

Blueprints of the Future: Charting the Digital Transformation of Romania's Construction Sector*

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ABSTRACT The construction sector is a cornerstone of the European Union's economy, significantly contributing to GDP and employment. Despite its economic importance, the sector faces numerous challenges such as low productivity, resource inefficiency, and labor shortages. Digital technologies, especially Building Information Modelling (BIM), are seen as solutions to these issues. EU initiatives like the "Strategy for the sustainable competitiveness of the construction sector," the "Renovation Wave," and the Circular Economy Action Plan, along with programs like "Digital Europe Programme" and "Horizon Europe," support the sector's digitalisation. Countries across Europe have mandated BIM in public projects, showcasing its potential to enhance collaboration, reduce costs, and optimize resource use. Romania, categorized as an "Emerging Innovator" by the 2021 European Innovation Scoreboard, has been slow in adopting digital methods in construction. However, recent governmental efforts are accelerating this transformation. BIM is increasingly mandated in public tenders, reflecting a growing acknowledgment of its benefits. Romania's construction sector is thus on a path towards comprehensive digitalisation, aligning with broader EU goals for smarter, greener, and more efficient construction practices.

1. Construction digitalisation across the European Union

The European construction sector stands as a fundamental economic pillar, contributing significantly to the EU GDP and providing a substantial number of jobs. It is a sector of pivotal importance, not only due to its economic weight but also because of its extensive ties to various industries, ranging from raw materials to services like banking.¹

Despite its economic significance, the construction industry faces a plethora of challenges including competitiveness, labor shortages, resource efficiency, and notably, productivity, which has lagged behind manufacturing for decades.²

Digital technologies, particularly Building Information Modelling (BIM), are recognized as transformative forces capable of addressing these challenges. Furthermore, the *European Construction Sector Observatory Digitalisation* in construction sector report

extends the scope of digitalisation beyond BIM to include data acquisition, process automation, and other digital-information technologies, indicating a broader digital horizon for the sector. Yet, the construction sector remains one of the least digitalized sectors of the economy whilst it is also quite difficult to obtain a level playing field when it comes to digitalization across Europe, with some countries adopting horizontal strategies that either include³ or exclude⁴ construction, and others implementing vertical digital strategies targeting the construction sector specifically.⁵

Several European Union (EU) policy initiatives support the digitalisation of the construction sector, such as the "Strategy for the sustainable competitiveness of the construction sector and its enterprises", the "Renovation Wave" and the Circular Economy Action Plan. Furthermore, programs like "Digital Europe Programme" and "Horizon Europe" show EU's commitment

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¹ European Construction Sector Observatory, *Digitalisation in construction sector*, Analytical Report, April 2021.

² European Construction Sector Observatory, *Digitalisation in construction sector*, Analytical Report, April 2021.

³ Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Spain, Sweden.

⁴ Belgium, Hungary, Italy, Malta, Netherlands, Poland, Portugal, Romania, Slovakia.

⁵ Estonia, Finland, France, Germany, Greece, Ireland, Lithuania, Luxembourg.

towards digitalisation. Digital transformation is also a key component of EU investment initiatives under “InvestEU”, which seeks to fund projects in areas such as research and innovation, industrial digital transformation, growth of major innovative firms, artificial intelligence, among others.⁶

BIM, in particular, has become a cornerstone of the EU’s digitalisation strategy for construction. It enables better collaboration among stakeholders, leading to a more streamlined construction process, optimized resource usage, and a decrease in time and cost overruns. While BIM adoption in Europe shows moderate levels, the market is expected to experience substantial growth, driven by both policy mandates and the recognition of BIM’s benefits. Countries like Austria and the Netherlands have already mandated Open BIM standards, and others have integrated BIM requirements into public-procurement processes.

