

Digitalization of Product Certification in Construction

Ira MIHAIL¹, Mihaela ZURGA², Irina VLAD³, Raul-David ȘAIN⁴

Rezumat. Digitalizarea certificării produselor în construcții îmbunătățește eficiența, transparența și siguranța prin emiterea și gestionarea certificatelor digitale, urmărirea produselor prin intermediul platformelor software și automatizarea verificărilor. Aceasta reduce birocrăția și riscurile de erori, accelerând procesul de certificare. Integrarea cu reglementările europene și utilizarea blockchain pentru trasabilitate sporesc transparența și securitatea. Principalele provocări includ securitatea datelor și lipsa unui standard universal de certificare digitală la nivel global. Per total, digitalizarea va moderniza industria construcțiilor, aducând beneficii semnificative.

Abstract. The digitalization of product certification in construction improves efficiency, transparency, and safety by issuing and managing digital certificates, tracking products through software platforms, and automating verifications. It reduces bureaucracy and the risks of errors, speeding up the certification process. Integration with European regulations and the use of blockchain for traceability enhance transparency and security. The main challenges include data security and the lack of a universal digital certification standard globally. Overall, digitalization will modernize the construction industry, bringing significant benefits.

Keywords: Digitalization, Product Certification, Transparency, Blockchain, Data Security.

1. Introduction

The construction industry is a key sector of the global economy, with a significant impact on the environment, natural resources and human health. In a global context where sustainability and efficiency are priorities, the sector is in a state of continuous change, moving towards greener, more efficient and more transparent solutions.

Digitalization represents a profound and inevitable change in all economic areas, and the construction industry is no exception. Transforming traditional processes by implementing advanced technological solutions brings significant benefits in the management and certification of products in this sector. In particular, the integration of digital technologies in the certification of construction products represents a revolution, not only in terms of operational efficiency, but also in terms of transparency, safety and data protection. This change allows for better compliance with standards and technical

¹ Eng., Transport Research Institute INCERTRANS, Bucharest, Romania
(ira.mihail@incertrans.ro).

² Eng., Transport Research Institute INCERTRANS, Bucharest, Romania
(mihaela.zurga@incertrans.ro).

³ CDI department, Transport Research Institute INCERTRANS, Bucharest, Romania
(irina.vlad@incertrans.ro)

⁴ Eng., Transport Research Institute INCERTRANS, Bucharest, Romania (raul.sain@incertrans.ro)

regulations, ensuring that the materials used in construction meet the necessary requirements.

Certification of construction products is essential to guarantee the quality and reliability of the materials used, and the digitalization of this process solves multiple challenges that the industry has been facing to date. Replacing traditional methods, often affected by human errors and excessive bureaucracy, digitalization ensures a much faster and safer flow of products to the market, significantly reducing waiting times and risks associated with the management of physical documentation. In this context, digitalization becomes not just an option, but a necessity for the efficiency of the entire industry.

2. Issuance and management of digital certificates

Another pillar of digitalization in construction product certification is the use of IT platforms for product tracking and verification. These platforms provide centralized access to complete and up-to-date information on certified products, including their certification history, performance tests and any changes in the production process.

This allows authorities, manufacturers and distributors to verify at any time the compliance of products with the regulations in force.

For example, IT platforms can be configured to integrate QR codes, which allow products to be scanned to quickly verify certification data. This allows the authority certification to verify whether a product is compliant with regulations and can be sold on the market, without the need for a complex physical check of documents. In addition, IT platforms allow for real-time updates of a product's certification status, so that all parties involved have access to the latest information, contributing to an efficient workflow.

These platforms can also help prevent the marketing of non-compliant or dangerous products. Authorities can track products throughout their entire life cycle, from manufacturers to end use, ensuring that all safety requirements are met. Implementing such a system significantly reduces risks and improves the efficiency of the certification process.



Fig. 1. QR code and CE marking for a product used in construction

3. Automating verification and certification processes

Another significant advantage of digitizing product certification in construction is the automation of verification and certification processes. Using advanced technologies, such as artificial intelligence (AI), it is possible to automate the processes of assessing product

conformity. For example, algorithms can analyze the technical documentation of a product and compare it with the regulations and standards in force, providing a fast and accurate assessment of it.

Automating processes not only reduces the risk of human error, but also allows for a much faster certification process. This is particularly important in industry, where short lead times can make the difference between a successful construction and costly delays. By automating these processes, authorities can issue certificates of conformity in a much shorter time, and manufacturers and distributors can quickly obtain the necessary approvals to put their products on the market. In addition, automation reduces bureaucracy, eliminating the need to manually handle and verify documents, which helps reduce costs and administrative risks. Thus, advanced technologies can speed up the certification process, while reducing the possibility of errors or non-compliance.

