between AI tools and existing digital construction standards (e.g., IFC, ISO 19650)
- Pre-commercial procurement schemes for AI pilots on public works
- EU-wide testbeds or regulatory sandboxes for AI deployment in real construction environments

The integration of public administrations is especially important. Access to public data—on permits, zoning, infrastructure conditions, and regulatory frameworks—is essential for intelligent design, automated compliance, and planning optimisation. Construction AI leadership must therefore align with broader European efforts to create sector-specific data spaces and ensure data interoperability across borders and jurisdictions.

Construction Shaping AI, Not Just Using It

Ultimately, the construction sector should see itself not merely as a user of AI, but as a co-designer of its future. Engineers, architects, and contractors possess deep domain knowledge, ethical responsibility, and an intuitive grasp of physical and societal complexity—precisely what generic AI systems often lack.

By contributing domain-specific requirements, validation expertise, and operational insights in structured collaboration with AI/ICT developers, the sector can ensure that emerging technologies are adapted to the built environment without assuming full AI development responsibilities. Europe’s AI ecosystem will be stronger, and the construction industry will be safer, more innovative, and more globally competitive.

7. Policy Recommendations



Romain Henrard
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To enable the strategic, responsible, and competitive use of Artificial Intelligence in the construction sector, we propose the following policy priorities. These measures are aligned with EU digital and industrial strategies but tailored to the unique demands of construction.

1. Accelerate AI Adoption in the Sector

- **Support pilot projects** with EU and national funding (e.g., Horizon Europe, Digital Europe, ERDF) focused on sector-specific AI use cases across the construction value chain.
- **Establish sectoral AI testbeds and sandboxes** for safe experimentation in real construction environments, involving both large firms and SMEs.
- **Promote joint R&D partnerships** between construction firms, technology providers, and research institutions.
- **Strengthen the role of the European Digital Innovation Hubs** network in supporting SMEs in building awareness, enhancing digital skills, and adopting artificial intelligence technologies

2. Ensure Equitable Access for SMEs

- **Develop open, construction-focused AI platforms** with APIs compatible with BIM (IFC, ISO 19650) and existing construction software ecosystems.
- **Fund SME digitalisation vouchers** to acquire AI-ready tools, access cloud infrastructure, and train staff.
- **Update procurement policies** to incorporate AI-readiness criteria, encourage collaborative innovation between SMEs and AI providers, and allow AI-generated outputs where verified by qualified professionals.

3. Maintain Professional Responsibility and Regulatory Clarity

- **Affirm that liability remains with licensed professionals**, irrespective of AI support, using existing legal frameworks.



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- **Avoid technology-specific regulation:** regulate outcomes and practices, not tools or algorithms.
- **Promote clear guidance** on the use of AI-generated content in contracts, inspections, and compliance processes.

4. Strengthen Data Foundations

- **Secure access to public sector data** (e.g., cadastral, zoning, permitting, performance) to fuel AI systems.
- **Promote interoperable, machine-readable data formats** in public works and tender documents.
- **Support European construction data spaces** as part of the broader EU data strategy.

5. Build Human Capacity

- **Invest in AI literacy** for engineers, managers, site staff, and other construction professionals through vocational and lifelong learning programmes.
- **Encourage professional bodies** to develop codes of practice and ethical guidance for AI use.
- **Recognise AI competence** in public procurement and qualification criteria.

6. Position Construction as a Strategic AI Sector

- **Include construction in EU digital industrial priorities**, recognising its role in climate action, energy transition, and resilient infrastructure.
- **Advocate for construction-specific streams** in Digital Europe, CEF Digital, and standardisation mandates.
- **Leverage FIEC and national associations** to coordinate messaging, share best practices, and influence policy development at EU level.

These recommendations aim to ensure that the construction industry is not only digitally transformed—but also remains competitive, responsible, and aligned with Europe’s strategic technological sovereignty.

8. Conclusion



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Artificial Intelligence is no longer a distant prospect—it is a present-day force reshaping global industries, and construction is no exception. What distinguishes construction, however, is its profound responsibility: to shape the physical world in ways that are safe, sustainable, and meaningful for generations to come. In such a context, the adoption of AI is not simply a question of technological modernisation; it is a strategic imperative.

Used wisely, AI can help the sector overcome its longstanding productivity challenges, improve project outcomes, reduce environmental impacts, and strengthen Europe's resilience. From generative design to predictive maintenance, from site automation to intelligent procurement, AI has the potential to enhance every phase of the construction lifecycle.

But this transformation must be guided by principles—professional responsibility, transparency, and human control. AI should remain a tool in the hands of qualified professionals. Regulation must stay focused on conduct and accountability, not the mechanics of technology itself. The frameworks for responsible innovation already exist; they should be applied with clarity, not replaced with complexity.

Europe's construction sector must move beyond cautious experimentation and take a proactive role. It must demand AI tools that serve its needs, participate in their development, and ensure that their use aligns with the public interest embedded in every built structure.

The time to act is now. The greatest risk is not overuse of AI, but underuse. By embracing this transformation with both ambition and responsibility, the construction industry can reaffirm its essential role in building the future—intelligently, safely, and sustainably.



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