In 2007, Finland pioneered the mandate for BIM in Europe, setting a precedent with state-owned Senate Properties’ BIM guidelines for new buildings. This sparked a wave of BIM adoption across Europe, with Norway and Denmark implementing BIM requirements for government buildings in 2008 and 2011, respectively. The Netherlands launched its Open-BIM for Infrastructure program in 2012. Austria adopted Open BIM standards in 2015, and Sweden required BIM for all Transport Administration projects.⁷

The UK’s 2016 BIM Level 2 mandate marked a watershed moment, aligning BIM with the government’s construction productivity goals and mandating its use for all public projects, which significantly boosted its adoption. Following suit, France outlined its BIM mandate in 2017 as part of its digital transition plan, and Germany aimed to mandate BIM for all transport projects by 2020. Spain and Italy introduced BIM mandates for large public projects in 2018 and 2019, while the Russian Federation decreed in 2021 that BIM be mandatory for all federal contracts starting in 2022.⁸

The initiatives at the EU level underline the vital role digitalisation plays in not just advancing the construction sector but in reshaping it to meet the challenges of the 21st century – from environmental concerns and the need for sustainability to the demands for smarter, more livable urban spaces. As these digital technologies become more ingrained in the sector, they promise to deliver a new era of construction that is smarter, greener, and more efficient. The digital transition is not only about improving efficiency but also about creating resilient infrastructures that are environmentally responsible, adhering to the EU’s green-transition goals and the overarching framework of the Climate Change Act.

2. The digitalization of Romania construction sector

2.1 BIM and the need for a common legal environment

At the national level, the European Construction Sector Observatory’s country profile for Romania, dated January 2022, paints an optimistic picture for the Romanian construction sector over the medium to long term. The sector is expected to expand, propelled by EU-led investment in infrastructural projects.⁹

Particularly poised for growth is the sector’s digital segment. The 2021 European Innovation Scoreboard categorizes Romania as an “Emerging Innovator”.¹⁰

Historically, the Romanian construction sector has been slow to adopt digital methods, both in authorization processes managed by public institutions and in project development, including design and execution. This is somewhat connected to a general inertia of the public sector and tendency to procure and manage public projects cautiously, with a very traditional and a lowest tender bid approach. Despite this resistance, transformative actions over the past three years have laid the groundwork for the sector’s digital transition. At the governmental level, efforts towards digitalisation have been manifested through an allocation of approximately EUR 1.5 billion,

⁶ European Construction Sector Observatory, *Digitalisation in construction sector*, Analytical Report, April 2021.

⁷ O. Eischet, *BIM adoption across the world: a Global Outlook*, published on: <https://medium.com/specter-automation-insights/bim-adoption-across-the-world-a-global-outlook-1b3879f23bc6>, visited on February 16, 2024.

⁸ *Ibidem*.

⁹ European Construction Sector Observatory’s country profile for Romania, dated January 2022.

¹⁰ European Commission, *European Innovation Scoreboard 2021 – Romania* quoted in European Construction Sector Observatory’s country profile for Romania, dated January 2022.

earmarked for enhancing the digital infrastructure of public administration across critical areas such as public procurement, skills development, employment, and social protection.¹¹

Furthermore, the Recovery and Resilience Plan (RRP), under Pillar I: The Green Transition, Component C5 - The Renovation Wave, ratified by the European Union Council on October 28, 2021, encapsulates multiple objectives aimed at enhancing digitalisation in the construction sector.

In line with these objectives, Romania plans to undertake comprehensive reforms for the digitisation of the public institutions responsible for the authorization of construction and urban planning projects. Hence, through the aforementioned RRP objectives, Romania aspires to:

- Shorten administrative processing times and costs in urban planning and construction permits through process and information-flow optimization, and e-Government system expansion;
- Implement a centralized platform for obtaining planning certificates, approvals, and construction permits;
- Implement a comprehensive one-stop-shop system to facilitate the acquisition of urban planning certificates, requisite approvals, agreements, and construction permits.
- Devise requisite mechanisms and systems to enhance the electronic exchange of data among entities endorsing urban-planning documents and those engaged in construction authorization.
- Guarantee transparent access to legislation and technical regulations by creating a national portal dedicated to urban planning and construction.