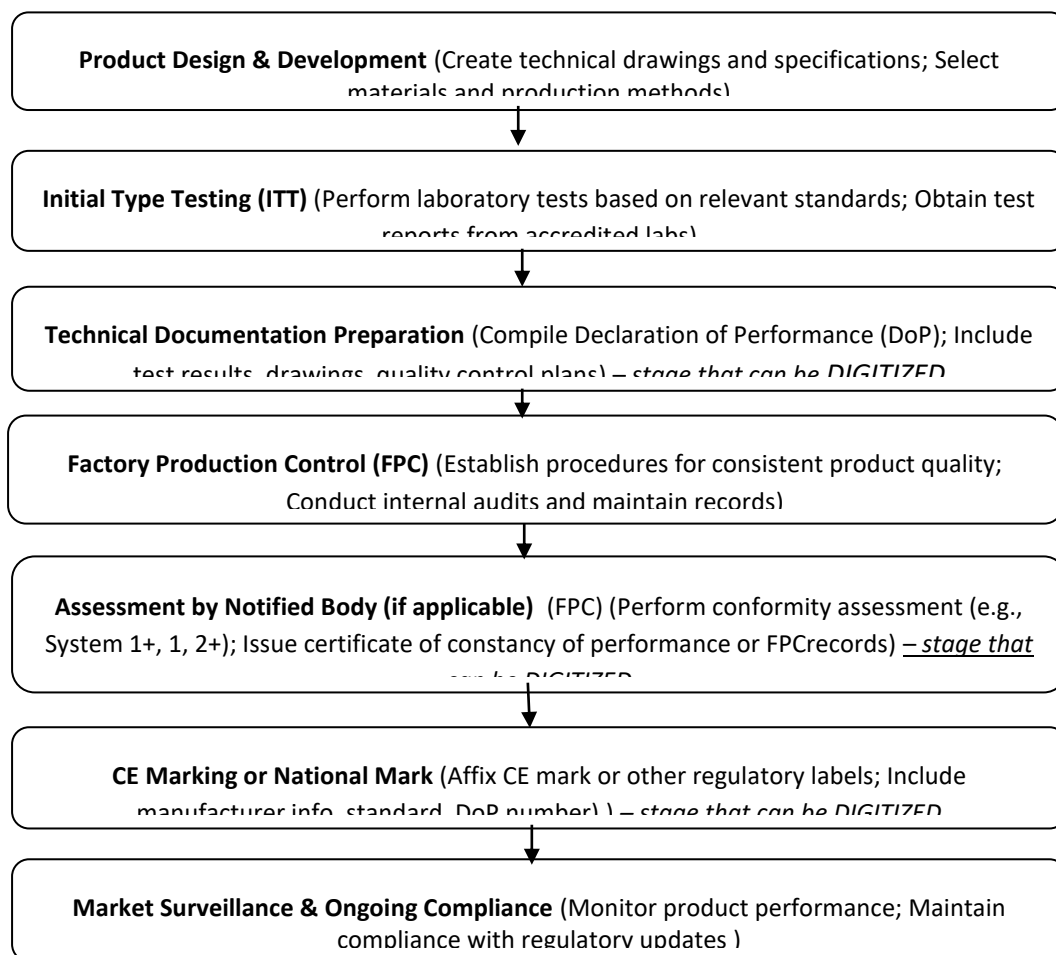


Fig. 2. The stages of the certification process

4. Integration with European and international regulations

A crucial aspect of the digitalization of product certification is its integration with European and international regulations. In the European Union, the regulations on the certification of construction products are clearly defined, and the digitalization of this process facilitates the implementation and uniformity of regulations at European level. Products that comply with CE standards can be certified and marketed throughout the European Union, which supports free trade between Member States.

These regulations are essential to ensure a high standard of quality and safety of products used in construction. Digitalisation allows certification authorities in different EU Member States to quickly share information and coordinate the certification process, which contributes to a rapid and uniform implementation of the regulations across all EU countries. Thus, digitalisation contributes to better integration of the internal market and supports cross-border trade.

As technologies advance, international regulations can also be integrated into a digitalized system, and products can benefit from global certifications, facilitating international trade. This is an important step towards standardizing certification processes and promoting a global regulatory framework that supports international trade and the development of the global economy.

5. Transparency and accessibility of information

The digitalization of construction product certification brings an increased level of transparency to the certification process. Through digital platforms, all parties involved – certification authorities, manufacturers and distributors – can access the information needed to verify the status and history of a product. This reduces the risks of fraud and contributes to increasing trust in construction products.

Transparency in the certification process is essential to prevent potential non-conformities that could jeopardize the safety of a building structure. For example, digital platforms allow authorities and consumers to check the history and status of a product, ensuring that the materials used are safe and comply with international standards. In addition, these platforms allow the publication of detailed reports that can be accessible to anyone, helping to strengthen public trust in the quality of construction products. In addition, the accessibility of online information allows for quick and efficient verification, saving time and resources. This transparency also helps prevent the use of non-compliant products, which can lead to serious safety problems in construction.

Regulation (EU) 2024/3110 of the European Parliament and of the Council of 27 November 2024 laying down harmonised rules for the marketing of construction products and repealing Regulation (EU) No. 305/2011, which will enter into full force on 8 January 2026, states that: “It is necessary to establish functional information flows, including by electronic means and in a machine-readable format, to ensure the availability, along the supply chain, of coherent and transparent information on the performance of construction products. This is expected to increase transparency and

improve efficiency in terms of information transfer. Ensuring digital access to comprehensive information on construction products would contribute to the digitalisation of the construction sector as a whole, preparing the framework for the digital age. In addition, granting access to reliable and sustainable information would also mean that economic operators and other actors would not contribute to non-compliance by others” and “The digitalisation and availability of product information increases transparency for the benefit of product safety and the protection of the environment and human health, while reducing the administrative burden and costs for economic operators”.

6. Using blockchain technology for traceability

Blockchain is an emerging technology that can play an important role in digitizing product certification in construction. This technology allows information to be stored in a decentralized, immutable and transparent ledger that can be accessed by all interested parties. In the case of product certification, blockchain can be used to track every stage of a product’s manufacturing and distribution process, ensuring that information cannot be tampered with.

By using blockchain, certification authorities can track a product’s traceability from manufacturing to end use, ensuring that the product meets all quality and safety standards throughout its lifecycle. For example, a building material could be recorded on the blockchain at every step of the production process, and all information would be accessible at any time, without the risk of data modification or falsification. Blockchain adds an additional level of security and transparency to product certification, reducing the risk of fraud and increasing trust in construction products. It can become an essential solution for ensuring the quality and safety of products in the long term.

7. The benefits and challenges of digitalizing construction product certification

Digitalization of construction product certification brings multiple benefits: Reducing bureaucracy, by eliminating physical documents and automating processes, digitalization significantly reduces bureaucracy, accelerating the certification process. Increasing efficiency, digital certification is much faster than traditional procedures, reducing the time needed to obtain approvals and allowing for the rapid processing of a large number of products. Minimizing risks digital technologies reduce the risks of human error and document falsification, ensuring a more secure and reliable certification.

Although the digitalization of certification brings many advantages, there are also significant challenges that need to be addressed: Data security, the protection of sensitive information is essential. Certification platforms need to implement

appropriate security measures to prevent unauthorized access and the risks of security breaches and standardization, the lack of a single global digital certification standard may hinder the rapid and uniform implementation of certification processes across regions, creating barriers to international trade.

Germany and France are relevant examples of implementing digitalization. From functional platforms to blockchain pilot projects. Germany was one of the first countries in the European Union to adopt a digital system for certification of construction products. Since 2015, authorities and manufacturers can communicate directly through dedicated online platforms, saving time and resources. Product certification is carried out quickly, and information is available in a centralized system, eliminating the risk of document loss and streamlining the entire process. France has been a remarkable example in using advanced technologies to digitize construction product certification. In 2020, a pilot project was launched that used blockchain to track the traceability of construction materials from the manufacturer to the end consumer. This method eliminated the risks related to document falsification and ensured full product traceability.

8. Digital passports for construction products

A digital passport for a construction product is an electronic database containing detailed information about the materials and products used in a construction, throughout their life cycle. This can include essential information about the manufacturer, material composition, technical performance of the product, carbon footprint and recycling possibilities. Digital passports allow for full tracking of materials, helping to ensure traceability and compliance with environmental regulations. A digital passport can include the following information: Details about the company that manufactured the product, the certifications obtained and the production processes. Material composition: The types of materials used (concrete, steel, wood, etc.), their sources and manufacturing processes. Technical performance: Data on the product's durability, fire resistance, thermal and acoustic behaviour, etc. Carbon footprint: Calculation of the environmental impact of the product throughout its life cycle. Recycling information: Details on how the product can be recycled or reused, facilitating the transition to a circular economy.