In addition to these measures, the RRP acknowledges the pivotal role of Building Information Modeling (BIM) within the construction sector. To date, the adoption of BIM in Romania has been relatively circumscribed. Nevertheless, the government, as evidenced in the RRP, is initiating measures to promote broader application across the country. The RRP posits the development of a normative framework for the BIM concept, viewed through the prism of digitalizing the construction sector. This encompasses the enactment of technical

regulations, such as a guide on managing and monitoring information within the BIM system and a guide on employing design tools and managing digital data pertinent to construction.

These steps are not Romania's first efforts to incorporate BIM more extensively. A milestone was achieved with the adoption of the Romanian version of the BIM standards SR EN ISO 19650-1:2019 on July 9, 2023. These standards prescribe the organization of digital information for edifices and civil-engineering works employing BIM. Additionally, the government earmarked funds for the aforementioned goals through the project "*Increasing the coherence of the regulatory framework and the efficiency of technical regulations in the construction sector*," co-financed by the European Social Fund (ESF) via the Operational Programme Administrative Capacity (OPAC) 2014 – 2020. This initiative falls under Priority Axis 1 - Efficient public administration.

Since its inception on October 10, 2019, the project has pursued the following objectives:

- Drafting technical regulations and supplementary documents to support the integration of BIM in Romania's construction processes. This includes:
 - Crafting a detailed roadmap outlining the phases, benchmarks, and measures, along with identifying the responsible entities.
 - Establishing a comprehensive guide to manage and monitor the information within the BIM framework.
 - Setting technical standards for employing design tools and managing the digital data associated with construction.
- Implementing a series of educational programs aimed at upskilling public officials in the nuances of BIM.

As part of this initiative, an extensive consultation process took place, engaging stakeholders from the design, execution, academia, research, and public administration sectors to discuss BIM's implementation plan in Romania. Participants identified several critical barriers impeding the widespread adoption of BIM in Romania, including:¹²

- The inability to secure necessary

¹¹ European Construction Sector Observatory's country profile for Romania, dated January 2022.

¹² The Report of the Public Consultations on the BIM Implementation Plan in Romania developed within the *Increasing the coherence of the regulatory framework and the efficiency of technical regulations in the construction sector* programme.

approvals and authorizations from public administration for BIM-based projects.

- An absence of a legislative framework governing the use of BIM.
- A discernible disinterest in BIM projects among public-sector clients.
- A deficiency of trained professionals within both the economic-operators and public-administration spheres.
- The prohibitive costs associated with BIM software and hardware.
- A lack of effective communication among various project teams and their interactions with external partners or stakeholders.

The Romanian government seems to be addressing however these challenges and is currently trying to establish a legislative framework for BIM and mandate its use in projects financed by public funds. The advancement of BIM in Romania was significantly marked by the government's endorsement of a comprehensive roadmap on September 16, 2023, for the national deployment of BIM in publicly funded construction initiatives. This adoption aligns with the RRP, Component 5 – The Renovation Wave, Reform 1. This Memorandum lays the groundwork for the national application of BIM in the construction sector, aiming to establish an updated and streamlined regulatory framework to facilitate a shift towards sustainable and resilient construction practices. The implementation roadmap outlines four phases:

- Phase 1 (Q3–Q4 2022) – This phase focused on promoting and securing government approval for the national BIM implementation memorandum, as well as forming an interdepartmental working group under the Ministry of Regional Development and Public Administration's guidance.
- Phase 2 (Q1 2023–Q2 2024) – Spanning 18 months post-Phase 1, this phase is dedicated to preparing the implementation framework. It involves creating communication tools, a technical regulatory framework, identifying BIM-applicable practices, and establishing requirements, specifications, and classification systems, among other supportive instruments, to ensure a well-prepared implementation framework.
- Phase 3 (Q3 2024–Q3 2026) – This phase

marks the beginning of BIM's national roll-out and the execution of pilot projects, incorporating a BIM Maturity Stage 2 approach. Planned over 27 months following Phase 2, it will initiate the broad introduction of BIM into national practices.

- Phase 4 (Q4 2026–Q4 2028) – This final phase, lasting another 27 months after Phase 3, aims to widen BIM's development and application across various project categories. It will see extensive use of the digital tools developed in the preceding phases, including those for communication, data sharing, and information interoperability. It will also see the operationalization of a digital platform for BIM-based public projects, ensuring compatibility with other digital construction systems.

Further, following the roadmap approval, the Ministry of Regional Development and Public Administration issued Order 2221/2023 for the “*Guide on BIM Information Management and Monitoring, RTC 8-2022*”,¹³ and Order 2224/2023 for the “*Guide on Using BIM Tools in Construction Data Management, RTC 9-2022*”.¹⁴

These guidelines were developed as part of *Increasing the coherence of the regulatory framework and the efficiency of technical regulations in the construction sector* and will be applied to pilot investment projects in the public sector during Phase 3. These concerted efforts highlight the Romanian construction industry's acknowledgement of BIM's substantial benefits, indicating an imminent national expansion and integration of BIM practices.

Furthermore, another significant element of the RRP poised to catalyze the broader application of BIM, is the impending ratification of the Romanian Code of Territorial Planning, Urbanism, and Construction. This code is set to overhaul the legislative framework governing these sectors and is currently in the adoption stage. Upon its announcement, industry leaders harbored expectations that the code would encompass comprehensive regulations concerning BIM, thereby streamlining its adoption. Regrettably, the draft of the Code presented by the

¹³ Published in the Romanian Official Gazette no. 950 dated October 20, 2023.

¹⁴ Published in the Romanian Official Gazette no. 975 dated October 27, 2023.

Ministry of Regional Development and Public Administration, and approved by the Romanian Senate, references BIM merely five times, offering only tentative directives for its utilization. For instance, the code stipulates that:

- contractual clauses specific to construction execution may encompass conditions pertaining to BIM protocols,
- architectural activities and site management may engage in methodologies such as Computer-Aided Design (CAD) or the collaborative BIM approach,
- the assessment process for design projects may include the evaluation and integration of the collaborative BIM strategy.

Therefore, with respect to the implementation of BIM, the Romanian Code of Territorial Planning, Urbanism, and Construction falls short of being a transformative instrument. Nonetheless, in terms of the comprehensive digitization of the construction sector, the Code makes substantial advancements. For instance, it explicitly states that all requisite documentation for securing approvals and building permits can be submitted in digital format.

It is noteworthy that the current Emergency Ordinance 140/2020 *for establishing measures regarding the use of documents in electronic form in the fields of construction, architecture, and urban planning*¹⁵ already allows for the digital signing and management of documents throughout the complete procedural sequence of planning, design, authorization, construction, inspection, and the commissioning of buildings. However, the practical application of this ordinance has been met with resistance, as both public institutions and public clients continue to prefer physical documentation.

It is the collective aspiration that with the formal adoption of the Code of Territorial Planning, Urbanism, and Construction, the utilization of digital documentation throughout the entire lifecycle of construction projects will become the norm and be widely embraced. Furthermore, the trajectory toward digitization encompasses several additional initiatives, including:

- The preparation of territorial planning documents in both digital and traditional

formats.