Digital passports are a key solution in promoting the circular economy, a concept that encourages the reuse of materials and the reduction of waste. They allow for the continuous monitoring of construction materials, facilitating the identification of those that can be recycled and reintegrated into the production chain. In addition, by making the production and use process transparent, digital passports contribute to reducing environmental impact and support the development of greener construction solutions. One of the most important advantages of digital

passports is that they allow the calculation and monitoring of the carbon footprint of construction products. This helps to identify the materials that generate the highest CO₂ emissions and promotes the use of greener and more energy-efficient solutions. By integrating this information into the digital passport, full traceability and better resource management can be achieved, reducing the environmental impact of construction.

Spain and the United Kingdom are examples of the implementation and development of this innovation area, TECNALIA, a research center in Spain, is collaborating with European authorities to implement a centralized system of digital passports that will include detailed information on construction products. This system will help authorities and manufacturers to more effectively monitor the environmental impact of the materials used and will support the use of a more efficient recycling system at European level. A relevant example of the use of digital passports in construction is the Edenica project in London. It includes a system for tracking construction materials, allowing their reuse and minimizing waste. Each material used in construction has a digital passport that contains detailed information about its composition, technical performance and environmental impact. The project promotes a sustainable construction model, in which materials do not become waste, but are reintegrated into the production or construction process.

9. Implementing digital passports in Romania

In Romania, the implementation of digital passports is facing difficulties due to the lack of a centralized digital infrastructure. Currently, there is no unified platform to store and manage information related to construction products. This makes it difficult to implement digital passports uniformly at the national level.

Another major obstacle is the initial costs required to implement a centralized digital system. Many small producers and entrepreneurs lack the resources to adopt this technology, which can lead to slow development. In Romania, the regulations governing the implementation of digital passports for construction products are still insufficiently developed. The absence of a clear legislative framework can create confusion and delay the adoption of this innovative technology.

To support the adoption of digital passports, Romanian authorities should adopt clear regulations and develop a legislative framework to regulate this process. Also, the integration of European regulations would facilitate alignment with international standards. It is essential that authorities and industries invest in the professional training of construction employees, so that they are prepared to adopt new technologies. Digital education will play an important role in the transition to

a more digitalized and sustainable construction sector. A close collaboration between Romanian authorities and the private sector is essential for the development of the digital infrastructure necessary for the implementation of digital passports. This collaboration can contribute to creating an environment conducive to digitalization, ensuring that all stakeholders benefit from the necessary technology.

Conclusions

The digitalization of construction product certification represents a major change in the construction industry, with significant benefits in terms of efficiency, transparency, safety and risk reduction. By implementing digital technologies, certification authorities and manufacturers can issue certificates of conformity faster, and IT platforms allow for continuous tracking and verification of products, ensuring that they comply with all regulations in force. The automation of verification processes and the integration of advanced technologies, such as blockchain, support the traceability and integrity of products. At the same time, digitalization contributes to reducing bureaucracy, accelerating the certification process and facilitating international trade. However, the implementation of these technological solutions requires attention to data security and process standardization.

As for digital passports for construction products, they represent an innovative and essential tool for the future of the construction industry. They bring multiple benefits, from increased sustainability to cost reduction and increased transparency. In Romania, their implementation faces significant challenges, but with investments in infrastructure, education and collaboration between authorities and industry, this concept can become a fundamental pillar for a greener, more efficient and safer construction sector.

Regulation (EU) 2024/3110 of the European Parliament and of the Council of 27 November 2024 laying down harmonised rules for the marketing of construction products and repealing Regulation (EU) No 305/2011 states that: "Digital technologies, which offer significant potential to reduce administrative burdens and costs for economic operators and authorities, while promoting new and innovative business opportunities and models, are evolving rapidly. The adoption of digital technologies will also significantly contribute to achieving the objectives of the renovation wave, including energy efficiency and life cycle assessment and monitoring, as well as of the building stock."

REFERENCES

- [1] Digital Construction in the European Union. European Commission web p., <https://ec.europa.eu>.
 - [2] Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. European Union web p., <https://european-union.europa.eu>
 - [3] Regulation (EU) 2024/3110 of the European Parliament and of the Council of 27 November 2024 laying down harmonised rules for the marketing of construction products and repealing Regulation (EU) No 305/2011. Official Journal of the European Union Series L/18. 12.2024. European Union web p., <https://european-union.europa.eu>
 - [4] Regulation (EU) 2018/1724 of the European Parliament and of the Council of 2 October 2018 on the establishment of a single digital gateway to provide access to information, procedures and assistance and problem-solving services and amending Regulation (EU) No 1024/2012 (OJ L 295, 21.11.2018, p. 1). European Union web p., <https://european-union.europa.eu>
 - [5] Digital transformation Tecnia web p., <https://www.tecnalia.com>
 - [6] Trialling materials passports at the Edenica office building - Cibsejournal web p., <https://www.cibsejournal.com/case-studies/trialling-materials-passports-at-the-edenica-office-building/>
-