- The requirement to conduct a 3D modeling analysis for regions undergoing significant urban development during the formulation of the General Urban Plan.
- The launch of a unified planning and construction authorization platform, which will streamline the operational processes of local public administration and digitally consolidate approved planning and urbanism documentation with construction permits.
- The integration of a national urban planning geo-portal into this unified platform, which will compile all territorial planning and urbanism plans in a Geographic Information System (GIS) format.
- The establishment of a digital one-stop-shop system for the acquisition of urban planning certificates, approvals, agreements, and construction permits.
- The stipulation that all urban planning documents are to be submitted digitally to the ministry charged with territorial planning, urbanism, and construction, facilitating their incorporation into the National Territorial Observatory and the National Platform for urban and territorial planning and construction authorization.
- The creation of a legal framework to enable the interconnection of databases and the formation of cooperative protocols with infrastructure network management, aiming to simplify the one-stop-shop processes at the municipal level and promote online interactions between mayors and authorization bodies, ultimately reducing bureaucratic complexity.

Therefore, Romania is at a critical juncture in the evolution of its construction sector, particularly with the integration of digital technologies like BIM. The anticipated Romanian Code of Territorial Planning, Urbanism, and Construction, despite its modest provisions for BIM, represents a step towards the larger goal of sector-wide digitization. The challenges that remain, such as the resistance to abandoning traditional documentation in favor of digital alternatives, are being addressed through legislative measures and the promotion of digital literacy and infrastructure.

¹⁵ Published in the Romanian Official Gazette no. 767 dated August 21, 2020.

3. BIM in practice

In the practical sphere, public clients are beginning to mandate BIM competencies in their tender documentation, indicating a burgeoning recognition of BIM's value in construction projects. However, the current methodology appears to be disparate and lacks coherence with the overarching Government Strategy outlined previously.

Take, for instance, the forthcoming Iași Regional Emergency Hospital project. Prior to issuing the tender, the National Agency for the Development of Health Infrastructure (ANDIS) engaged in a market consultation that contemplated BIM's incorporation in the project.

Specifically, ANDIS sought insights on:

- The expertise and resources required by contractors to meet BIM-related obligations, encompassing skilled personnel, procedural workflows, technological tools, and associated expenditures.
- The adequacy of the guidelines provided by the Authority regarding the specific data to be integrated into BIM, such as the efficacy of equipment, HVAC systems, and the collaborative dynamics among the construction parties (Contractor, Specialist Subcontractors, Designer, Supervisor) for the scrutiny of data housed within BIM.

This consultation signaled an encouraging precedent, reflecting a public client's intent to deeply comprehend and apply BIM in a project of significant scale and complexity. Regrettably, this optimism was short-lived. Upon the tender's release, it became apparent that the stipulated BIM prerequisites were cursory at best, necessitating the contractor to formulate a basic BIM model, draft preliminary and detailed BIM Execution Plans, and provide a platform for the management and dissemination of BIM data. The sparse details offered by the public client could pose challenges to the effective implementation of BIM within the project.

Also, the Ministry of Defense is demonstrating a keen interest in BIM. Recent tenders have utilized the bidder's BIM capability during design and execution as award criteria, rewarding full points to those showing advanced BIM proficiency in prior ventures. Despite this, the Ministry's requirements may not fully reflect the market's maturity level or the project's

complexity. In addition, the tenders also stipulate the submission of documentation in traditional formats, highlighting a juxtaposition between innovation and conventional practices.

The conclusion drawn is that while public clients are advised to incorporate BIM requirements into their procurement processes, such criteria must be thoughtfully crafted in alignment with governmental strategies and by BIM specialists, to prevent the establishment of well-intentioned yet ultimately impractical mandates.

On the private front, a commendable initiative is the work of Bimtech, a non-profit entity dedicated to the research, development, and deployment of technologies within a comprehensive platform for the design, construction, and maintenance of the built environment. Bimtech is at the forefront of educating the Romanian market on BIM and has undertaken several pilot studies to bolster the adoption of BIM throughout the nation.

In summary, the digital transformation journey of Romania's construction sector encapsulates a strategic embrace of BIM and a broader commitment to digitalisation. Despite initial reluctance, the sector is advancing towards a comprehensive integration of digital tools and methodologies, as evidenced by governmental initiatives, legislative reforms, and the adoption of European standards and practices.